PUBLIC ADMINISTRATION AT THE BOUNDARIES
Studies and Perspectives on an Evolving Public Law

N. 5

Isabel Celeste Fonseca

SMART CITIES AND LAW, E-GOVERNANCE AND RIGHTS

with a preface by
Julián Valero Torrijos

Wolters Kluwer

CEDAM

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PREFACE

Smart cities are nowadays one of the main examples of technological innovation in the public sector, particularly at the local level. This type of project aims to address the challenges raised by sustainability in the urban environment and, by using cutting-edge information and communication technologies, achieve a more efficient and effective provision of services.

From the legal perspective and with regard to the legal implications of this type of project, it is necessary to emphasise the complexity that the involvement of a variety of different and very heterogeneous actors entails. Indeed, on the one hand, there are many different interests at stake, which may even be potentially conflicting and therefore generate disputes with an undeniable legal dimension. On the other hand, the plurality of activities and services involved also determines the diversity of the applicable legal framework, originally introduced for different purposes - eGovernment, data protection, environmental protection, open data and re-use of public sector information - and not always properly alignment with the achievement of the objectives of smart city initiatives.

Furthermore, all this in a context where the prominence of information and communication technologies requires an additional effort in relation to interoperability and information security, principles that are particularly important not only from a technological perspective but, above all, from a legal and organisational perspective. In short, it is essential to design appropriate governance schemes that consider all these dimensions and, in particular, the concrete context in which the smart city

must work. All of this should be achieved from the perspective and according to the requirements of Open Government, so that social participation is ensured when designing and monitoring the project.

One of the essential tools for tackling this challenge is Law, which is expected to play an essential role, as it must offer the essential preconditions for technological innovation in this type of initiative to be fully consistent with the integrity of legal guarantees and, in particular, with total respect of citizens' rights. In addition, the provision of an appropriate regulatory framework -and a set of guidelines for its interpretation in line with the social reality of the time in which it is to be applied- is an extremely important factor in ensuring the basic conditions of legal certainty that enable the indispensable public-private collaboration to flourish. A proactive analysis of the regulatory context of smart cities is finally crucial in order to detect any legal barriers that may exist and, if necessary, to propose appropriate solutions to tackle them.

It is therefore imperative to overcome the traditional perception of Law as a barrier that tends to hamper technological innovation and, therefore, hinder the success of smart city projects. The deficiencies of the current legal framework also need to be faced from a new approach. Specifically, it is necessary to adopt a proactive, cross-cutting, comprehensive and open vision that helps to circumvent the regulatory limitations that local authorities may find; these, for their own part, must support a truly alternative model for managing the information and services on which the project is founded.

To this end, from a legal perspective, it is of the utmost priority to provide interpretation guidelines for enabling local authorities to embrace this approach by understanding the law in a way that allows them to use the legal powers and tools that are conferred on them - in short, the exercise of their competences - in support of the above-mentioned approach. In particular, beyond the capacity to adopt unilateral decisions through administrative acts when required, there is a wide path to be followed in the field of public procurement which, ultimately and from the horizontal and strategic vision that must inspire any smart city project, would

make it possible to provide an adequate solution to potential legal gaps and dysfunctions.

As a general point, it should be underlined that smart cities projects are usually inspired by a management approach based on sustainability and efficiency in the use of existing resources, in particular with regard to environmental protection, mobility and, in general, urban public services. And it is exactly the result of this approach that determines that it must necessarily be based on the intensive use of ICTs. More precisely, from the point of view that we are considering here, it is essential for any project in this field to foster an advanced framework of advanced analysis and intensive exploitation of the data generated and, specifically, of the data associated with the provision and use of public services, facilities, and infrastructure.

The local government therefore becomes the key player around which smart city projects are articulated, particularly in terms of the public services it provides, and also in terms of the use of the assets and infrastructures it owns. However, there are also a number of other key players who are also expected to have a major contribution to make:

- local officials and staff;
- private entities that, via the corresponding contract, provide public services;
- those companies in charge of providing the software and the information systems;
- the entities that manage the telecommunication networks through which the information is transmitted and the services are managed;
- interconnected objects and sensors (IoT) which, in an automated and uninterrupted way, provide countless data of potential interest for the better and more efficient provision of services and use of public resources;
- the individuals to whom the services are addressed, whose data are integrated into the information system;
- the re-users of public sector information, who may offer value-

added services, free of charge or not, based on the data generated in the context of the smart city project.

Considering this variety of stakeholders involved in smart city scenarios, it can be understood that, from the premises previously stated, the main risk lies in the diversity of interests pursued by each of the aforementioned parties, as they could even be in conflict with each other. For example, it is likely that the entities that provide the services are unwilling to open the data they manage, as this could mean that other companies competing with them would have relevant information; likewise, from the users' perspective, it is also understandable that there may be reluctance to use the information linked to their activity, particularly if the appropriate measures are not implemented to dissociate the data; finally, telecommunications companies themselves may consider that it is in their interest to keep the exclusive control of their customers' data in order to offer them, even with their prior consent, personalised value-added services.

Additionally, the large number of actors entails an extra complexity in addition to the intensive use of technology and the exploitation of data: many of the players concerned carry out a different activity under diverse legal regimes which not always will be adjusted to the needs and singularities of a smart city. Moreover, the intensive role of technology in this context poses an additional challenge from the point of view of law, since in addition to the aforementioned regulatory diversity, it is also necessary to align this element to ensure that the information generated by all the subjects involved can be made accessible in keeping with the requirements of open data: in other words, readable in an automated manner according to technical, semantic, organisational and legal interoperability criteria.

As Professor Isabel Celeste Fonseca states in the first chapter of this book, it is necessary to propose a global strategy for a specific digital transition in the field of the city, taking into account the different perspectives involved. This challenge must be faced, as is done in the book, from the fulfilment of major global sustainability objectives, but taking advantage of technology as a suitable lever

for the transformation of city management from a data-driven approach based on cloud computing and the advanced use of Artificial Intelligence. Not only should the focus be on better service provision, but also on the rights of people living in the city, without disregarding the essential role of inclusive policies, a dimension that is analysed in several passages of the book. This is precisely why, even though the focus of the book is mainly on the Portuguese perspective, the contributions relating to other legal-political realities, such as the Brazilian and Spanish experiences, which focus on two areas of singular importance: urban development and cultural heritage, do have a special value.

Finally, it should be remarked that the works that are now being published in this book are the result of a previous reflexion, analysis and discussion process that has taken place over the last few months within the framework of the activities promoted by the School of Law of the University of Minho in Braga as part of the "*Smart Cities and Law, e-Governance and Rights*" project. The excellent leadership of Professor Isabel Celeste Fonseca and her academic generosity not only have undoubtedly been essential for the activities to be held successfully but for their fruits to be gathered in the inspiring book that is now being released as well.

Murcia, 1 June 2023

Julián Valero Torrijos

CITIES AND LAW, E.GOVERNANCE AND RIGHTS: BECAUSE WE NEED A GLOBAL DIGITAL TRANSITION STRATEGY FOR THE CITY *

Isabel Celeste Fonseca **

0. *Introduction: Old issues, new ideas, amazing challenges*

As so many times before said, the urban population continues to increase, and it is said that currently more than 60% of the world's population lives grouped around urban centres, whether they are called cities or agglomerations, and forecasts indicate that it will reach almost 70% in 2050. Cities have a great impact on the economic and social development of countries and are beginning to

* This text follows on from the question initially formulated in our article: *Smart cities and Law, E.Governance and Rights: do we need a global digital transition strategy for the city?*, in *European Review of Digital Administration and law*, Erdal, vol. 2, issue 1, 2021, ISSN 2724-5969.

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occupy an untapped place on the world scene, counting on economic, political and technological power. They constitute true ecosystems where people live and work, where companies develop their activity and in which numerous services are provided. They are also great centres of resource consumption. It is estimated that they are currently responsible for 75% of the world's energy consumption and the production of 80% of the gases responsible for the greenhouse effect.

As we said before,[1] the smart city concept emerged two decades ago to address the problems of sustainability and efficient resource management, fundamentally linked to energy efficiency and the reduction of carbon emissions. It is important to Ethics and Law to foresee solutions to the problems and challenges that cities are already facing.[2]

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[1] See our article: *Smart cities and Law, E.Governance and Rights...*, *op. cit.*

[2] According to a study published by Ericson, which corresponds to the 23rd edition of its 2015 Sustainability and Corporate Responsibility Report, it is configurable that the use of Information and Communication Technologies can contribute to the reduction of CO_2 by 15% by 2030, allowing the achievement of several of the 17 United Nations Sustainable Development Goals, including the 11th and 13th ("action against global climate change"). On the subject, it is important to highlight The New Urban Agenda (NAU), Quito Declaration on Sustainable Cities and Urban Agglomerations for All. It was approved in 2016 at the United Nations Conference on Housing and Sustainable Development (Habitat III): "the right to the city". In addition to Agenda 2030, the NAU is part of other international agreements, such as the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) and the Addis Ababa Action Agenda of the Third International Conference on Financing for Development. See Directorate-General for International Policies, Policy Department Economic and Scientific Policy, *Mapping Smart Cities in the EU*, Study, 2014. See also, I.C. Fonseca, *Estudos de Direito das Autonomias Locais*, Coimbra, Gestlegal, 2020; I.C. Fonseca and A.R. Prata, *Smart cities vs. smart(er) governance: cidades inteligentes, melhor governação (ou não)*, in *Questões Atuais de Direito Local*, 24, 2019. I.C. Fonseca and A.R. Prata, *Las ciudades inteligentes en Portugal*, in M.L. Gómez Jiménez and O. Romero Guisado (coords.), *Greencities, 11° Foro de Inteligencia y Sostenibilidad Urbana: Actas del XI International Greencities Congress*, 2021,

However, and once again we say,[3] there is no single agreed definition of what a smart city should be. On the contrary, the notion of smart city is intrinsically related to different dimensions of the right to live with quality of life in the city, and it depends on multiple factors, including the availability of Information and Communication Technologies (ICTs), demographic, geographic and cultural aspects of the city, as well as on the political choices for the city.

Today the concept of smart city is mainly associated with technology and innovation. The new intelligent city makes use of software, algorithms and tools of artificial intelligence, leading us to foresee what is called algorithmic governance, Open & Linked Government Data (O&LGD)[4] or digital governance.

The digital transition process has been gaining speed. It is a priority for Europe and for Portugal and it must also be the priority of Regions and Local Governments. In Europe, Portugal and Local Governments the goal is the same: effective e.Government can provide a wide variety of benefits, including more efficiency and savings for governments and businesses, increased transparency and greater participation of citizens in political life, and contribute to the decarbonization and significant improvement of the environment.[5]

New technologies, digitalization, population aging, reinforcement of environmental awareness, a new culture of mobility and

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ISBN 978-84-09-19596-1, pp. 267-278. See also, for further developments, J. Cristino, *A Missão das Cidades no combate às Alterações Climáticas. A governança multinível para o êxito da saúde planetária*, Guerra e Paz, Lisboa, 2021.

[3] See our article: "Smart Cities and Law, E.Governance and Rights: (retomando) o diálogo com a Benedita", in: *Liber Amicorum Benedita Mac Crorie,* Escola de Direito da Universidade do Minho, Volume I, UMinho Editora, Braga, 2022, 509-527.

[4] See more: https://ec.europa.eu/futurium/en/content/open-government-what-value-and-what-are-barriers-and-drivers-2.

[5] See I.C. Fonseca, *Governação Pública (Local) Digital: notas breves sobre a aceleração da transição digital*, in A. Flamínio (coord.), *Direito Administrativo e Tecnologia*, Almedina, Coimbra, 2021.

communication are trends that require new answers. As we rely more and more on information and communication technology, cybersecurity becomes both essential and problematic to our societies. On the one hand, cybersecurity is essential to prevent cyber threats from undermining citizens' trust and confidence not only in the digital infrastructure but in policy-makers and state authorities as well. On the other hand, the security of digital systems is of paramount importance as it strengthens users' confidence in the rule of law and affirms the fundamental values like equality, fairness, autonomy, or privacy. [6]

This is the main objective of this book. It results from the studies developed under the research project Smart Cities and Law, E-Governance and Rights – which is co-financed by the European Regional Development Fund (ERDF), through the Support System for Scientific and Technological Research, in the framework of the Regional Operational Programme North 2020, and which is developed under the Research Centre in Justice and Governance (JusGov) of the Law School of the University of Minho (UM).

This project, which began more than 24 months ago and now ends in June 2023, has involved several research activities, some of which are empirical research and mapping of the state of the art of smart cities in the north of the country, and others are theoretical studies, and the activities have been developed by a multidisciplinary team of permanent researchers from the UM, which also includes scholarship holders and contract researchers, and other collaborators.

We are certain that the construction of smart cities does not dispense either one type of study or the other. And, in fact, it is important to identify the measures already implemented in Portuguese cities, especially in terms of digitalization of administrative structures and procedures and their impact on

[6] For further developments, see I.C. Fonseca, *Governação Pública Digital e a Proteção de Dados Pessoais: notas breves sobre as dificuldades de harmonização*, in *Estudos de E.Governação, Transparência e Proteção de Dados*, Almedina, Coimbra, 2021.

citizens' privacy, and it is necessary to continue studying the concept of smart city and the set of indicators that, today, allow its identification.

Building smart cities is an emerging topic of study, for many reasons: it is possible that by 2050, 70% of the population will be urban; that cities will continue to be major centres of resource consumption and responsible for the production of 80% of greenhouse gases. This is also why the 11th sustainable development goal of the United Nations 2030 Agenda, which is to make cities and urban settlements more inclusive, safe, resilient and sustainable, justifies the study of sustainable cities. At the same time, the new regulatory frameworks on artificial intelligence (AI), administrative digitalization, interoperability and the Common European Data Space are on the agenda. The European Commission has high ambitions for a Europe that wants to be strong by having data in its possession and being able to put it to work to produce new goods and services, through openness and re-use. Municipal public governance is also part of this agenda. For these and other reasons, this book has been published, as it is important to prepare the future of cities, drawing lines for a Smart Cities Charter. This subject presents, in short, "Global Challenges", both as regards the implementation of the sustainability principle in cities and as regards the intensification of the digital transition of local public governance, digital inclusion, data protection, access to open data and reuse of data held by Local Authorities.

1. *Contextualization: the acceleration of digital transition is a Europe and Portuguese priority*

Digitalization is a priority for Europe and Portugal. It is in this framework that this text intends to justify the need to conceive the Digital Transition Plan for Local Governance.

"Imagine for a moment what life would be like in this pandemic without the digital in our lives," Ursula Von der Leyen, President of

the European Commission, began by saying when she addressed the topic of technology and digital in the State of the Union on September 16, 2020 (It.insight, 27.10.2020). Assuming that "we are reaching the limit of what we can do in an analog way," it is necessary to create "a common plan for digital Europe with clearly defined goals for 2030". These goals include connectivity, digital public services, following "clear principles" such as "the right to privacy and connectivity, freedom of expression, free movement of data, and cyber security". The President of the European Commission identifies three areas that need focus: data, artificial intelligence and finally infrastructure.

1.1. In Europe, the Digital Single Market was conceived as an absolute priority and there are several strategies adopted.[7] As part of the Digital Single Market objective, the European Commission has presented a series of measures including the European Action Plan (2016-2020) for e-government: accelerating the digital transformation of public administration (e-Government & Digital Public Services), designing the unique digital platform and implementing the European cloud as part of the

[7] If we wanted to present a list of international and European legislation that provides solutions for the implementation of the intelligent city we would have to start with the Agenda 2030: "Leaving no one behind" is the motto of Agenda 2030 that was adopted in 2015 by the United Nations General Assembly and that is structured in 17 sustainable development goals (SDGs). The 11th goal refers to making cities and urban settlements more inclusive, safe, resilient and sustainable. Next: The New Urban Agenda (NAU), Quito's declaration on Sustainable Cities and Urban Conglomerates for All was approved in 2016 at the United Nations Conference on Housing and Sustainable Development (Habitat III): "the right to the city". In addition to Agenda 2030, the NAU integrates other international agreements such as the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) and the Addis Ababa Agenda for Action of the Third International Conference on Financing for Development.

NextGenerationEU model. And multiple are the benefits to be achieved, it is said.

In the European context, there has been strong investment in the digital field: i) in the creation of programmes and strategies to boost the digital and economic competitiveness of businesses; ii) supporting initiatives aimed at empowering citizens with the necessary skills for the digital world and labour market and promoting the closing of the gap in participation between women and men; iii) the institutionalization of a regulatory and economic environment conducive to the use and creation of new technologies, with particular focus on the well-being and prosperity of citizens; iv) the development of a digital infrastructure that allows citizens to take advantage of the new opportunities offered by technologies. And in particular in initiatives to promote e-Government, responsible State innovation based on new technologies, the co-creation and experimentation of digital public services, the implementation of Open Administration principles and the creation of partnerships between innovation actors.

In 2021, the European Commission presented its Guidelines for Digitalisation up to 2030: Europe's way to the Digital Decade. And in 2022, the Commission in its Communication of 26 January presented a European Declaration on Digital Rights and Principles for the Digital Decade.

Also, in this direction goes the European data governance law: Regulation (EU) 2022/868 of the European Parliament and of the Council of 30 May 2022 on European Data Governance (and amending Regulation (EU) 2018/1724 (Data Governance Regulation)). It is fully in line with European Union (EU) values and principles and will bring significant benefits to EU citizens and businesses. As a key pillar of the European data strategy, the Data Governance Act seeks to increase trust in data sharing, strengthen mechanisms to increase data availability and overcome technical barriers to data re-use.

The Data Governance Act will also support the creation and development of European common data spaces in strategic areas,

involving private and public stakeholders, in sectors such as health, environment, energy, agriculture, mobility, finance, manufacturing, public administration and skills. Data governance entered into force on 23 June 2022 and, after a 15-month grace period, should be implemented from September 2023. As regards its object and scope, Article 1(1) states that it establishes:

"(a) conditions for the re-use in the Union of certain categories of data held by public sector bodies;

(b) a notification and supervision regime for the provision of data intermediation services;

(c) a scheme for voluntary registration of entities collecting and processing data made available for self-serving purposes;

and (d) a regime for the establishment of a European Data Innovation Board".

And while it is true that, under the terms of Article 1(2), "the Regulation does not create any obligation for public sector bodies to allow re-use of data nor does it exempt them from confidentiality obligations that they may have under Union or national law", the truth is that this Regulation takes a very serious step forward in the creation of a common space for data that public bodies in the Member States have in their possession and thus have to share.

The Data Governance Regulation will be a powerful driver of innovation and new jobs. It will allow the EU to make sure it is at the forefront of the second wave of data-driven innovation.

1.2. The acceleration of the digital transition process is also a commitment of the Portuguese authorities. The Action Plan for the Digital Transition (Resolution of the Council of Ministers no. 30/2020, of 21.04.2020) was approved, with the purpose of accelerating Portugal, without leaving anyone behind, and projecting the country in the world, aiming at convergence with Europe, in the digital domain. This Action Plan for the digital transition is based on three pillars: empowerment and digital inclusion, the digital transformation of the business fabric and the digitalization

of the State (and central and local public administrations). And it translates, in fact, another stage in the journey of administrative modernization and simplification, the strengthening of digital public services and the achievement of connectivity and openness of data held by Public Administrations. [8]

Precisely, the digitalization of the State is the third pillar of the Action Plan for the Digital Transition of Portugal. At this level, the Plan includes three measures, among which instituting a connected and open Regional and Local Administration is only briefly listed.

Therefore, it is important to continue developing the study of the Local Government digital transition process, to which the Action Plan for the Digital Transition of Portugal will soon be referred, and to conceive in this research project the Definition and Implementation of the Global Strategy of Smart Cities: From Smart Cities to Smart Nation, to Smart EU.

Scanning is also a priority for Portugal. And this is proven by the Digital Transition Plan for the Nation, which is in line with the European strategy. The Portuguese Digital Transition Plan

[8] The Strategy for Innovation and Modernization of the State and Public Administration 2020-2023 (Resolution of the Council of Ministers No. 55/2020 of 31.07.2020) develops around four axes and 14 strategic objectives: (I) Investing in people, with three strategic objectives: i) developing and renewing leadership; ii) mobilizing and training workers, and iii) involving workers in cultural change; (II) Developing management, with four strategic objectives: i) strengthening performance management to improve the quality of public services; ii) planning human resources in an integrated manner; iii) investing in administrative simplification, and iv) promoting innovation in public management; (III) Exploiting technology, with three strategic objectives: i) strengthening the global governance of technology; ii) improving interoperability and service integration, and iii) managing the data ecosystem with security and transparency; (IV) Strengthening proximity, with four strategic objectives: i) promoting integration and inclusion in the service; ii) encouraging citizen participation; iii) deepening the decentralization of competencies to local authorities, and iv) strengthening proximity public services, namely through the deconcentration of public services to the regional level.

presupposes strategic action on three main focuses: people, companies and Public Administrations.

Naturally, at the level of people's empowerment, the strategy goes through Digital Education, Professional Training, requalification and inclusion and digital literacy. The Plan aims to develop and implement the INCoDe.2030 programme, as an inter-ministerial initiative that aims to respond to three major challenges: ensuring digital literacy and inclusion for the exercise of citizenship; stimulating specialization in digital technologies and applications for the qualification of employment and producing new knowledge in international cooperation.

From the point of view of the transformation of companies, the national strategy involves entrepreneurship and investment attraction, focuses on the business fabric, on small and medium-sizes enterprises (SMEs), and the transfer of scientific and technological knowledge to the economy.

Finally, it is important to reinforce how to achieve State digitalization: it goes through the digital public services, it goes through the whole Public Administration of the State, seeking to achieve an agile and open central administration, and includes the Regional and Local Public Administration. This has to be connected and open. Therefore, the digitalization of the State is the third level of action for the digital transition. And it translates, on one hand, the continuity of programs for simplification and dematerialization of procedures (continuing the Simplex I and Simplex II programmes) and aims at instituting connected and open Public Administration (to include Local Governance).

Thus, as for public services, the Digital Transition Plan considers that facilitating citizens' access to public services and simplifying and dematerializing administrative procedures continue to be identified as ways for the State to better serve citizens, thus ensuring the reconversion of processes to the digital universe, their multi-lingual translation, as well as investing in training and valuing workers in information technology and digitalization.

The Digital Transition Plan aims to expand the supply of

digitalized public services, with 25 online procedures and the promotion of public services connected to each other and open, in the sense that they have reusable information. The Cloud Measure for Public Administration is one of the most measured measures, following the proposal of the Cloud Strategy for Public Administration, in 2019, by the Council for Information and Communication Technologies in Public Administration.

All measures, included in the XXII Constitutional Government Programme, aim to ensure simplification and online access to at least the 25 most used administrative services, ensuring their dematerialization and that everyone has access to public digital services. In this sequence, it is important to note the expected benefits: this measure will actively contribute to the reduction of bureaucratic obstacles in public services, optimize other channels of contact at a distance with the Public Administration and contribute to the decarbonization and significant improvement of the environment.

Finally, regarding the connected and open regional and local Administration, the strategy to which the Digital Transfer Plan summarily refers to is the definition and implementation of the National Strategy of Smart Cities (From Smart Cities to Smart Nation) and the Inventory and streamlining of the territory coordination through the initiative of the Single Building Counter.

For years now, the public sector in Portugal has been changing its operating model, adapting to new technological realities and the challenges of the so-called e-government.[9] For example, the

[9] LabX – Public Administration Experimentation Laboratory, created in 2017, with the purpose of designing innovative solutions for public services based on citizens' needs. Designed to test new solutions that improve public services and the daily lives of citizens and businesses, LabX is an open space that works in collaboration with service users, public administration officials and leaders, and the scientific and business community; The ICT2020 Strategy, Strategy for Digital Transformation in Public Administration, published in 2017 by the Resolution of the Council of Ministers No. 108/2017, has contributed to strengthen the

Simplex+ Programme, launched in 2006, already includes more than a thousand administrative and legislative simplification measures to make life easier for citizens and companies in their relationship with the Administration, as well as to contribute to increase the internal efficiency of public services. Reinforced in 2016, the Programme includes 255 measures of administrative and legislative simplification and modernization of public services.

With the entry into force of the Public Procurement Code in 2008, which placed Portugal at the forefront of public procurement through exclusively electronic means, it is also possible to consult online all contracts resulting from the public procurement process through the Public Procurement Portal (Portal BASE), managed by the Institute for Public Markets and Construction (IMPIC). Subsequently, in 2009, the obligation of electronic public procurement as well as the creation of a private market of certified service providers of public procurement platforms were established, two pioneering and innovative solutions worldwide.

The e-procurement system adopted by the Portuguese Government is based on the promotion of a private market for e-

transparency of the public sector and the participation of citizens, consolidating the use of ICT as a central tool for the process of modernization of the State, presenting a series of measures grouped into three axes of action: integration and interoperability; innovation and competitiveness; sharing of resources. The Agency for Administrative Modernization, which is the public institution responsible for the promotion and development of administrative modernization in Portugal, promoted, in May 2018, the creation of the National Open Administration Network. With regard to the circular economy of data, the First Action Plan of the National Open Administration Network (RNAA) is structured on four main axes, namely: Open Data, promoting the availability and reuse of information generated by the Public Administration; Transparency, promoting access to public information and administrative documents from the public sector; Use of Information and Communication Technologies and Digital Inclusion, disseminating new relationship channels between the Public Administration and citizens/companies and standards of accessibility and assisted access to public services; and Public Participation, stimulating the use of processes of public consultation and participatory democracy.

procurement services, by companies under a regulated competition regime, managing the corresponding electronic platforms. [10] In 2015, Law no. 96/2015 of 17 August 2015 updated the legal regime for electronic procurement platforms in Portugal, having transposed Article 29 of Directive 2014/23/EU, Article 22 and Annex IV of Directive 2014/24/EU and Article 40 and Annex V of Directive 2014/25/EU. This diploma contains, namely, the rules regarding the use and availability of electronic platforms, as well as all the conditions to which they must be subject, including the obligation of interoperability with the Public Procurement Portal and also with other systems of public entities. In general terms, the new legal framework has brought three major innovations: 1. licensing requirements for the activity of management and operation of electronic platforms and other requirements to the managing entities, namely greater duties and functional, technical and security requirements; 2. interoperability and compatibility requirements; 3. introduction of a penalty system.

The electronic public procurement platforms thus constitute a fundamental and indispensable instrument in the dematerialization of public procurement procedures, and the contracting entity must make available there the following elements: the procedure notice; tender notice or invitation; the tender documents, of which the tender specifications are an example; the clarifications and rectifications of the procedure documents, lists of errors and omissions identified by the competitors in those documents, as well as the decision that will fall on them; the competitors' proposals; the qualification documents of the successful bidder; the list of

[10] Currently, and according to the information available on the BASE portal, five electronic platforms are licensed: ACINGOV (Academia de Informática, Lda.), ANOGOV (Ano – Sistemas de Informática e Serviços, Lda.), Electronic Platform for Public Procurement COMPRASPT (Miroma – Serviços e Gestão de Participações, Lda.), SAPHETYGOV (Saphety Level – Trusted Services, S.A.) and VORTALGOV (Vortal, Comércio Electrónico Consultadoria e Multimédia, S.A.).

competitors and the list of candidates; the preliminary and final reports and the drafts and the respective contracts.

The National Public Administration Open Data Portal was launched in 2011 and reformulated in 2018 and aggregates references and hosts open data from different bodies and sectors of the Public Administration, being the central catalogue of open data in Portugal. This portal allows citizens and companies to access, study and (re)use the data produced by the State. The data.gov is an open portal, i.e., any user can create an account and upload data to be shared with the community under open licenses.

The Portuguese system today adopts the general principle of open data and open administration (Article 2 of the Law on Access to Administrative Documents (LADA)). This means that administrative entities (and private entities for these purposes equivalent) must ensure that the documents and data they produce or make available are, as far as possible, open from their conception and must allow future availability to citizens and social organisations. The principle translates into the following: access to and re-use of administrative information is ensured in accordance with the principles of equality, proportionality, fairness, impartiality and partnership with individuals. The information must guarantee the transparency of the administrative activity, allowing the control of the activity by citizens and institutions, and must be actively disseminated.

The Portuguese system incorporates in Article 5 of the Law the right of open access to data: every person, without the need to express an interest, has the right of access to administrative documents, which includes the rights of consultation, reproduction and information on their existence and content. A restriction to the right may occur when access is faced with the invocation of nominative or personal information, and the consent of the holder of the personal data must be requested or, failing that, justification for accessing the information in a fair and proportionate manner.

In truth, the open data system is not only the result of the transposition of Directive (EU) 2019/1024 of the European

Parliament and of the Council of 20.06.2019, it is also natural to the democratic rule of law and the exercise of citizenship rights. It is connatural with the Portuguese rule of law and with its rules, which impose duties of transparency and duties of publicity of public registers and archives in order to allow the control of public authorities by the Community: Article 268(1) and (2) of the Constitution of the Portuguese Republic; Article 17 of the Code of Administrative Procedure; and Law on Access to Administrative Documents (Law no. 26/2016 of 22 August 2016, as amended by Law no. 68/2021, of 26 August 2021).

Reference should also be made to the recent amendment to the Administrative Procedure Code (approved by Decree-Law No. 4/2015, of January 7 2015), which introduced important novelties in this field, consecrating, from the outset, the principle of "electronic administration", with a view to reinforcing procedural simplification and respective digitalization, including in procedures in which local authorities are involved.

The Portuguese Participatory Budget (OPP), launched in 2016, is a paradigmatic case of participative democracy powered by technology. The OPP is a deliberative democratic process, through which people present investment proposals and choose, through voting, which projects should be implemented in different areas of governance. The implementation of the OPP aims to build a citizen participation project that brings people closer to politics and promotes greater connection and integration between territories through nationwide projects.

2. *The (new) smart city concept*

In this time of accelerated digital transition, designing the smart city is a challenge. It is a challenge for the policy-maker in the international community and especially in Europe and is an ongoing task for the State and Local Governments. In particular, it is a strategic issue of strengthening the power of Regions in

Europe and the autonomy of Local Government. And it has in fact been welcomed as the greatest contribution to the achievement of the United Nations' 11th SDG: "to make cities and urban settlements more inclusive, safe, resilient and sustainable" and the 13th SDG: Action Against Global Climate Change. [11]

In fact, according to a study, the use of ICTs contributes significantly to the reduction of CO_2, being expected to be reduced by 15% by 2030. Ericsson published the 23rd edition of its Sustainability and Corporate Responsibility Report 2015, which details the company's performance in three areas: business responsibility, energy, environment and climate change and communication for all. The report also highlights how ICTs can enable the United Nations' 17 Sustainable Development Goals, and explains their potential as an accelerator to achieving them.

The new smart city makes intensive use of Information and Communication Technologies, applying in public procedures high technologies, such as software, algorithms and tools of artificial intelligence. It makes us believe that the new Algorithmic Governance or local digital governance will be environmentally friendly. [12]

It is certain that today there is less consensus on the definition of

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[11] See Organization of the United Nations, *17 UN Sustainable Development Goals*, 2015, available at: https://nacoesunidas.org/conheca-os-novos-17-objetivos-dedesenvolvimento-sustainable- (last access on: 16.10.2020). See also, O. Gassmann, J. Böhm and M. Palmié, *Smart Cities. Introducing Digital Innovation to Cities*, Emerald Publishing, United Kingdom, North America, Japan, India, Malaysia, China, 2019, esp. pp. 67-147.

[12] See O. Gassmann, J. Böhm and M. Palmié, *Smart Cities. Introducing Digital Innovation to Cities*, *op. cit.*, esp. pp. 283 a 304; J. Reichental, *Smart Cities for dummies, Learning made easy*, John Wiley & Sons, Hoboken, New Jersey, Canada, 2020, esp. pp. 131-205 and pp. 208-244; A. Lisdorf, *Demystifying Smart Cities. Practical Perspectives on How Cities can Leverage the Potential of New Technologies*, Apress, Copenhagen, Denmark, 2020, esp. pp. 14-19, pp. 73-103, pp. 105-137 and pp. 175-195.

what a smart city should be. On the contrary, the notion of smart city is intrinsically related to the available technology, demographic and geographic aspects of the city, local cultural aspects and the policies primarily accepted for the city. It should be noted that it is common in the speech to make references to multiple dimensions of smart city, being very diversified the projects that allow their implementation. Thus, there is talk of smart economy, smart living, smart environment, smart mobility, smart buildings, among other possibilities. Because it is a transversal phenomenon, the concept has been achieved through dialogue between the various branches of knowledge and science. [13]

Today, that concept has been evidenced associating smart city to intelligent governance, whose decision is based on more updated information, in the sense that it is faster and more direct, i.e., efficient, being able to attract companies, create more jobs and allow human development, being, at bottom, synonymous with productivity, competitiveness and quality of life. For this reason, the document drafted by the European Parliament advocates a minimum concept of an intelligent city. [14]

Thus, "the idea of Smart Cities is rooted in the creation and connection of human capital, social capital and information and

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[13] For further developments, see M.L. Gómez Jiménez, *Smart cities: inexistencia de una definición jurídica*, in *VIII Congreso Internacional de Ordenación del Territorio, de Derecho Urbanístico: Nuevos tiempos, nuevos objetivos*, Asociación Canaria de Derecho Urbanístico, 2016. M.L. Gómez Jiménez, *Smart cities vs. Smart governance: dos paradigmas de interrelación administrativa no resueltos aún?*, Parte I, in *Revista de Derecho Urbanístico y Medio Ambiente*, número monográfico sobre Smart Cities, ano XLIX, n.° 300, septiembre-octubre 2015, pp. 53 et seq.; M.L. Gómez Jiménez, *«Smart cities»: una aproximación desde la gobernanza pública y la innovación social*, in S. Galera Rodrigo and M. Gómez Zamora (eds.), *Políticas Locales de clima y energía: teoría e práctica*, Instituto Nacional de Administración Pública, Madrid, 2018.

[14] European Union, *Mapping Smart Cities in the EU. Policy department: An Economic and Scientific Policy*, Brussels: 2014, p. 18, available at: https://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET(2014)507480_EN.pdf (last access on 16.10.2020).

communication technology (ICT) infrastructure in order to generate greater and more sustainable economic development and a better quality of life". [15]

In a certain sense, smart city is the one whose government is able to collect data, plan and decide based on them, direct and supervise in real time through ICTs and Big Data, through the Cloud software and algorithms. [16]

In short, smart city is the result of the application of science and technology in local governance, allowing to solve the problems of cities in the 21st century, such as the rationalization in the use of

[15] On this subject, for further developments, see S. Ranchordas, *Nudging Citizens through Technology in Smart Cities*, in *University of Groningen Faculty of Law Legal Studies Research Paper Series*, No. 1/2019, pp. 1-44, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3333111 (last access on 18.04.2019). See Direção Geral do Território (DGT), *Portugal. Cidades analíticas. Acelerar o desenvolvimento das cidades inteligentes em Portugal*, DGT: 2015, p. 27, available at: https://www.dgterritorio.gov.pt/sites/default/files/publicacoes/Cidades_Analiticas_2015.pdf. A. Oliveira, and M. Campolargo, *From smart cities to human smart cities*, in *48*th Hawaii International Conference on System Sciences (HICSS), Washington, DC: IEEE Computer Science, 2005, pp. 2336-2344.

[16] As R. Kitchin says: "big data consists of massive, dynamic, varied, detailed, inter-related, low cost datasets that can be connected and utilised in diverse ways, thus offering the possibility of studies shifting from: data-scarce to data-rich; static snapshots to dynamic unfoldings; coarse aggregation to high resolution; relatively simple hypotheses and models to more complex, sophisticated simulations and theories". R. Kitchin, *The Real-Time City? Big Data and Smart Urbanism*, 2013, p. 5 (pp. 1-20), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2289141 (last access on 16.04.2019). See, also, M. Barlow and C. Lévy-Bencheton, *Smart Cities, Smart Future. Showcasing Tomorrow*, Wiley, New Jersey, Canada, 2019, pp. 29 et seq. and pp. 106 et seq.; W. Sarver, *Smart City Tech Panning Handbook*, 2017, available at: www.wade4wireless.com, esp. pp. 56-82; B. Boorsma, *A New Digital Deal, Beyond Smart cities. How to Best Leverage Digitalization for the Benefit of our Communitie*s, Community Nova BV, boekXpress, Netherlands, 2020, esp. 155-251; B. Green, *The Smart Enough City, Putting Technology in Its Place to reclaim Our Urbane Future*, The Mit Press, Strong ideas series, Cambridge, Massachusetts, London, England, 2020.

resources, the neutralization of environmental externalities and the mitigation of risk factors of climate change, providing services with an undeniable added value, allowing human development and social inclusion.

The city government is currently confronted with a challenging reality that the pandemic has vitally highlighted: the concept of "urban resilience".[17] A "resilient city" is one that "has a competent, inclusive and transparent local government that is concerned with sustainable urbanization and invests the necessary resources for capacity building for municipal management and organization before, during and after an adverse event or natural threat".[18]

The digital transition it's not just about the 4th Industrial Revolution, also known as Industry 4.0, corresponding to the automation and exchange of data in production processes through the implementation of cyberphysical systems (CPS), it is also requested by citizens or consumers.

Thus, from a technocratic perspective of smart city (although without forgetting the Rights), Smart Local Governance must offer itself to its citizens on digital platforms, similarly commercial platforms — Apple iTunes or GooglePlay, which allow immediate contact between applications and their respective consumers — be able to provide information, allow connection with other National and European digital platforms, offer digital tools for the exercise of participatory citizenship, allow the most widely used procedures

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[17] See K. Schwab, *A quarta revolução industrial*, Portugal: Levoir, 2017, p. 66. And also I. Ayres and J. Braithwaite, *Responsive Regulation. Transcending the Deregulation Debate*, New York: Oxford University Press, 1992. See also about "smart regulation", N. Gunningham, P. Grabosky and D. Sinclair, *Smart Regulation: Designing Environmental Policy*, Oxford: Oxford University Press, 1998; R. Baldwin and J. Black, *Really responsive regulation*, in *Modern Law Review*, 71(1), 2008.

[18] See United Nations Office for Disaster Risk Reduction, 2013, p. 11, available at: https://www.unisdr.org/files/26462_guiagestorespublicosweb.pdf (last accessed on: 16.10.2020). See also B. Boorsma, *A New Digital Deal, Beyond Smart cities...*, *op. cit.*, esp. pp. 155-251.

to be activated online to reach quick decisions in certain specific areas of the exercise of public powers, according to their own conditions of use, within the privacy and security rules of their infrastructures.

The smart city concept must take into account the evolution towards an increasingly inclusive and democratic digital society, endowed with public services that better serve communication accessibilities, providing everyone, and in particular people with disabilities, conditions to access the opportunities that are created by new digital technologies. [19]

At the heart of the scientific issue is the need to address connectivity and openness of data in local governments, to prepare public officials for the application of Open Data and Data Protection law, in particular with regard to the protection of personal data and cyber security. In this scenario, the new IoT (Internet of Things) products, the current ICT tools and the access to Big Data (or set of data and information of great volume and variety that the Local Government may have in its possession) demand the Ethics and Law regulation of the administrative structure that will make the appropriate use of its functionalities and procedures foreseen or yet to be conceived for this purpose.

Considering this panorama, we understand that it is the University's role to foster ethical reflection and debate on current and challenging topics, with an impact on several branches of knowledge, especially in the legal universe, promoting economic and social development, with consequent improvement in the quality of life in cities, through knowledge. [20]

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[19] J.R. Gil-Garcia, T.A. Pardo and T. Nam, *What makes a city smart? Identifying core components and proposing an integrative and comprehensive conceptualization*, in *Information Polity*, 20(1), 2015, pp. 61-87.

[20] By following D. Schuurman et al., *Smart ideas for smart cities: Investigating crowdsourcing for generating and selecting ideas for ICT innovation in a city context*, in *Journal of Theoretical and Applied Electronic Commerce Research*, v. 7, n. 3, 2012, pp. 49-62; C. Veeckman and S. Van Der Graaf, *The City as Living Laboratory: Empowering Citizens with the Citadel Toolkit*, in *Technology Innovation Management Review*, v. 5, n. 3,

It is a fact that the first demands and challenges that smart cities and the digital transition have been calling for concern the law, and are focused on solving three types of problems: 1. The adoption of digital technologies in the management of public organizations, a process that is often referred to as the digital transition; 2. The promotion of intelligent cities, that is, cities where technologies are an integral part of the urban fabric and social practices, including matters concerning public bodies and labour relations between them and their employees;[21] 3. The solution of problems related to the treatment of data, in a logic of difficult balance between the opening (or circular economy of data) and the protection of citizens' privacy and secrets.[22]

That is why the scientific issue begins by thinking about the Ethics and Law that serves as an "umbrella" for city governance, covering the various domains of smart cities, in particular smart mobility (of people, goods and data), since, in the future, urban mobility will be dematerialized in terms of data, multimodal, electrical, shared and autonomous, in terms of people and things.

This reflection exercise does not ignore the complex theme of urban planning models (municipal master plans) that currently do not integrate the concepts of smart cities, including the theme of mobility of people through public electric transport and other low-carbon fuels, or through other active modes such as walking and cycling, and individual transport (here there is more and more immediate space for autonomous cars). Nor does it ignore urban micrologistics and access to urban centres, the supply of businesses,

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mar. 2015, pp. 6-17; J.R. Gil-Garcia, T.A. Pardo and T. Nam, *What makes a city smart?...*, *op. cit.*

[21] A. López Folgues et al., *La innovación social digital colectiva y la administración en el entorno de la Ciudad Inteligente*, in *GAPP*, Nueva Época, 18, 2017, pp. 23-42.

[22] See I.C. Fonseca, *E.governação, transparência e protecção de dados: a caótica perspectiva portuguesa (rectius europeia)*, in L.R.G.M. Pires (coord.), *Cidades Inteligentes, humanas e sustentáveis: II Encontro de Direito Administrativo Contemporâneo e os Desafios de Sustentabilidade*, Belo Horizonte, Arraes Editores, 2020, pp. 45 et seq.

commercial and catering services and consumer traffic, urban waste (separating and reusing), promoting circular economy, according to sustainable solutions.[23] We are also talking about the form of regulation itself, i.e., the new intelligent cities will demand intelligent regulation.

But there is no doubt that the main idea of this scientific book is to reveal that one Strategy for the Global Digital Transition of Cities needs to be conceived, fulfilling the specific scientific objectives: 1. Promotion, through the study, of a regulatory environment that allows the exploitation of the potential of ICTs and the circular economy of data, respecting principles of ethics, privacy and cyber security;[24] 2. With regard to the circular economy of data, promotion through the study, the possibility of reducing legislative and bureaucratic barriers to the free flow of data, without prejudice to the provisions in force concerning information subject to special security measures, including classified information, in line with the challenging Regulation (EU) 2022/868 of the European Parliament and of the Council of 30.05.2022 on European data governance, in force from May 2022 and to be implemented in September 2023 (and amending Regulation (EU) 2018/1724 (Data Governance Regulation) or in line with the European Directive 2019/1024 on open data and reuse of public sector information and, on this subject, the Law on Access to Administrative Documents); 3. With regard to Regulation, Privacy, Cyber-security and Cyber-defence, promotion, through the study, the modes of training and organizational adjustment of the local Data Protection Officer structure, in order to ensure the protection of personal data and

[23] See J. Walker et al., *Citizen centric services for Smart cities. University of Southampton*, 2019, available at: http://smartcityinnovation.eu/wp-content/uploads/2019/06/7389-Final-Smarter-Cities-web-B.pdf.

[24] By following J. Valero Torrijos, *El acceso y la reutilización de la información del sector público desde la perspectiva de la reforma de la administración electrónica*, in I. Martín Delgado (dir.), *La reforma de la Administración electrónica: Una oportunidad para la innovación desde el Derecho*, 2017, pp. 443-458.

the preservation of privacy of citizens, in accordance with the European Regulation on Personal Data Protection and the Portuguese Law on Enforcement of the Regulation. Finally, it is important to think about the digitalization of the five local public services most used by citizens and companies, one that presupposes a previous empirical analysis of the most frequent services and the mapping of the observations made by those.

3. *Some ideas justifying the drafting of the proposed charter for smart cities: risks and challenges*

In this sense, we leave some principles that a Charter of Smart Cities should have. It is important to configure the Smart City Charta, which recognises the National Digital Transition Plan, the Strategy for Innovation and Modernisation of the State and Public Administration 2020-2023, the National Urban Development Policy, EU Urban Agenda (Amsterdam Pact) and New Urban Agenda of the United Nations. It can only be stated that the Charter should support the implementation of the national and European Sustainability Strategies and the achievement of the Sustainability Goals of the United Nations Agenda 2030 (Sustainable Development Goals).

In this context, we also think that the Charter should be preceded by a broad process of dialogue between representatives of the State (through the Agency for Administrative Modernisation, I.P, the General Directorate of Local Authorities, the North Regional Coordination and Development Commission, the Council for Information and Communication Technologies in the Public Administration), Municipalities (through the National Association of Portuguese Municipalities), the Intermunicipal Communities, and the Parishes. Besides these, representatives of several scientific, business and social organisations and local associations will be invited to participate. The Smart Cities Dialogue Platform, that we think we are (http://smartcitiesandlaw.pt), aims to develop not only

normative guidelines for the digital transformation of municipalities action, but also as recommendations for the implementation of these guidelines.

In fact, we think the "Smart City Charta model, Digitale Transformation in den Kommunen nachhaltig gestalten" (drawn up by Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), at Bonn, 2017 [25]) is a good model to follow.

The Charter for the Smart City should come to set the normative standard for a forward-looking smart city. According to this framework, a smart city is:

i) Liveable – puts people's needs at the centre of actions, supporting local initiatives.

ii) Diverse and open – uses digitalisation to increase the power of integration, offset demographic challenges, social and economic imbalances and exclusion. It aims to ensure the functioning of democratic structures and processes.

iii) Participatory and inclusive – realises integrative models for the participation of all in social life, facilitating their access to digital offerings.

iv) Adopts the goals of climate neutrality and efficiency in the use of resources, encouraging ecological concepts of mobility, energy, thermal, sanitation and waste, thus contributing to the municipality being CO_2 neutral, green and healthy.

v) Competitive and prosperous – uses digitalization in a targeted way, aiming to strengthen the local economy and the new processes of value aggregation, making available adequate infrastructure options.

vi) Open and innovative – develops solutions that ensure compliance with municipal obligations, reacts quickly to processes

[25] *Smart City Charta, Digitale Transformation in den Kommunen nachhaltig gestalten*, Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (BMUB), Bonn, 2017.

of change and elaborates, in a participatory manner, innovative local solutions.

vii) Responsive and sensitive – uses sensor technology, data acquisition and processing, new forms of interaction in order to achieve constant improvement of community processes and services.

viii) Secure and freedom preserving – provides citizens with secure digital spaces, private and public, where everyone can move around without their right to freedom being usurped by surveillance methods.

As can be concluded, digital transformation – the transition of cities to smart cities – means pursuing the goals of sustainable European cities by applying the resources of digitalization. [26]

If the 19th century was the time of Empires and the 20th century the time of States, the 21st century will definitely be the Century of Cities and, therefore, here is this simple contribution: one of two open books that this team will publish, seeking to disseminate the research work carried out over several months on Smart Cities and Law, e-Governance and rights.

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THE RIGHT TO THE (SMART) CITY, HUMAN RIGHTS AND 2030 AGENDA: SMART CITIES AND THE CITIES (R)EVOLUTION

Camilo Stangherlim Ferraresi *

1. *Introduction*

The complexity of postmodern society and social (re)organization, due to the impact of the emerging new technology and climate change, allows possibilities of (new) scenarios which demand the resignification of the right to the city, so that it becomes suitable for the intended improvement in the quality of human life.

According to The United Nation's data, in 2014, 54% of the world population was living in urban areas, with a rough estimate of 66% for 2050, and such ongoing growth is a relevant factor regarding the prospects for the city of the future.[1] The expanding urbanization

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points out to the city as the centre from where the future of humanity irradiates, and the right to the city becomes the necessary condition for the intended (re)organization of urban spaces able to accomplish alternative projects of life.

Henry Lefebvre presented the right to the city in 1968 as a possibility of overcoming the constant crises emerging in the urban environment, explaining that:

> "The right to the city manifests itself as a superior form of rights: right to freedom, to individualization in the socialization, to habitat and to inhabit. The right to the *oeuvre*, to participation and *appropriation* (clearly distinct to the right to property), are implied in the right to the city". [2]

It is within this context that the theme "The right to the (smart) city, human rights and Agenda 2030 – Smart cities and the cities (r)evolution" is introduced herein. The theoretical framework of this study is based on the right to the city as conceptualized by Henry Lefebvre, and carried out by means of the exploratory research, with bibliographical and documentary resources.

2. *The dialogue between juridical sources and the juridicization of the right to the city*

Lefebvre [3] conceived the right to the city as the right to the encounter, the creation and participation in the construction process of the urban space. The right to the city is "the right to a renewed urban life and with quality – with an entire set of implications associated to it, emphasizing the right to participation

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[1] UN-HABITAT, *Envisaging the Future of Cities: world cities report 2022*, New York: Department of Economic and Social Affairs, 2022, p. 9.

[2] H. Lefebvre, *Right to the city*, in E. Kofman and E. Lebas (eds.), *Writings on cities*, 5, ed. Oxford, Blackwell, 1996, pp. 173-74.

[3] Idem.

in the city construction, in the sense of the urban space appropriation by its citizens." [4]

Henry Lefebvre [5] points out that the right to the city is the right to "a renewed urban society, a renovated centrality, leaving opportunity for rhythms and use of time that would permit full usage of moments and places [...]". Harvey, [6] on analysing the right to the city as proposed by Lefebvre, explains that it emerged from a cry and a demand, that is, "the cry was a response to the existential pain of a withering crisis of everyday life in society." [7]

Lefebvre's elaboration of the right to the city as a cry and a demand is shaped by the necessity of signifying such a right, as a reply to an emerging non-planned urbanization which, by excluding individuals from the urban life potentialities, prevent them from experiencing all possibilities of their existence.

The first movement to attain juridical recognition of the right to the city surfaced at the international level, and since the 1950's, multilateral international organizations have formulated public policies on urban development, due to the inequitable phenomena of urbanization taking place in developing countries. [8] That culminated in the United Nations' conferences during which the Urban Agenda was created, as explained by Manquian. [9]

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[4] Free transl. of: "[...] direito à vida urbana renovada e de qualidade – com todo conjunto de implicações a este associado, destacando-se o direito de participação na construção da cidade, no sentido de apropriação do espaço urbano pelos cidadãos." (A.R.M. Ferreira, *Direito à cidade e direito urbanístico: limites e relações recíprocas*, in D.C. Libório (coord.), *Direito Urbanístico: fontes do direito urbanístico e direito à cidade*, Belo Horizonte, Fórum, 2020, p. 229).

[5] H. Lefebvre, *Right to the city*, *op. cit.*, p. 19.

[6] D. Harvey, *Rebel Cities: from the right to the city to the urban revolution*, translation: Jeferson Camargo, New York, Verso, 2012.

[7] Idem, p. 11.

[8] M. Santos, *Ensaios sobre a urbanização latino-americana*, 2. ed., São Paulo, Editora da Universidade de São Paulo, 2017.

[9] M.A.Q. Manquian, *Relações internacionais: o protagonismo das cidades e dos governos*

The first UN conference was held in 1976, with the purpose of an agreement on an urban agenda to be observed by its member countries within the period of two decades. "HABITAT I was held in Vancouver in 1976, followed by HABITAT II in Istanbul, Turkey, in 1996 and, finally, HABITAT III – the United Nations conference on housing and sustainable urban development, which took place in Quito, Ecuador, in October of 2016." [10] Those conferences emphasized the recognition of the urbanization as a collective, global issue.

In this circumstance, the right to the city (re)emerges (internationally), with The World Charter for the Right to the City being approved in the World Social Forum, with the purpose of "pressing the UN to recognize the emergence of a new collective right for the urban populations, incorporating it to the international instruments of human rights." [11]

The World Charter for The Right to the City recognizes that:

> "Today's cities are far from offering equitable conditions and opportunities to their inhabitants. The majority of the urban population is deprived or limited – in virtue of their economic, social, cultural, ethnic, gender or age characteristics – in the

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locais no sistema de governança mundial contemporâneo, in E. Bello and R.J. Keller (org.), *Curso de direito à cidade: teoria e prática*, 2 ed., Rio de Janeiro, Lumen Juris, 2019, p. 25.

[10] Free transl. of: "A Conferência HABITAT I aconteceu em Vancouver, em 1976; a HABITAT II aconteceu em Istambul, na Turquia, em 1996 e, finalmente, a HABITAT III – Conferência das Nações Unidas sobre habitação e desenvolvimento sustentável, ocorreu em Quito, no Equador, em outubro de 2016." (B. Alfonsin et al., *Das ruas de Paris a Quito: o direito à cidade na nova agenda urbana – Habitat III*, in *Revista de Direito da Cidade*, Rio de Janeiro, v. 9, n. 3, 2017, p. 1215).

[11] Free transl. of: "[...] pressionar a ONU a reconhecer a emergência de um novo direito coletivo das populações urbanas, incorporando-o aos instrumentos internacionais de direitos humanos." (B. Alfonsin, *Direito à cidade sustentável na nova ordem jurídico-urbanística brasileira: emergência, internacionalização e efetividade em uma perspectiva multicultural*, in A.C. Walkmer; J.R. Leite (orgs.), *Os "novos" direitos no Brasil: natureza e perspectivas – uma visão básica das novas conflituosidades jurídicas*, 3. ed. São Paulo: Saraiva, 2016, p. 367).

> satisfaction of their most elemental needs and rights. Public policies that contribute to this by ignoring the contributions of the popular inhabiting processes to the construction of the city and citizenship, are only detrimental to urban life." [12]

The right to the city "[...] relates, therefore, to the aspiration of whom lives, works, survives, produces in the urban space: it should be defined by participation processes – which are not merely formal –, by experiences, including the spontaneous practices encountered in the city." [13]

Manquian [14] states that the right to the city stems from a series of social movements, international networks and coalitions that culminated in the UN-Habitat III conference, during which the Urban Agenda was created. The pressure applied by multiple international actors and social movements resulted in the World Urban Campaign, launched by the UN during the World Urban Forum in 2010. It was inspired by The World Charter for the Right to the City, which "[...] had the purpose of expanding the knowledge on this theme and ensuring the adoption of actions connected to the effectiveness and sustainability of the right to the city by local governance [...]." [15]

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[12] IAI – International Alliance of Inhabitants, Social Forum of the Americas, Quito, July 2004. World Urban Forum, Barcelona, October 2004. World Social Forum, Porto Alegre, January 2005. Barcelona, September 2005, *World charter for the right to the city*, International Alliance of Inhabitants, 2005, p. 1.

[13] Free transl. of: "[...] relaciona-se, assim, aos anseios de quem mora, trabalha, sobrevive, produz no espaço urbano: ele deve ser definido por processos de participação – que não sejam meramente formais –, pelas experiências, inclusive as práticas espontâneas vivenciadas na cidade." (V.T. Guimarães, *Direito à cidade e direitos na cidade: integrando as perspectivas social, política e jurídica / Right to the city and rights in the city: integrating social, political and legal perspectives*, in *Revista de Direito da Cidade*, [S.l.], v. 9, n. 2, abr. 2017, p. 632).

[14] M.A.Q. Manquian, *Relações internacionais...*, *op. cit.*

[15] Free transl. of: "[...] que tinha como finalidade "ampliar o conhecimento a respeito do tema e garantir a adoção de práticas ligadas à efetividade e

The symbolic content present in the UN recognition of the right to the city has broadened the horizon of possibilities for the (re)organization of urban spaces, considering that the "New Urban Agenda recognizes, in its distinct articles, the principle of the social function of property, the right to the popular participation in decision-making processes, the human right to adequate housing, the principle of preventing regression, and the right to the public space." [16]

3. *Smart cities and human rights: The cities (r)evolution*

The right to the city is a live concept and not only the prescriptive participation of a theoretical notion, and the "city, in this extent, manifests itself not just as an object *per se*, even less as the ultimate end of a conflicting process, but, above all, it is the initial point of understanding and analysis of the world, which structures and is structured by social fights." [17]

In the process of resignifying the right to the city in view of the emergence of smart cities, human rights and the SDG11 of the UN

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sustentabilidade do direito à cidade pelos governos municipais [...]" (B. Alfonsin, *Direito à cidade sustentável na nova ordem jurídico-urbanística brasileira*..., *op. cit*., p. 369).

[16] Free transl. of "A Nova Agenda Urbana reconhece, em diferentes artigos, o princípio da função social da propriedade, o direito à participação popular nos processos de tomada de decisão, o direito humano à moradia adequada, o princípio da proibição de retrocesso e o direito ao espaço público." (B. Alfonsin, *Repercussões da nova agenda urbana no direito público e provado no Brasil e na América Latina: o papel do direito à cidade*, in E. Bello and R.J. Keller (org.), *Curso de direito à cidade: teoria e prática*, 2 ed., Rio de Janeiro, Lumen Juris, 2019, p. 222).

[17] Free transl. of: "[...] cidade, nessa medida, manifesta-se não apenas como um objeto em si, tampouco como o fim derradeiro de um processo conflitivo, mas, sobretudo, enquanto um ponto inicial de compreensão e análise do mundo, que estrutura e é estruturado pelas lutas sociais." (D. Pardue and L.A. Oliveira, *Direito à cidade: problema teórico e necessidade empírica*, in *Plural, Revista do Programa de Pós-Graduação em Sociologia da USP*, São Paulo, v. 25.2, 2018, p. 10).

2030 Agenda have become imperative for attributing meaning that meet the social needs and mediate between those claims and the economic interest involved in the urbanization movements and city transformations. The construction of meaning and signification for the human right to the smart city necessarily involves the dialogue amongst the juridical sources which permeate the SDGs of the UN 2030 Agenda.

The targets provided in SDG 11 are directly related to the cities'(re)adjustment aiming at the (re)construction of urban spaces that are inclusive, sustainable, safe, resilient, and able to impact the (in)effectiveness of human rights. With the rising of new rights, new technologies, and the emergence of socio-environmental transformations, the resignification of the right to the city, guided by human rights, permeates the smarty city model as a necessary condition for the (re)organization of urban spaces in order to ensure people's quality of life in the context of a hypercomplex society.

As to the smart city concept, Fonseca and Prata [18] state that there is not just a single definition of that, and such juridical-conceptual imprecision has been challenging the Law. However, there is the consensus that the smart city is the one whose focus is on human beings and on the improvement of the population's quality of life. In accordance with that, the Brazilian Charter for Smart Cities establishes that:

> "Smart cities in Brazil are committed to sustainable urban development and digital transformation, in their economic, environmental, and sociocultural aspects that act in a planned, innovative, inclusive, and networked manner, promote digital literacy, governance, and collaborative management and use technologies to solve real problems, create opportunities, offer

[18] I.C.M. Fonseca and A.R.A. Prata, *Smart Cities vs. Smart(er) governance: cidades inteligentes, melhor governação (ou não)*, in I.C.M. Fonseca, *Direito das Autonomias (Locais): Estudos Reunidos*, Braga, NEDip, 2019, pp. 245-265.

> services efficiently, reduce inequalities, increase resilience and improve the quality of life of all people, ensuring the safe and responsible use of data and information and communication technologies." [19]

It is important to emphasized that the right to the smart city, as one of the human rights, keeps in constant dialogue with all the others which are internationally recognized, which includes all civil, political, economic, social, cultural, and environmental rights already regulated by international treaties of human rights; therefore, its resignification becomes relevant to meet the community claims, by means of the guidance of 2030 Agenda's SDG 11.

The strengthening and expansion of citizenship in the local context, propelled by new technology (digital inclusion) pave the way to the (re)construction of smart urban spaces, by means of the modern participatory governance. This kind of local governance becomes the materialization of the right to the oeuvre as described by Lefebvre, with the participation of city's inhabitants in the decision-making process of local interest.

(Re)organizing urban spaces with the purpose of humanizing the city, keeping in view the smart city models that are structured according to a plan of digital transition, inclusion, sustainability, resilience and safety, as well as the resignification of the right to the smart city guided by human rights, demands the deepest attention of the law system.

The occupation of urban areas, by complying with the requirements of the smart cities model, shows potential to impact human rights positively as to their efficacy. The smart city, as a model for the cities of the future, is expected to organize its

[19] BRASIL, Ministério do Desenvolvimento Regional. Secretaria Nacional de Desenvolvimento Regional e Urbano, *Brazilian Charter for smart cities: short version*, 2021, p. 8.

structuring elements, such as social and digital inclusion, availability of virtual technology, amongst others.

According to Fonseca and Prata,[20] those structuring elements entails certain premises, or guiding pillars, for smart cities, such as technological innovation, smart people, smart economy, smart lifestyles, mobility, environment, and local governance, "where all those pillars become interdependent."[21] The authors also emphasize that the "Law is essential to the orderly structuring of this new emerging reality, avoiding following it in tow, as it has been the case."[22]

Those elements identified as constituting the structure of smarty city models complement and dialogue with each other, considering that sustainability, resilience, inclusion, safety, and digital transition are conditioning factors for the materialization of each of them. Such interdependence is what makes them structuring elements, that is, they become the fundamental bases for the recognition and definition of the smart urban space. The smartness of cities by applying technology and participatory governance is the central characteristic for the future of cities that intend to be sustainable, safe, resilient, inclusive, and with the availability of virtual technology.

The Law, therefore, becomes a vital structural coupling, which ensures the juridicization of the right to the smart city, which is able to incorporate the set of structuring elements evidenced by SDG 11, within the context of the innovative cities of the future, a set of elements to be enlightened and guided by human rights.

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[20] I.C.M. Fonseca and A.R.A. Prata, *Smart Cities vs. Smart(er) governance...*, *op. cit.*, p. 249.

[21] Free transl. of: "[...] onde todos esses pilares se tornam interdependentes." (Idem, ibidem).

[22] Free transl. of: "O Direito será essencial para estruturar de forma coordenada esta nova realidade emergente, evitando ir a reboque da mesma, como tem acontecido até então." (Idem, p. 253).

4. *Final considerations*

Within this scenery of constant transformations, the smart city model becomes the next step towards the overflow of the current understanding on the right to the city, a new level of (smart) city project, which, if guided by the human rights ethics, shows enough power to cause the emergence of a new inclusive structure, with potential to contemplate the (re)construction of public spaces towards a fairer, more equitable and participatory society.

The cities of the future are envisioned as spaces (re)constructed from a humanized perspective, apt to ensure quality of life for all (co)existent members within their perimeters. Those urban areas ought to be "alive, safe, sustainable and healthy" [23] as the necessary condition for accomplishing projects which promotes dignified and meaningful lives and provides equitable experiences of the urban space benefits.

This historical time is to be employed in improving the concrete conditions of the humanity existence, otherwise society can undergo the penalty of missing the "opportune wind", in this case, new models of urban occupation would cause the world's social and technological exclusion to become even more aggravating. Therefore, in this scenario, "Law is essential to the orderly structuring of this new emerging reality, avoiding following in its tow, as it has been the case." [24]

The resignification of the right to the smart city is inserted in this context by experiencing smart cities as the (r)evolution of this fundamental human right, and by adopting city models which are

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[23] Free transl. of: "[...] vivas, seguras, sustentáveis e saudáveis." (J. Gehl, *Cidades para pessoas*, translation: Anita Di Marco, 3. ed., São Paulo, Perspectiva, 2015, p. 6).

[24] Free transl. of: "O Direito será essencial para estruturar de forma coordenada esta nova realidade emergente, evitando ir a reboque da mesma, como tem acontecido até então." (I.C.M. Fonseca and A.R.A. Prata, *Smart Cities vs. Smart(er) governance...*, *op. cit.*, p. 253).

suitable to meet social needs, besides promoting material and technological inclusion, so that the construction of life projects based on human dignity can be accomplished. Both the right to the city and the city concept are definitions going through constant mutation, due to open systems that are to be fulfilled by the population's demands, as well as the citizenship expansion that necessarily pervades the technological inclusion, allowing the city's inhabitants active participation in identifying and intervening in the urban challenges.

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SMART CITIES AND ELECTRIC MICROGRIDS: REGULATORY FRAMEWORK AS LOCAL ENERGY COMMUNITIES *

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1. *Introduction*

In today's world, the concept of smart cities emerges as an alternative to the traditional model of urban centers, aiming to

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combat the challenges that humans experience due to the predominantly adopted way of life.

In this context, changes in lifestyle and the dynamics of urban life are sought to promote improvements in urban spaces such as: making them more inclusive and human-centered; reimagining urban mobility to reduce the use of natural and financial resources in people's transportation and minimize congestion; advancements in the interaction between citizens and their governments, whether local, regional, or national, in order to develop public policies that meet the genuine aspirations of specific populations while reducing bureaucracy; increase access to and improve the quality and resilience of public services, promoting sustainability and greenhouse gas emissions neutrality; among many others.

The significance of these changes is reflected in the 2030 Agenda for Sustainable Development of the United Nations (UN), specifically the 17 Sustainable Development Goals (SDGs).[1] In fact, the transformation of cities is designated as a distinct goal, the eleventh, which states:

> **"Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable."**[2]

In this context, smart cities demand multiple approaches to address the problems that need to be resolved, given that these problems clearly manifest in a multilateral manner. The interdisciplinary nature required for constructing solutions that align with the SDGs, particularly the eleventh goal, becomes an almost indispensable requirement for those undertaking this task. This is because, at times, the different objectives intertwine, and meeting one objective can serve as a means to fulfill another.

As proposed in the previous paragraph, technological

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[1] United Nations' General Assembly (Org.), *A/RES/70/1. Transforming Our World: The 2030 Agenda for Sustainable Development*, United Nations, 2015.

[2] Ibid.

advancements related to electricity services, especially in the fields of electricity generation, distribution, and storage, should be considered as a way to make cities smarter and, therefore, help reduce the problems associated with them. As mentioned, the issue of energy consumption is also embodied in its own SDG, the seventh, which states:

> **"Goal 7: Ensure access to reliable, sustainable and modern energy sources for all."** [3]

The matter of energy encompassed within SDG 7 is approached through four distinct paradigms: access, sustainability, cooperation for research, and modern services. [4]

Expanding and universalizing access to electricity has long been a known challenge, especially in non-developed or developing countries. [5] In 2020, about 9% of the global population still lacked access to electricity, meaning they were unable to utilize electrification for essential services related to health, education, and other social services, considering that these regions are predominantly rural and disconnected from urban centers. [6] While there has been progress in the period between 2010 and 2020, with around 1.2 billion people gaining access to electricity in their daily lives, there is concern about the slowdown in the electrification rate. This justifies why access to energy is an important issue addressed in SDG 7, [7] considering that the lack of access to

[3] Ibid.

[4] Ibid.

[5] For contextualization on the challenges of energy universal access in the Brazilian, check: A. L. Ferreira, and F. B. Silva, *Universalização do acesso ao serviço público de energia elétrica no Brasil: evolução recente e desafios para a Amazônia Legal*, in *Revista Brasileira de Energia*, v. 27, n. 3, 2021, pp. 135–154.

[6] International Energy Agency et al., *Tracking SGD7: The energy progress report 2022*, Washington: IEA, 2022, p. 25.

[7] On the issue: "The share of the world's population with access to electricity rose from 83 percent in 2010 to 91 percent in 2020,1 increasing the number of

electricity hinders people's ability to access basic services necessary for health, education, and overall social development.

The other three pillars related to energy in the UN's 2030 Agenda refer directly to issues closely tied to cities. Sustainability, modern services, and research for their development often arise due to the dense population concentrations in urban centers, industrialization processes, and the use of fossil fuels. Electricity is considered a strategic service for promoting the decarbonization of countries' energy sources, given its greater capacity for sustainable and renewable energy generation, which can replace fossil fuels sources in everyday tasks such as transportation and heating.[8] According to Fonseca,[9] approximately 75% of global energy consumption and 80% of greenhouse gas emissions occur within cities, emphasizing the centrality of the energy issue in discussions about smart cities.

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people with access by 1.3 billion globally. The number without access declined from 1.2 billion people in 2010 to 733 million in 2020. However, the pace of progress in electrification has slowed in recent years because of the increasing complexity of reaching more remote and poorer unserved populations and because of the expected impact of the COVID-19 pandemic. From 2010 to 2018, 130 million people gained access to electricity each year, on average; that figure fell to 109 million between 2018 and 2020. The annual rate of growth in access was 0.8 percentage points between 2010 and 2018 but fell to 0.5 percentage points in 2018-20." – Ibid., p. 25.

[8] Verify the decarbonisation strategic plans of the European Union and the State of São Paulo: European Commission, *COM(2018) 773 final - COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE, THE COMMITTEE OF THE REGIONS AND THE EUROPEAN INVESTMENT BANK A Clean Planet for all. A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy*, Brussels, 2018; São Paulo – Estado, Secretaria de Infraestrutura e Meio Ambiente, São Paulo, *Plano de ação climática do Estado de São Paulo: diretrizes e ações estratégias PAC net zero 2050*, São Paulo: Governo do Estado, 2021.

[9] I. C. M. Fonseca, *Smart cities and law, E. Governance and rights: do we need a global digital transition strategy for the city?*, in *European review of digital administration & law*, v. 2, n. 1, 2021, pp. 47–56.

This underscores the need for smart cities to adopt sustainable, efficient, and modern energy solutions, highlighting the coherence between the 2030 Agenda and the intrinsic relationship between SDGs 7 and 11.

Therefore, this paper proposes to discuss the concept of smart grid systems, which have the potential to make cities smarter by providing energy solutions aligned with SDGs 7 and 11. Initially, considerations are made about microgrids, a technology associated with electricity services that can offer energy solutions in line with SDGs 7 and 11, explaining its concept and advantages over conventional grids. Subsequently, the European and Portuguese regulatory framework is examined to assess the applicability of microgrids in their territories, particularly the local energy communities, which were introduced by the 2019 Clean Energy Package and incorporated into Portuguese law. Finally, the paper concludes by asserting the applicability of the European and Portuguese regulatory models to microgrids, with some necessary revisions, and emphasizing its contribution to smart cities.

2. *Microgrids: smart and sustainable electricity grids*

In simple terms, microgrids, as the name suggests, are miniature versions of electrical grids.[10] They encompass all essential elements found in conventional grids, including energy generation, distribution/sharing, and end consumption. Due to their geographical confinement within small regions,[11] the need for

[10] D. Felice et al., *Microrredes: impactos de novas tecnologias energéticas na mobilidade e dignidade humana*, in R. Baeninger et al. (orgs), *Migrações Internacionais e a pandemia de COVID-19*, Campinas: Núcleo de Estudos de População "Elza Berquó" – Nepo/Unicamp, 2020.

[11] Hence the given name of the microgrids, i.e., a small electricity grid.

transmission service is eliminated, recognizing that those communities may also incorporate energy storage in various forms.

One of the key singularities of microgrids, which contributes to their advantages over conventional grids, is their ability to isolate and reconnect from the main grid at the discretion of the microgrid operator, or even operate in a permanently isolated mode.[12] Once the decision to island is made, the microgrid disconnects from the main grid while maintaining its capacity to supply electricity to the community within all designed electric parameters.

The increased deployment of sustainable energy sources, driven by a heightened commitment to the climate crisis,[13] introduces generation sources in the power system that exhibit greater production instability. Historically, the use of coal and petroleum derivatives as energy sources provided stability to the generation system as long as there was sufficient fuel to maintain the operation of power plants. Wind and solar sources – that along with modern biofuels are the renewable sources that are gained significant traction in recent years[14] – are directly dependent on momentary weather conditions and exhibit inconsistent production variations throughout the day. As their generation tends to be local and on a small scale, microgrids emerge as a means to coordinate the integration of these sources with the more traditional ones

[12] In this last scenario, microgrids are used to supply electricity to remote and/or isolated areas, where the cost of infrastructure to connect it to the main grid makes the operation unviable. In this sense, check the pilot projects installed in Maranhão's remote islands, located on the northeastern coast Brazil: D. Felice et al., *Microrredes: impactos de novas tecnologias energéticas na mobilidade e dignidade humana*, *op. cit.*

[13] In particular, the Paris Agreement (2015), the *European Clean Energy Package* (2019) and the São Paulo State Climate Action Plan (2021) are cited.

[14] See International Energy Agency et al., *Tracking SGD7: The energy progress report 2022*, *op. cit.*, pp. 82–104.

existing in the main grids, thereby adding efficiency, sustainability, resilience, and reliability to the operation of the electrical system. [15]

With the rapid technological advancement of microgrid components, the associated costs of establishing microgrids are becoming increasingly affordable. This trend makes the construction of microgrids increasingly feasible for practical implementation. According to Felice et al., microgrids are regarded as energy solutions that are:

> "(...) efficient, reliable, sustainable, and resilient, ensuring access to modern energy services, contributing to poverty reduction and overall socio-economic well-being, enabling the promotion of health, education, and human development in various regions of the world, from remote to urban areas." [16]

According to the U.S. Department of Energy (DOE), microgrids can be defined as:

> "A group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island mode." [17]

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[15] J. C. Lopéz et al., *Objetivos e desafios do projeto de p&d merge: Microgrids for efficient, reliable and greener energy*, in *Simpósio Brasileiro de Sistemas Elétricos-SBSE*, v. 1, n. 1, 2020; D. Felice et al., *Microrredes: impactos de novas tecnologias energéticas na mobilidade e dignidade humana*, *op. cit.*

[16] Free translation of the original in portuguese: "(...) eficientes, confiáveis, sustentáveis e resilientes, de forma a garantir o acesso a serviços modernos de energia, contribuindo na redução da pobreza e no aumento do bem-estar socioeconômico de modo geral, possibilitando a promoção da saúde, educação e desenvolvimento humano nas diversas regiões do mundo, das remotas à urbanas" – D. Felice et al., *Microrredes: impactos de novas tecnologias energéticas na mobilidade e dignidade humana*, *op. cit.*

[17] M. A. Ton and D.T. Smith, *The U.S. Department of Energy's Microgrid Initiative*, in *Electr. J.*, v. 25, 2012, pp. 84–94.

Among the various advantages that microgrids can offer over traditional and centralized energy grids, the most notable ones include: [18]

(1) Greater reliability/resilience in delivering energy services: Since microgrids are designed with the capacity to operate independently of the main grid, they can continue to supply energy to their constituents in the event of a service failure. Additionally, by often utilizing renewable energy sources and incorporating energy storage capacity (e.g., batteries), microgrids can sustain energy supply even in the face of natural disasters or cyber and physical attacks on centralized infrastructure of the main grid.

(2) Reduction in energy costs: In addition to having their own means of electricity production, which avoids the need to purchase energy from retailers/wholesales market, microgrids can implement operational plans where they operate in an islanded mode during periods of high energy tariff costs and reconnect during economically favorable moments.

(3) Increased energy efficiency: By relying on local energy production in close proximity to the loads they serve, microgrids minimize losses that typically occur in long-distance energy transmissions. Furthermore, they eliminate the need for constructing extensive transmission lines to bring energy from large-scale centralized power plants, which are often located far from urban consumption centers.

(4) Greater sustainability: Microgrids are often designed with the integration of distributed energy resources from renewable sources such as solar and wind power. By facilitating the integration of these resources with the main grid, microgrids can help reduce greenhouse gas emissions and contribute to greener energy matrices. Additionally, by adopting an operational plan that involves operating in islanded mode during peak periods of conventional system usage, microgrids can avoid dispatching more

[18] P. Boyce et al., *Victorian Market Assessment for Microgrid Electricity Market Operators*, Monash University, 2019.

expensive and CO2-emitting thermal power plants to meet peak demand.

(5) Enhanced energetic security: By reducing the dependency of local communities on the main grid and utilizing a greater share of distributed energy resources, microgrids decrease the risk of energy shortages for those communities, particularly in the event of main grid failures or physical and cyber-attacks on energy production, transmission, and distribution infrastructure.

3. *Local energy communities in European and Portuguese law*

What has come to be known as the *Clean Energy Package* consists of a set of legislative and regulatory measures approved at the European Union (EU) level, aiming to promote sustainable energy transition and ensure access to more resilient, secure, efficient, and cost-effective energy.[19] Approved between 2018 and 2019, the package comprises eight different fronts that address topics such as the energy market, the promotion and integration of renewable sources, energy efficiency, among others,[20] conforming the UE legal energy framework to internationally agreed environmental objectives, notably the Paris Agreement.

According to Santos,[21] the focal point of the Clean Energy

[19] F. M. Santos, *Tendências recentes do direito administrativo da energia: A regulação das comunidades de energia (e do autoconsumo coletivo) e a descarbonização do setor do gás natural*, in *e-Publica*, v. 8, n. 1, 2021, pp. 272–283.

[20] The eight instruments consist of the following acts: energy performance of buildings and energy efficiency (Directive UE 2018/844); promotion of the use of energy from renewable sources (Directive EU 2018/2001); governance of the Energy Union and Climate Action (Regulation EU 2018/1999); internal market for electricity (Regulation EU 2019/943); common rules for the internal market for electricity (Directive EU 2019/944); risk-preparedness in the electricity sector (Regulation EU 2019/941); and establishing a European Union Agency for the Cooperation of Energy Regulators (Regulation EU 2019/942).

[21] F. M. Santos, *Tendências recentes do direito administrativo da energia...*, *op. cit.*

Package lies precisely in the electricity sector as a strategy for energy transition: initially, the objective is to electrify the European energy consumption matrix while simultaneously promoting incentives for renewable electricity production.[22] Consequently, cities' energy-related issues are addressed through this strategy, implying that smart cities should primarily rely on electricity as their main energy source, instead of other energy sources.

Beyond electrifying the energy matrix, the Clean Energy Package incorporates local generation[23] as a means to enhance the electrical system, granting a more active role to communities and empowering consumer associations in executing electricity services. According to the measures, communities can engage not only in energy production but also in activities such as trading, storage, aggregation, energy efficiency services, or even local distribution and sharing of energy.[24] Thus, the European directives on common rules for the internal market for electricity (Directive EU 2019/944) and promotion of the use of energy from renewable sources (Directive EU 2018/2001) now include Citizen Energy Communities (CECs)[25] and Renewable Energy Communities (RECs),[26] aligning with the proposed direction.

Among the different forms of communities, in the scope of this paper, the focus is on RECs, which are exclusively limited to local associations of individuals and the use of renewable energies.[27] According to European legal provisions:

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[22] One cannot, therefore, fail to notice the influence that the model employed had in other locations, for example, in the Climate Action Plan of the State of São Paulo: São Paulo – Estado, *Plano de ação climática do Estado de São Paulo*..., *op. cit.*

[23] Further information on the advantages of local (or distributed) power generation, check: D. F. F. Baptista et al., *A Natureza Jurídica da Geração Distribuída de Energia Elétrica no Brasil*, in *Revista de Direito Público*, v. 19, n. 104, 2023.

[24] F. M. Santos, *Tendências recentes do direito administrativo da energia*..., *op. cit.*

[25] Articles 2.11 and 16 of Directive 2019/944.

[26] Articles 2.16 and 22 of EU Directive 2018/2001.

[27] As can be noted, the definition of the CECs covers, to a certain extent, the RECs, which result to be a kind of particular case of the former: Art. 2.11 of

> "Art. 2.16: 'renewable energy community' means a legal entity:
> (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity;
> (b) the shareholders or members of which are natural persons, SMEs or local authorities, including municipalities;
> (c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits;" [28]

The Portuguese State promptly followed the European directive, amending its domestic legislation to include the figures of collective self-consumption and renewable energy communities. Defined in Decree-Law No. 162/2019, of October 15, its respective Regulation No. 266/2020, of March 20, and more recently in Decree-Law No.

Directive 2019/944: "`citizen energy community' means a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; and (c) may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders;" – European Union, *DIRECTIVE (EU) 2019/944 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU*, in *European Union official journal*, v. L 158/125, 2019.

[28] European Union, *DIRECTIVE (EU) 2018/2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the promotion of the use of energy from renewable sources*, in *European Union official journal*, v. L 328/82, 2018.

15/2022, of January 14, these norms partially transpose the Clean Energy Package, specifically Directive EU 2018/2001 concerning renewable energies. Silva contemplates that the introduction of these figures in Portuguese law enhances the participation of local communities in Portugal's electricity grid:

> "Thus, firstly, it is worth noting that traditionally consumers relied on the supply provided by retailers who, in turn, used the public grid into which energy was injected by producers. Self-consumption has long been a notable exception to this reality, allowing consumers to produce for their own consumption. However, until recently, its expression was limited, especially as it was only conceivable on an individual basis.
>
> The phenomenon is immensely empowered and expanded through the introduction of these new legal realities: collective self-consumption and energy communities. The former allows for the production of renewable electricity for sharing among multiple associated end-use installations located in proximity to the production unit, with the possibility of utilizing the public grid. In the case of communities, as a form of organization involving producers, consumers, and other actors, various activities can be undertaken for the development of renewable electricity projects, in addition to collective self-consumption. These activities range from renewable energy production to consumption, storage, sale, and sharing of renewable energy." [29]

[29] Free translation from the original, in portuguese: "Asim, primeiramente, faz-se notar que tradicionalmente os consumidores dependiam do fornecimento abastecido pelos comercializadores que, para tanto, utilizavam a rede pública na qual era injetada a energia pelos produtores. O autoconsumo é, desde há muito, uma notável exceção a essa realidade que permite ao consumidor produzir para seu consumo. Mas, até há pouco tempo, a sua expressão era limitada, tanto mais que tal era concebível apenas individualmente. fenómeno é imensamente potenciado e expandido por via da introdução destas novas realidades jurídicas: o autoconsumo coletivo e as comunidades de energia. O primeiro permite a produção de energia elétrica de origem renovável para partilha entre várias instalações de utilização associadas e localizadas na proximidade da unidade de

As proposed, the concept of Renewable Energy Communities has a good fit with microgrid technology. Indeed, except for the eventual necessity of regulatory permission for toggling between islanded or connected operations, which should be the subject of study and corresponding legislative/regulatory review,[30] microgrids can be characterized as energy communities in Portugal and the European Union, promoting their value chains to local groups that engage with them.

However, it should be emphasized that the research conducted within the scope of this work did not find explicit authorization for islanding these communities in the current regulations. It is important to recognize that ability of islanding is responsible for a significant portion of the benefits brought by microgrids, and the issue must be carefully considered due to the potential configuration of public services or services prohibited to individuals without proper state delegation, as seems to be the case, for example, in Brazil.

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produção. Sendo que, para tanto, pode ser utilizada a rede pública. No caso das comunidades, enquanto forma de organização de produtores, consumidores e outros agentes, com vista ao desenvolvimento de projetos de energia elétrica de origem renovável, além do desenvolvimento de projetos de autoconsumo coletivo, podem ser desempenhadas várias atividades, desde a produção de energia renovável, ao consumo, armazenamento, venda e partilha de energia renovável." – F. M. Santos, *Tendências recentes do direito administrativo da energia...*, *op. cit.*

[30] For further academic investigation, it would be valuable to undertake a comprehensive analysis of Energy Communities (CEC), that are entitled to own, establish, purchase or lease distribution networks. This exploration aims to explore the potential of CECs as a means to circumvent the explicit requirement for a dedicated regulatory framework allowing microgrids to operate in islanded mode. For more, see the art. 16.2(b) of the Directive (EU) 2019/944 – European Union, *DIRECTIVE (EU) 2019/944...*, *op. cit.*

4. *Conclusion*

As previously explained, both the European Union and Portugal aim to promote the energy transition proposed in international agreements, especially through electrification and the expansion of renewable energy sources in their energy matrices. These environmental commitments address issues closely associated with urban centers. The energy sustainability is a major contributor to global warming, and considering that approximately 75% of all energy consumption occur within the urban and largely populated areas, it is essential to recognize that a model of smart city should consider the energetic matter.

Given the inherent production instability of the renewable sources that are gaining more prominence, particularly wind and solar power, technological strategies are needed for their integration into conventional energy systems. The movement to incorporate technology into urban centers to address issues related to population density and sustainability aligns with the concept of transforming conventional cities into smart cities. The use of microgrids for this purpose promotes energy sustainability and makes urban centers more inclusive, sustainable, and resilient, contributing to the achievement of both SDG 7 and SDG 11 simultaneously, highlighting their interconnectedness within the cohesive UN Agenda 2030.

Microgrids, a technology that encompasses all the functionalities of conventional grids but on a local and small scale, appear to be a solution that promotes these established objectives. With their energy storage capacity, local sharing, and community energy management, they also enhance the electrical resilience of the group, even in the face of physical, natural, and cyber threats. As microgrids typically operate with distributed energy resources, and so they tend to make electrical grids more sustainable while also potentially reducing energy-related costs.

Within the European and Portuguese regulatory context, provisions are in place to accommodate microgrids, particularly

through the figures of Renewable Energy Communities at the European level and energy communities in Portugal. However, at least in the legislation examined, there is no provision for the possibility to island the community, which is one of the key characteristics of microgrids and should be subject to future legislative and/or regulatory revision.

Therefore, in the pursuit of transforming urban centers into smarter cities, promoting sustainability, and achieving the environmental goals set forth in the Paris Agreement and the UN Agenda 2030, the deployment of microgrids can be feasible and advisable to promote electrical sustainability. With the growing recognition of local energy communities at the European and Portuguese levels, the existing regulatory frameworks align with the proposed technology, except for the eventual necessity of permission for switching between operation connected to the main grid or islanded operation, which suggests that it may be necessary to be addressed through legislative and/or regulatory measures.

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HUMAN RIGHTS AND LOCAL GOVERNANCE: SMART CITIES AS THE HORIZON FOR DEMOCRATIC AND PARTICIPATORY CITIES

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1. *Introduction*

The complexity of social transformations and the global crises of recent years (re)locate the city to the center stage of the global scene, and pave the way for us to (re)think the urban space.

According to the United Nations (UN) data, 54% of the world population was living in urban areas in 2014, and projections show that it will have reached up to 70% by 2050.[1] Therefore, thinking about the future of the cities is thinking about the future of humanity.

New information and communication technology (ICT) instates smart cities and their local governance as the horizon of a democratic (re)organization of urban spaces that are inclusive, sustainable, resilient, safe and intelligent.

The cities of the future have been envisioned as spaces (re)constructed from a humanized perspective, being apt to ensure quality of life for all the (co)existent members inside their perimeters. They are expected to be "alive, safe, sustainable and healthy",[2] as a condition for viable projects that promote dignified and meaningful lives, besides offering the equitable enjoyment of the benefits of urban life.

Within this scenario, the general objective of this research is to analyze the digital transition of public governance in smart cities, considering it as a necessary condition towards the intended construction of participatory decision-making processes.

The problem arisen is to define to what extent the digital transition of the local public governance in smart cities can contribute to the construction of democratic public decisions and propitiate a better quality of life to their citizens. This research has been carried out

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[1] UN-HABITAT, *Envisaging the Future of Cities: world cities report 2022*, New York, Department of Economic and Social Affairs, 2022.

[2] Free Transl of: "[...] vivas, seguras, sustentáveis e saudáveis." (J. Gehl, *Cidades para pessoas*, translation: Anita Di Marco, 3. ed., São Paulo, Perspectiva, 2015, p. 6).

by means of exploratory, bibliographical and documentary procedures.

2. *Human rights, 2030 Agenda, and smart cities*

Inspired by the city evolution throughout the Western history, Henry Lefebvre [3] initially conceived the right to the city as the right to the encounter, creation and participation in the construction process of the urban space, establishing that:

> "[...] the right to the city manifests itself as a superior form of right: right to freedom, to individualization in the socialization, to habitat and to inhabit. The right to the *oeuvre*, to participation and *appropriation* (clearly distinct to the right to property), are implied in the right to the city." [4]

On analyzing the right to the city as proposed by Lefebvre, [5] on his considerations about it having emerged from a cry and a demand of society, Harvey [6] explains that "the cry was a response to the existential pain of a withering crisis of everyday life in society", also clarifying that:

> "The demand was really a command to look that crisis clearly in the eye and to create an alternative urban life that is less alienated, more meaningful and playful but, as always with Lefebvre, conflictual and dialectical, open to becoming, to encounters (both fearful and pleasurable), and to the perpetual pursuit of unknowable novelty." [7]

Lefebvre's perception of the right to the city as a cry and a demand was shaped by the need to resignify such a right, in reply to the

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[3] H. Lefebvre, *Right to the city*, in E. Kofman and E. Lebas (eds.), *Writings on cities*, 5, ed. Oxford, Blackwell, 1996.

[4] Idem, pp. 173-74.

[5] Idem.

[6] D. Harvey, *Rebel Cities: from the right to the city to the urban revolution*, translation: Jeferson Camargo, New York, Verso, 2012, p. 11.

[7] Idem, ibidem.

complex and accelerated urbanization process that had emerged. In his view, the only way out would be to include all individuals as part of the city processes, mainly in the creation and reconstruction of democratic public decisions, which could considerably improve the quality of life for all citizens.

This scenario, where resignifying the right to the city is a prerogative to more democratic cities in the future, became the background to the smart cities' construction, as projected within the social and urban contexts intended by the Sustainable Development Goals of the UN 2030 Agenda, amongst which, the most prominent for this research is indicator SDG 11.[8]

As to the smart city concept, Fonseca and Prata[9] state that there is no such a single definition, and this juridical-conceptual imprecision has been challenging the Law. However, there is some consensus that the smart city is the one whose focus is on human beings and the improvement of the population's quality of life. In accordance with that, the Brazilian Charter for Smart Cities establishes that:

> "Smart cities in Brazil are committed to sustainable urban development and digital transformation, in their economic, environmental, and sociocultural aspects that act in a planned, innovative, inclusive, and networked manner, promote digital literacy, governance, and collaborative management and use technologies to solve real problems, create opportunities, offer services efficiently, reduce inequalities, increase resilience and improve the quality of life of all people, ensuring the safe and responsible use of data and information and communication technologies."[10]

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[8] UNITED NATIONS, *The 2030 Agenda and the Sustainable Development Goals: An opportunity for Latin America and the Caribbean (LC/G.2681-P/REV.3)*, Santiago, ECLAC, 2018.

[9] I.C.M. Fonseca and A.R.A. Prata, *Smart Cities vs. Smart(er) governance: cidades inteligentes, melhor governação (ou não)*, in I.C.M. Fonseca, *Direito das Autonomias (Locais): Estudos Reunidos*, Braga, NEDip, 2019, pp. 245-265.

[10] BRASIL, Ministério do Desenvolvimento Regional. Secretaria Nacional de

The smart city as a model towards the cities of the future is intended to organize the structuring elements involved in their (re)construction, such as social and digital inclusion, sustainability, resilience, safety, and virtual spaces. The right to participation in decision-making processes and the expansion of citizenship work as guiding threads to the smart city planning and also to the right to the city as a collective human right.

3. *Digital and participatory governance*

New information and communication technology (ICT) instates smart cities and their local governance as the horizon for the democratic (re)organization of urban spaces that are inclusive, sustainable, resilient, safe and intelligent.

Citizenship expansion becomes a principle to be accomplished within smart cities and to be met by the right to the city, being an element of social cohesion since it promotes the sense of belonging to a certain urban community, which is fundamental in the (re)creation of inclusive and democratic urban spaces.

That involves taking part in the (re)construction of meanings for the urban life, and in the decision-making processes related to local interests. Those actions have the potential to materialize this broadened concept of citizenship into the city reality. This would transform the passive citizen into a participating actor of the urban space creation. Therefore, inclusion – social and technological – is one of the structuring elements of the smart city model, and the participation of people in the decision-making processes by means of the information technology entails digital literacy.[11] It consists of mastering the "techniques and skills to access, interact, process and

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Desenvolvimento Regional e Urbano, *Brazilian Charter for smart cities: short version*, 2021, p. 8.

[11] C.S. Ferraresi, *A ressignificação do direito à cidade a partir dos direitos humanos: As*

develop a multiplicity of competences which enables the reading of the most varied types of media content",[12] and digital, or information literacy (IL), becomes an exceedingly important factor for the constitution of the citizenship in smart cities.

Within this context, Regina Celia Baptista Beluzzo emphasizes the challenges and responsibility involved in ensuring digital inclusion and literacy:

> "It is known that many people and organizations haven't fully mastered the ICT resources or even received any education or training referring to their use, and this fact makes them significantly lacking in the development of new competences and skills, which otherwise would make them more demanding and critical as to the possibilities of having their needs met by means of that. It is necessary to keep updated and be aware of the light and dark sides of the digital revolution. Then, it is necessary to accept them. Knowing how to interrelate the digital reality (considering the global digital economy) to the populations' reality (acting in the physical local economy) is a decision to be taken, and whose responsibility lies with every social actor."[13]

Smart Cities como um espaço para garantir a qualidade de vida das pessoas com deficiência, 1. ed., Blumenau, Editora Dom Modesto, 2021.

[12] Free transl. of : "[...] técnicas e habilidades para acessar, interagir, processar e desenvolver multiplicidade de competências na leitura das mais variadas mídias." (BRASIL, *Brazilian Charter for smart cities: short version*, *op. cit.*, s.p).

[13] Free transl. of: "É sabido que muitas pessoas e organizações não dominam plenamente os seus recursos de TIC ou não estão sendo educadas e formadas com o seu uso, e esse fato as tornam significativamente carentes de desenvolvimento de novas competências e habilidades que as tornem mais exigentes e críticas no que diz respeito às possibilidades de verem suas necessidades atendidas por esse meio. É preciso estar informado e ter consciência do lado luminoso e do lado sombrio da revolução digital. Depois é preciso aceitá-los. Saber inter-relacionar a realidade digital (pensar na economia digital global) à realidade das populações (agir na economia física local) será uma decisão a ser tomada, cuja responsabilidade é de todos os atores sociais." (R.C.B. Belluzzo, *Transformação digital e competência em informação: reflexões sob o enfoque da*

Citizenship expansion by means of the ICT is a necessary condition for the implementation of an e-governance model, whose horizon is found in the transition to a participatory and digital democracy. That can be accomplished, provided that people are assured to have the opportunity of mastering techniques and skills to access, interact, process, and develop a multiplicity of competences in reading the most varied types of media. It is also necessary to highlight the connection between digital transformation and digitalization:

> "Digital transformation entails digitalization, meaning automation. It is considered that the integration of multiple technologies in a single piece of equipment – the mobile, the ubiquity (at any time and place) and the hyperconnectivity (calling, sharing, and creating knowledge in a cooperative way) represent, as combined elements, a kind of technological disruption never anticipated before, for they radically change the social agents' behavior, intervening in the value chain of the new digital ecosystem of goods and services; therefore, the development of competences is required, and the Information Literacy (IL) is highlighted as a priority for the new social scene." [14]

It is clear, therefore, that the right to the internet access towards all individual is also fundamental to the implementation of the participatory and digital governance in the city. Public spaces with

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Agenda 2030 e dos Objetivos de Desenvolvimento Sustentável, in *Conhecimento em Ação*, Rio de Janeiro, v. 4, n. 1, jan./jun. 2019, p. 13).

[14] Free Transl. of: "A transformação digital traz consigo a digitalização que significa automatização. Considera-se que a integração de múltiplas tecnologias num único equipamento – o mobile, a ubiquidade (a qualquer hora e em qualquer lugar) e a hiperconectividade (ligar, compartilhar e criar conhecimento em cooperação) representam, quando combinadas, disrupções tecnológicas jamais antecipadas, porque transformam radicalmente o comportamento dos agentes sociais que intervêm na cadeia de valor do novo ecossistema digital de bens e serviços, requerendo, portanto, o desenvolvimento de competências, destacando-se, primordialmente, nesse novo cenário social a Competência em Informação (CoInfo)." (R.C.B. Belluzzo, *Transformação digital e competência em informação...*, *op. cit.*, p. 14).

free wi-fi are democratic spaces, which allows people to be inserted into the digital city and take part in the construction of public decisions.

Digital inclusion also involves the acknowledgement of the internet access as a fundamental human right, as Marques [15] point out that "the right to the internet, and, consequently, the access to information and technology must be prioritized, and in order that the individual reaches the opportunity to evolve in the digital society, the internet must be democratic." [16]

Remedio and Silva agree that internet has to be democratized, emphasizing the need to remodel the structures of its access, to allow digital inclusion.

> "It is necessary to find solutions to infrastructure issues, for keeping the present infrastructure, as public wi-fi only in more elitist public spaces, such as airports, important data related to the implementation of public policies will be concealed, and cities will not be contemplated as a whole, generating even more serious distortion. Digital inclusion can make people's empowerment viable and allow their voices to be heard, bringing about new perspectives on reality and even the rupture of the digital media monopoly. Today this potential is already known; however, monopolies are deeply rooted, together with the concentration of power, income, and all that opposes the logical principles." [17]

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[15] G.M. Marques, *Transformação digital e o acesso a internet como direito fundamental*, in *Revista Brasileira de Direitos e Garantias Fundamentais*, v. 6, n. 2, jul./dez. 2020, pp. 69-70.

[16] Free transl. of: "[...] o direito à internet e consequentemente o acesso à informação e tecnologia deve ser prioridade, para que se dê a oportunidade ao indivíduo de evoluir junto à sociedade digital, a internet precisa ser democrática." (Idem, ibidem).

[17] Free transl. of: "São necessárias soluções de infraestrutura, pois se forem mantidas as infraestruturas presentes, como wi-fi público somente em ambientes públicos mais elitizados, como aeroportos, estarão sendo ocultados dados importantes para a implementação de políticas públicas, e não serão

The materialization of smart cities as democratic spaces is directly related to the promotion of the information literacy (IL), and the transition to an intelligent local governance, by applying the information and communication technology in safe and responsible ways to amplify people's participation in the construction of democratic public decisions.

The expansion of political participation in defining, executing, monitoring, and budgeting urban policies intends to reinforce transparency, efficiency, and the inclusion of diverse inhabitants and their organizations (civil or business ones) in the construction of democratic public decisions, prioritizing public and social interests, collectively determined.

New ways of participation by means of the participatory governance, based on the citizens' empowerment, all the stakeholders' involvement, and the innovative use of the social capital to expand the construction of social cohesion. In a context where the connections between economic growth and social progress are more and more debilitated, social innovation becomes crucial, allowing the expansion of public spaces, and stimulating the civic involvement and participation, as well as creativity, ingenuity and cohesion. [18]

There are many challenges to the effectiveness of the right to the smart city related to technology, investment, urban planning and

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contempladas as cidades como um todo, gerando assim distorções ainda mais graves. Com a inclusão digital, há viabilidade de potencial de empoderamento às pessoas, que passam a ter mais vozes, viabilizando um olhar para novas realidades, inclusive, quebrando o monopólio de mídias digitais. Hoje conseguimos ver que tem esse potencial, mas por outro lado temos um aprofundamento muito grande de monopólios, de concentração de poder, renda e toda lógica contrária disso." (J.A. Remédio and M.R. Silva, *O uso monopolista do Big Data por empresas de aplicativos: políticas públicas para um desenvolvimento sustentável em cidades inteligentes em um cenário de economia criativa e de livre concorrência*, in *Revista Brasileira de Políticas Públicas*, Brasília, DF, v. 7, n. 3, dez. 2017, p. 684).

[18] European Union, European Commission, *Cities of tomorrow: challenges, visions, ways forwards*, Brussels, 2011, p. vii.

regulations, and perhaps the biggest one amongst them is the governance in the *smart* scenario. Digital and participatory governance is a necessary condition for everyone's participation in the elaboration of urban policies in the scenario of a complex society inserted in a context of global fragmentation and new technologies.

4. *Final considerations*

Smart cities are models of urban areas where technology is an amplifying factor of their organizational dynamic, and interact with elements of inclusion, sustainability, and resilience to (re)construct humanized cities, as the European Union establishes: "new and emerging technologies could help cities improve public services (including mobility and well-being), better interact with citizens, increase productivity, and address environmental and sustainability challenges." [19]

Citizenship as the guidance for smart cities and the right to the city evinces the recognition of the citizen as a protagonist, and points out the need to "implement, together with the mechanisms of the representative democracy, processes of participatory and direct democracy which are aligned with digital tools. That also means to promote the smart city and the smart citizen." [20]

The strengthening and expansion of citizenship in the local context, propelled by new technologies (digital inclusion), paves the way to the (re)construction of smart urban spaces, by means of the

[19] Idem, p. 98.

[20] Free transl. of: "[...] implementar, junto aos mecanismos da democracia representativa, processos de democracia direta e participativa que estejam sintonizados com as ferramentas digitais. Isso também significa promover a *smart city* e o *smart citizen*." (A. Lemos, *Cidades Inteligentes*, in *GV-executivo*, 12(2), jul./dez. 2013, p. 49).

modern participatory governance. Local and participatory governance represents the materialization of the right to the city as described by Lefebvre, in reference to the habitants' participation in the decision-making processes of local interest.

Considering this scenario, the digital transition of the public governance in smart cities, as a conditioning factor to the construction of participatory decision-making processes, necessarily implies the digital inclusion of all actors inserted in the urban context. Social inclusion permeates digital literacy, a better quality of education, and the acknowledgement of a high-quality internet access as a fundamental human right, so as to ensure the possibilities of participation and the conscious manifestation of will.

Citizenship expansion by means of participatory governance, as the guiding thread for the collective decision process in smart cities becomes the horizon of meaning to align (public and private) interests in the construction of the urban planning, since it inserts all actors of the urban society into the decision-making processes.

Thus, the digital transition of public local governance can contribute to the construction of democratic public decisions and improve people's quality of life, by means of the digital inclusion in the decision-making processes related to local issues.

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CHALLENGES AND PROPOSALS FOR PROMOTING WOMEN'S DIGITAL INCLUSION IN THE PORTUGUESE CONTEXT

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1. *Introduction*

According to Castells,[1] society cannot determine technology but uses it. The uses of technology can slow down or accelerate social development, with the State having an essential role in this movement. As stated by the author, technology alone cannot determine the historical evolution of society, but the capacity to dominate technology can influence the realization of essential social changes. As a result, all sectors and social groups must participate in the technological revolution. This model is the way to ensure that society will evolve positively and inclusively.

The active participation of historically excluded groups will have the capacity to impact society's destiny, enforcing the creation of an inclusive and modern legal framework in the digital era. In this context, it is fundamental that women, as a socially excluded group of different and essential stages of history, take part in this "accelerated process of technological modernization (...)"[2]

Therefore, this article aims to review the digitally index of Portuguese women and the level of representation of women specialists in Information and Communications Technology (ICT) in Portugal. To achieve our goals, we will establish a dialogue between statistics sources and the historical and societal reasons that justify the reality experienced by women in Portugal. The next step will be to recapitulate Portuguese policies adopted to strengthen female representation in the digitally and ICT market. Finally, we will offer some proposals to increase the inclusion and representation of women in digital and ICT Portuguese markets.

It is important to note that the technological areas consist of several sections. However, we will focus on the digital competences

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[1] M. Castells, *A era da informação: economia, sociedade e cultura*, 5.ª ed., Fundação Calouste Gulbenkian, 2016.

[2] Translated by the authors from the original language (Spanish). M. Castells, *A era da informação: economia, sociedade e cultura*, *op. cit.*, p. 8.

of the women and the ICT field because it is an area that lacks qualified human resources and has been impacted by the public health crisis of COVID-19.

We also recognize that factors such as limitation, devaluation, disqualification, and exclusion affect women at different levels depending on factors such as race, ethnicity, nationality, and sexual orientation, among others. However, we comprehend that an intersectional approach goes beyond the mere sum of identities and the "(...) simples reconhecimento da multiplicidade dos sistemas de opressão (...)" [3] – that means the simple recognition of the multiplicity of systems of oppression – demands that multiple aspects besides political, social, economic and cultural contexts be deepened. To avoid adopting a simple idea of intersectionality, we will focus our analysis without delving into the reasons for specific situations.

In methodological terms, this article fits into two research paradigms: quantitative and qualitative, and involves inductive and deductive reasoning. We aim to quantify and qualify the process by identifying the reasons behind the measure phenomenon. The research techniques adopted are the bibliographic review and document analysis from the systematization of statistical data for the years 2019 and 2020, articles, and academic books.

2. *The importance of ICT training and the women's challenges in the digital field*

Several processes are leading to an accelerated change in the productive sector that impacts the global labour market, among them the advance of new technologies and the social and economic political choices being made. However, it is not our purpose to

[3] Bielgi cited in T. Pires, *Prática e Teoria: direito à cidade e interseccionalidade: pistas para a ação e para a pesquisa*, in E. Belo and R.J. Keller (eds.), *Curso de direito à cidade*, Rio de Janeiro, Lumen Juris, 2019, p. 190.

scrutinize the reasons for the changes in the productive sector but only to illustrate the need for human resources training in the technology sector.

The technology sector has been experiencing gradual growth. Nonetheless, the COVID-19 crisis, the war in Ukraine and the economic consequences it generated, rising inflation, and the climate and energy crises, accelerated the sector's expansion. On the authority of the person in charge of the Software Development Department, Beltrão Coelho, "TI é um mercado de pleno emprego, onde a procura de talentos na área continuará a ter forte predominância."[4] – that means IT is a full-employment market, where the hunt for talent in the area will continue to have a strong predominance.

In addition, the European Union (EU) has also invested significant resources in Member States to support digital transformation. Thus, a total of EUR 127 billion was devoted to digital sector-related reforms and investments in national recovery and resilience plans. In turn, Member States have devoted, on average, 26% of their Recovery and Resilience Facility (RRF) allocation to digital transformation, staying above the mandatory 20% threshold. These financings are an unprecedented opportunity to accelerate digitalization, increase the UE's resilience and reduce external dependence.

Taking into account Portugal's circumstances, it is necessary to accelerate its digitalization rates. On the report of Robert Walters consultancy,[5] the ICT sector is one of the fastest growing in the country. The transformation processes to the business fabric and Public Administration will increase the demand for qualified

[4] M. Bandeira, *O software ainda está a devorar o mundo*, in *Jornal Económico*, [online], 2022, p. 7, available at: https://leitor.jornaleconomico.pt/download?token=c1cc6a3cdb004e85692025180e225ff3&file=Quem_%C3%A9_quem_nas_TIC5.pdf.

[5] Robert Walter Salary Survey, [online], 2022, available at: https://www.robertwalters.pt/pesquisasalarialglobal.html (accessed 19 January 2023).

professionals in the ICT sector even more. Nevertheless, this is an area that suffers from a lack of specialists. There are vacancies for around 15,000 IT professionals in Portugal. Data from IDC Portugal [6] show that by 2025, 90% of organizations will lack ICT resources. More specifically, there will be a lack of more than 1.15 million professionals in Western Europe. There will be a lack of more than 10,000 professionals by 2025.

One of the challenges faced in Portugal to fill vacancies in the ICT area, although not the only one, is related to training. The number of technicians specialized in ICT areas in Portugal is below the European average. However, we point out that the low value of wages practiced also contribute to qualified professionals leaving the country. Carapuça [7] verifies the need for an increase "in the number of graduates in ICT and the number of specialists in general, graduated or not". Another factor that must be considered is the phenomenon of the "informational city" and the Smart Cities that bring together the use of ICT in the urban environment to solve the most diverse problems faced in cities.

For these reasons, the ICT market is promising and requires more qualified workers. A country that invests in skilled labour training in ICT also invests in innovation and is closer to developing solutions that guarantee its digital sovereignty. The expansion of the ICT trade and the emergence of labour in the area can be an essential chance for women to have the opportunity to be recognized for their abilities, mainly from a collective and social point of view. This movement can impulse change to the space women occupy in society.

According to Piscitelli, [8] subordination experienced by women

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[6] https://idcportugal.com

[7] Costa, J.S., *Rogério Carapuça: há que estar entre os primeiros, não ser o primeiro dos últimos*, in *Jornal Económico*, 2022, p. 23, [online], available at: https://leitor.jornaleconomico.pt/download?token=c1cc6a3cdb004e85692025180e225ff3&file=Quem_%C3%A9_quem_ nas_TIC5.pdfp.

[8] M. Piscitelli, *Re-criando a (categoria) mulher*, in *A prática feminista e conceito de gênero*, 48, Textos didáticos, Campinas, 2002, pp. 7-42.

varies concerning the historical period, and the place examined. Despite the particularities, it is a universal phenomenon that occurs in all parts of the world and all historical periods. As claimed by feminist currents, the occurrence is structured based on the social construction that is made of women and can be modified. Such subordination also reflects on the division of labour and exclusionary processes based on gender. Regarding some of the barriers faced by women in accessing the labour market, we highlight those exposed by Coutinho: "(...) Dificuldade de inclusão; sua força de trabalho é social e culturalmente desvalorizada; recebem os menores salários; possuem baixa qualificação profissional, sendo conduzidas aos setores de trabalho intensivo, onde predomina a exploração do trabalho manual e repetitivo; frequentemente são obrigadas a pautar suas possibilidades de inserção laboral nas suas responsabilidades domésticas e familiares, acumulando trabalhos dentro e fora de casa."[9] – that means the difficulty of inclusion; social and cultural devaluation of the workforce; lower wages; low professional qualification led to the intensive work sectors, where the exploration of manual and repetitive work predominates; accumulating jobs inside and outside home.

As a first conclusion: even with the emergence of careers related to ICT and the lack of labour in the area, women continue to face barriers to their insertion in the labour market, as we will appreciate in the following topic.

3. *Women's digital competences and their position in the ICT sector in Portugal*

The European Commission annually publishes the economy and society digitally index (ESDI). It summarizes the indicators of

[9] J. Coutinho, *Mulheres Pioneiras na Engenharia*, in *Faces de Eva: Estudos sobre a Mulher*, 27, 2012, pp. 51-67.

Europe's digital performance and monitors the progress made in the EU Member States regarding digital competitiveness in human capital domains (available in the European Commission website – https://ec.europa.eu/commission). The most recent index version of ESDI is from 2021 and it presents data for 2020. We will analyse the 2020 data with regard to Portugal. For comparative purposes, we will also use the 2019 index. The intention is to offer an overview of the consequences of the COVID-19 pandemic on the progress of the digital and the effects of public policies adopted during that period. Data analysis will take into account that the digital agenda for Portugal was published in the *Diário da República* (December 31st – *Resolução do Conselho de Ministros n.° 112/2012*) and had the year of 2016 as a deadline to start implementing measures to improve digital literacy, qualification and inclusion.

The latest digital index known to Portugal indicates that the Portuguese digitally index is 49.2% (2021). The country is slightly below the European average (52.6%). Therefore, the country occupies the 14th place in the 27 Member States ranking. The best-ranked country is Finland, and the last is Romania. Half of the Portuguese population has basic IT knowledge that allows them to cope with everyday digital life, but the other half does not even have the basic IT knowledge to access services currently provided by digital means on their own and remotely. This represents a general problem that includes women and men and the Portuguese State must solve it.

According to data published by the European Commission (2020), before COVID-19, Portugal occupied the 19th position in the ranking due to the digitalization of public services. Concerning human capital, a relatively high number of people who do not regularly use the Internet justify the poor performance obtained.

Even though about half of the Portuguese population has basic digital skills, the country still lags significantly behind the Member States with the best performance.

About ICT specialists in Portugal, the average of employed in Portugal corresponds to the EU average. However, the level of ICT

graduates is one percentage point lower than the European average (3.9%). In 2019, before COVID-19, the percentage of ICT specialists was only 2.2%, of which only 0.7% were women. This means that the level of experts across Europe is still very low. As far as Portugal is concerned, in addition to the number of specialists still very low for the needs faced with digitization of services and companies, the number of women specialists is insignificant. This is a problem that originates in education. Considering education levels, the area related to ICT is the one with the lowest number of graduates in Portugal. Thus, in 2020, around 7,000 students graduated in a universe of 86,000 graduates.

The proportion of women exclusively ICT specialists in Portugal is 21%, exceeding the EU average of only 19%. Which means that not even a fourth of ICT specialists in Portugal are women. In addition, there has been a positive trend in the last 10 years in the growth in the number of women with ICT degrees, women accounted for only 20.1% last year while men accounted for 79.9% of graduates. Consequently, also with regard to employment in these areas, in the last 10 years only one woman in five people working in the ICT sector. It is also verified that men are more represented in areas related to research and business while women are more represented in the state sector.

There is, therefore, a notorious gender asymmetry in the employment of women in companies, where the feminisation rate is only 27.7%. Men are more focused on engineering and technology and women are more represented in medical sciences and health.

But the problem is not just around this.

In addition to the lack of ITC specialists, we see that the percentage of women with basic digital skills is still far from the desirable. The position held by Portuguese women in the digital field, calculated on the basis of internet use, digital skills and ICT work, ranks 14th, and is below Finland, Ireland, the Netherlands, Sweden, Denmark, Luxembourg, France, Spain, Estonia, Malta, Austria, Belgium and Slovenia. According to the data obtained in the 2021 report on the use of the internet by women, 79% of

Portuguese women habitually use the internet, 17% of women have never used the internet and 58% of women use the internet to relate to public administration. When we compared this data with the European Union with regard to women's use of the internet, we found that 87% of women use the internet, only 8% of women have never used the internet and 65% of women use the internet to relate to public administration.

Although not the subject of our study, we note that the internet usage habits are also different between men and women. Women use the internet slightly less than men (77% of women aged 16 to 74 have used the internet at least once a week, compared with 81% of men). Women use the internet predominantly to access social networks and men to read news, according to the National Institute of Statistics of Portugal.

In summary, in Portugal the digital and digital knowledge index is similar between men and women, but with regard to higher education and the exercise of ICT-related professional activities, women are in a large minority. Given the growing need for skilled ICT labour, increasing women's participation in ICT is a challenge to address. In addition, there is also a need to increase women's basic digital skills.

4. *Reasons for the asymmetry between men and women in the digital area*

For the asymmetry between man and women in the access, learning and use of ICT and also for the use of internet, historical, social, cultural and political factors contribute to it.

According to Saavedra et al.,[10] the dualism that associated science with man and nature with women was established in the 17th century

[10] L. Saavedra et al., *(A)Simetrias de Género no Acesso às Engenharias e Ciências no Ensino Superior*, in *Ex Aequo*, 23, Associação Portuguesa de Estudos sobre as Mulheres (APEM), 2011, pp. 163 a 177, available at: https://hdl.handle.net/1822/14564.

with Francis Bacon, and since then this association of values has accompanied us throughout history, continuing to influence the choice of professions, despite being known examples of renowned women in the field of mathematics and physics.

In Portugal, schools and textbooks have only very recently implemented the alteration of this stereotype that has haunted us for years. Many families also followed this dualism, eventually influencing the choice of Portuguese young women regarding the educational path to follow and, consequently, as to the profession to be performed in the future. Thus, even today there is a strong number of women dedicated to the areas of education, health and social protection, the arts and humanities, the social sciences and law; and a more reduced number of women dedicated to the study of science, mathematics and informatics, as well as in the field of engineering and manufacturing.[11]

The reasons responsible for maintaining this stereotype may be related to some historical factors. It should be recalled that in Portugal, just over 40 years ago, the difference between men and women was still very marked due to the political dictatorship in which we lived. Consequently, the limitations imposed on women were several and this reality was not really changed until after April 25th, 1974. Although the Revolution of April 25th (commonly known as the *Cravos* Revolution) overthrew the fascist regime, the emancipation of Portuguese women was not immediate. Women's emancipation was sedimenting step by step and began to truly impose itself in the 1980s and more sharply in the 1990s. According to Irene Pimentel, it was not until the 1980s that the operative concept of gender emerged in Portugal.[12] That is why the

[11] Idem.

[12] S.I.S. Cardoso, *A Mulher e a Censura no Estado Novo – O coro das Novas Cartas Portuguesas*, [online], 2016, available at: https://www.academia.edu/32841956/A_mulher_e_a_censura_no_Estado_Novo_O_coro_das_Novas_Cartas_Portuguesas.

path of equality between men and women in Portugal began slightly later than in the other Member States of the European Union where the rate of feminisation in the digital world is higher.

Making a brief synthesis of the evolution on the education and integration of women at the professional and social level in Portugal since the twentieth century, with interest for our study, in order to better understand the position of women in Portuguese society today, it is worth highlighting the following facts.

During the First Portuguese Republic that took place between 1911-1926, about 80% of women in Portugal were illiterate. Only from then on was the path to compulsory education opened from 7 to 11 years for boys and girls. However, in practice, there were not enough schools for this right to be exercised by all; and only from then on were women able to start working in the civil service. However, the First Republic was short-termed and the politicians of the time, with the aim of breaking with the ideals of the monarchy, were eventually lost in heated debates whose primary objective was to end monarchical ideals. Therefore, the achievements have been few, especially with regard to the position of women. In 1914, with the First Great War, women had an intervening role in society, however, this social intervention was summarized to education and hospital organizations from the rear, thus maintaining the role of caregiver. [13]

However, in Portugal there was a setback in the position and right of women in society with the installation of the dictatorial political regime, called the *Estado Novo*, preceded by the Military Dictatorship installed since 1926. The Constitution of the Portuguese Republic of 1933 provided in Article 5 that citizens were equal before the law, but provided for the exception: "the differences resulting from their nature and the good of the family are saved as far as women are concerned." The 1933 National Labour Statute also limited the

[13] L.A. ALVES, *Primeira República: Espaço para a Mulher no Ensino Técnico em Portugal*, in *Tempos de História*, 25, 2015, pp. 35 a 57.

possibility for women to work outside the home, and in cases where they could work the wage gap paid for the same work performed by a man was considerable. In addition, the Civil Code of the 1867 Portuguese remained in force in which several norms were foreseen within the family with the supremacy of male power.[14]

Portuguese women lived, therefore, in a condition of legal inequality *vis-à-vis* man, inequality in status within the family and the couple, but also in terms of political, social, labour and cultural rights. Only with the revolution of April 25th, 1974 Portugal starts living in a climate of freedom. Thus, on April 2nd, 1976, the Constitution of the Portuguese Republic was adopted, declaring the principle of equal choice of profession, access to work and pay without gender discrimination; and in the area of the family ensured equal rights and conjugal duties. It is indispensable to review the various Portuguese legal codes, such as labour legislation and the civil code. More specifically with regard to higher education, there began to be a renewal of the teaching taught in universities, the influence of the Annals' school and the "new history" of anthropological orientation, directed to the studies of private and daily life, as well as changes in Portuguese society itself, more specifically, the massive entry of women into higher education.[15] Before the revolution of April 25th, 1974, very few women were studying in higher education.[16] However, to this day, despite existing legislation and a change in the social mind-set, the family remains a singular feminine noun.[17] Thus, even during the

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[14] S.I.S. Cardoso, *A Mulher e a Censura no Estado Novo – O coro das Novas Cartas Portuguesas*, *op. cit.*

[15] J.L. Nunes, *As Primeiras Mulheres Assistentes e Doutoradas na Secção de Ciências Matemáticas da Universidade de Coimbra*, in *Boletim da Sociedade Portuguesa de Matemática*, 72, maio de 2015, pp. 53-74.

[16] I. Lousada, *Elos de Progresso Social e Científico: Contributo para a História das Mulheres Cientistas em Portugal*, in I. Lousada and M.J. Gonçalves (eds.), *Women, Science and Globalization: Whats up?*, Lisboa, Amonet, 2013, pp. 57-85.

[17] E. Macedo, *Os mecanismos de paridade no setor público local português*, in

21st century and, nevertheless, the Portuguese constitutional framework, which is very rich in norms that enshrine equal rights between men and women, as well as the varied legislation that has been published in defence of gender equality, in fact, the majority of Portuguese women continue to have the burden of domestic management and family management, with the education of children. That is, the family remains a burden more of women than men and of course this social factor has a strong impact on the choice of the professional area of studies.[18]

In addition, a political factor also contributes to the problem. Thus, in 2015 the measures that were being implemented with the aim of increasing the digital index in Portugal left out the development of human capital and the private sector, prioritizing investment in the digitization of public administration. With the proposal to update the Portugal Digital agenda, Portugal has approved the *Resolução de Conselho de Ministros 22/2015, de 16 de abril*. Consequently, initiatives aimed at the development of human capital in the digital area are beginning to be implemented.

5. *Policies for the development of human capital in the digital area, especially for digital inclusion of women in Portugal*

As we have seen above, when we present the exhibition on the statistical data of women's participation in the digital world, the Portuguese State is currently facing two major challenges with regard to the inclusion of women in the digital world: on the one hand, almost half of its population, which also includes women, does not have basic digital skills; on the other hand, only 1/4 of ICT specialists are women and only 1/5 of all ICT workers are women. These facts therefore call for a solution and a strategy.

Confederação nacional de municípios (ed.), *As políticas públicas de gênero no contesto da gestão local*, Brasília, 2022, pp. 33-44.

[18] Idem.

What strategies have been adopted by the Portuguese to address this problem?

Under the motto *No one can be left behind*, the 2030 Agenda is deeply transformative and provides a roadmap for the removal of all structural obstacles to equality between women and men, in the national territory and in terms of development cooperation. Accordingly, on April 21st 2020, the Portuguese government approved a strategy and action plan for the digital transition identifying the empowerment and digital inclusion of people as one of the national priorities, in line with the Recovery and Resilience Plan with a total allocation of more than EUR 16 million and which should be implemented by 2026. The digital dimension concentrates 22.1% of the overall amount of the Portuguese PRR, i.e., higher than the amount used by most Member States. The most prominent digital measures included in the plan are education and training in digital skills.

Thus, Portugal has promoted digital skills through various initiatives and programs: in schools the Digital School Program for teachers, an initiative of Digital Teacher Training to train workers; the Employment Digital initiative; the Youth Digital Program for unemployed young people; the UPSKILL Program to requalify unemployed people, converting them into IT specialists; the "Adult Boost Program" to update the skills of adults of active age; as well as the Technological Academies Programme. The digital inclusion of the population has been addressed through the "I AM Digital" Program, through the "MUDA" (Movement for Active Digital Use). All of these initiatives include men and women, so contributing to increase the level of basic skills of the general population.

More focused on a gender perspective, we highlight the INCoDe.2030 Roadmap – Digital Empowerment initiative, which is a national initiative that promotes digital skills among the general public, providing studies, measures and platforms to boost digital inclusion and literacy, training, qualification and gender convergence

programs. INCoDe.2030 includes initiatives to monitor gender balance, collect disaggregated data and boost women's participation.

In addition to this program that aims to boost digital literacy, within the National Strategy for Equality and Non-Discrimination 2018-2030, Portugal has launched The Program "Engineers for a Day" that has promoted the option for engineering and technologies among primary and secondary school students, with about ten thousand participants since 2017. She has also promoted the "Promote – Gender Equality Opportunities in Senior Management" Project that aims to develop female talents and foster their promotion to top management functions of companies.

6. *Conclusions*

It is possible to pronounce that the level of representation of women specialists in Information and Communications Technology (ICT) in Portugal is still deficient as well as the average of internet use by women. These are two different problems to be solved. On the one hand, the labour market is increasingly offering jobs in the digital area, so it is an opportunity that should also be used by women; and, on the other hand, daily life increasingly calls for the use of digital media. The COVID-19 period highlighted the importance of women having greater digital skills and the choice of women for ICT-related professions to be well represented in this field.

The Portuguese State has actively contributed to the digital inclusion of women and strongly encouraged their choice of engineering and ICT but in fact the concern with the development of human capital in the digital area in Portugal only started in 2016 (just over 5 years ago). The initiatives for the inclusion of women that the Portuguese State has taught seem promising. However, it is necessary to check whether such programs are sufficient and inclusive in practice to ensure that no one is left behind. Portugal still lags significantly behind the Member States with the best

performance. Therefore, studying the digital policies applied in other Member States may be interesting to understand what Portugal can do to improve in the digital.

As for the need to increase the number of women specialists in ICT, the incentive program carried out among girls in primary and secondary education is a commendable example. Only through education will it be possible to create awareness of the importance of learning ICT and demonstrate the immensity of the labour market. Nevertheless, the programs must continue for the long term. On the other hand, it is also necessary that the other factors that also influence women's distance from the labour market, and which we do not intend to delve into here, are also addressed: social and cultural appreciation of the female workforce; increased and equalization of female and male wages; promotion of supports to make possible that women do not have to give up their professional life in the name of domestic and family life. Only from a holistic approach will it be possible for the inclusion of women in the ICT market to correspond to an advance capable of repositioning them in society.

In any case, it seems that Portugal is on the right track. This is a subject that deserves further study, and our intention is to raise some topics contributing to this reflection that is not exhausted here.

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USING PREDICTIVE ALGORITHM IN LOCAL GOVERNANCE ADMINISTRATIVE DECISION MAKING: A BIBLIOMETRIC ANALYSIS OF CURRENT PRACTICES

José Ramón Saura *

1. *Introduction*

In the last two decades, advances in the development of new technologies, particularly artificial intelligence (AI), have led to an increase in innovation-focused strategies on both government and corporate levels.[1] The transformation process in the governments

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[1] J. Calof et al., *Understanding the structure, characteristics, and future of collective*

has been particularly facilitated by digitalization, use of new technologies, and adoption of data-driven algorithms that enhance administrative decision making. [2]

Accordingly, AI has been identified as a major opportunity for public administrations to optimize their processes and decision making. [3] AI is widely known for its versatility in terms of application and ability to automate processes. [4] Therefore, in the digital age where data have become a valuable asset for companies and governments to maximize and monetize their strategies, the development of AI has become essential for the future of these organizations. [5] The use of AI in public and local governance in the adoption processes related to both governmental decision making and the improvement of administrative services in public institutions [6] has been extensively discussed in the scientific literature.

Through simulating human intelligence via machines, particularly intelligent systems working with Natural Language Processing (NLP) [7] and applying algorithms to automatically identify patterns and trends in large amounts of data, AI develops and applies what is known as machine vision, thus allowing computers to identify

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intelligence using local and global bibliometric analyses, in *Technological Forecasting and Social Change*, Vol. 178, 121561, 2022, pp. 1-11.

[2] F. Provost and T. Fawceet, *Data science and its relationship to big data and data-driven decision making*, in *Big Data*, Vol. 1(1), 2013, pp. 51-59.

[3] M. Javaid et al., *Artificial intelligence applications for industry 4.0: A literature-based study*, in *Journal of Industrial Integration and Management*, Vol. 7(1), 2022, pp. 83-111.

[4] D. Acemoglu and P. Restrepo, *Artificial intelligence, automation, and work*, in *The economics of artificial intelligence: An agenda*, University of Chicago Press, 2018, pp. 197-236.

[5] H. Benbya et al., *Artificial intelligence in organizations: Current state and future opportunities*, in *MIS Quarterly Executive*, Vol. 19(4), 2020, pp. 1-15.

[6] D.F. Engstrom et al., *Government by algorithm: Artificial intelligence in federal administrative agencies*, in *NYU School of Law, Public Law Research Paper*, 2020, pp. 20-54.

[7] I.M. Enholm et al., *Artificial intelligence and business value: A literature review*, in *Information Systems Frontiers*, Vol. 24(5), 2022, pp. 1709-1734.

key elements through a camera or using speech recognition as a fundamental element for security and access.[8]

In the present-day interconnected ecosystem characterized by the continuous massive generation of data, governments should be able to appropriately incorporate and use AI in their administrative decisions.[9] Here, what is essential is not only intelligent systems, but also predictive algorithms that can measure profitability for smart governments to make decisions based on the predictive influence of AI.[10] In this context, the importance of good governance through the use of AI can hardly be overestimated. However, an ethical challenge to good governance is decision making through algorithms.[11]

In response to this challenge, public and local institutions should establish a framework of reference that would ensure safe and responsible application of predictive algorithms in AI. Other relevant issues include appropriate self-regulation, maintaining technical and ethical standards, as well as preserving user privacy and ethical treatment of user data.[12] Along with the many benefits of AI such as its capability to identify and understand large data systems, from the administrative perspective, it is difficult to control an equitable use of this power for data interpretation, as

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[8] J. Bullock et al., *Mapping the landscape of artificial intelligence applications against COVID-19*, in *Journal of Artificial Intelligence Research*, Vol. 69, 2020, pp. 807-845.

[9] D. Valle-Cruz et al., *A review of artificial intelligence in government and its potential from a public policy perspective*, in *Proceedings of the 20th Annual International Conference on Digital Government Research*, 2019.

[10] S. Fatima et al., *What explains governments interest in artificial intelligence? A signaling theory approach*, in *Economic analysis and policy*, Vol. 71, 2021, pp. 238-254.

[11] A. Dignam, *Artificial intelligence, tech corporate governance and the public interest regulatory response*, in *Cambridge Journal of Regions, Economy and Society*, Vol. 13(1), 2020, pp. 37-54.

[12] W. Zhang et al., *Factors influencing the use of artificial intelligence in government: Evidence from China*, in *Technology in Society*, Vol. 66, 101675, 2021, pp. 1-16.

well as to ensure that these data do not illegitimately benefit third parties. [13]

In this context, the present study aims to identify the main techniques for the adoption of predictive algorithms to improve administrative decisions in local governments. The research questions (RQs) addressed in this study are as follows: RQ1—What are the main techniques and AI algorithms used to make administrative decisions in local governments? RQ2—How does the use of predictive algorithms to optimize administrative decisions using data-driven strategies affect smart and local governance? While several previous studies have analyzed AI in public governance, to the best of our knowledge, none of them developed a bibliometric analysis to link such actions to predictive algorithms on administrative decisions. Accordingly, the present study bridges an important gap in the literature. The originality of the present study lies in the combination of several types of analysis and our focus on specifically predictive algorithms that work with AI on administrative decisions. The concrete objectives of the present study are as follows:

- To create knowledge about AI, public/local governance, and administrative decision-making
- To evaluate the role of predictive algorithms on administrative decisions
- To explore the types of AI-based algorithms used in local governance
- To provide guidelines to track future challenges of using predictive algorithms in public governance

To accomplish the aforementioned objectives, in this study, we employ bibliometric analysis [14] developed using VOSViewer to

[13] H. Mehr et al., *Artificial intelligence for citizen services and government*, in *Ash Cent. Democr. Gov. Innov. Harvard Kennedy Sch.*, no. August, 2017, pp. 1-12.

[14] M.K. Linnenluecke et al., *Conducting systematic literature reviews and bibliometric analyses*, in *Australian Journal of Management*, Vol. 45(2), 2020, pp. 175-194.

analyze a dataset of scientific papers (*n*=322 studies) published between January 1, 1956 and December 13, 2022 in Web of Sciences (WoS) using the Boolean Operators "AND" and "OR". The query made in the WoS database was as follows: "*TS=(Artificial Intelligence) AND TI=(Public Governance) OR TI=(Administrative Decisions)*". The following three types of analyses were performed to identify the most relevant contributions for subsequent analysis: (i) co-citation of authors; (ii) bibliographic coupling; and (iii) keyword co-occurrence.[15] Using this approach, we identified the most relevant publications on AI, public and local governance and administrative decisions to date. We also identified the main sources (journals) that publish information related to AI, public governance, and administrative decisions, as well as the main keywords and themes linked to the uses of predictive algorithms.

The remainder of this study is structured as follows. After the introduction and the theoretical framework, the methodology is presented. This is followed by reporting the main results. The results are then discussed, and their theoretical and practical implications are analyzed. The chapter concludes with a discussion of limitations of the present study.

2. *Theoretical framework*

2.1. *Towards intelligence administrative decisions*

In recent years, the exponential development of AI has driven the adoption of intelligent decision making.[16] Intelligent decisions are understood as those where AI or any type of an algorithm is used to identify patterns and trends in data so as to facilitate decision

[15] D.O. Oyewola et al., *Exploring machine learning: a scientometrics approach using bibliometrix and VOSviewer*, in *SN Applied Sciences*, Vol. 4.5, 2022, pp. 143-156.

[16] I.H. Sarker, *Ai-based modeling: Techniques, applications and research issues towards automation, intelligent and smart systems*, in *SN Computer Science*, Vol. 3(2), 2022, pp. 1-20.

making in local governments, public administrations, or other organizations.[17] AI can improve decision making in governments in terms of efficiency, profitability, cost management, as well as advances in development and research.[18] Accordingly, AI has become an essential tool for intelligent decision making in public organizations.[19]

Furthermore, AI can also improve government services through technologies such as machine learning, artificial vision, and robotic voice recognition.[20] These types of technologies can increase local governmental opportunities related to predictions, logistical strategies, solve repetitive problems in society, or automating processes that require large personnel costs.[21]

From the administrative and decision making perspective, AI can be effectively used by governments to make more informed decisions based on the analysis of large amounts of data. Moreover, as argued by Vrontis et al.,[22] AI-based algorithms can be used to improve resource management, thus helping governments to better use personnel, assign budgets, as well as undertake other activities related to institutional resources.

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[17] I. Castiglioni et al., *AI-based applications in hybrid imaging: how to build smart and truly multi-parametric decision models for radiomics*, in *European Journal of Nuclear Medicine and Molecular Imaging*, Vol. 46, 2019, pp. 2673-2699.

[18] E. Cunningham, *Artificial intelligence-based decision-making algorithms, sustainable organizational performance, and automated production systems in big data-driven smart urban economy*, in *Journal of Self-Governance and Management Economics*, Vol. 9(1), 2021, pp. 31-41.

[19] R. Davis et al., *Industrial artificial intelligence, smart connected sensors, and big data-driven decision-making processes in Internet of Things-based real-time production logistics*, in *Economics, Management and Financial Markets*, Vol. 15.3, 2020, pp. 9-15.

[20] H. Benbya et al., *Artificial intelligence in organizations...*, *op. cit.*, pp. 1-15.

[21] T. Miller, *Explanation in artificial intelligence: Insights from the social sciences*, in *Artificial intelligence*, Vol. 267, 2019, pp. 1-38.

[22] D. Vrontis et al., *Artificial intelligence, robotics, advanced technologies and human resource management: a systematic review*, in *The International Journal of Human Resource Management*, Vol. 33(6), 2022, pp. 1237-1266.

Another advantage of using AI is that, as noted by Paiva et al.,[23] it can also drive the use of traffic and citizen mobility management. By monitoring and using traffic and people's movements in cities through intelligent systems, better management and mobility can be achieved. Furthermore, there is evidence to suggest AI can be effectively used to predict natural events and climate disasters, thus preventing and predicting events such as earthquakes or fires and allocating appropriate resources to each situation that may affect local government activities.[24] In addition, AI can optimize citizen services, as well as help to achieve a more efficient personalization of citizen services and access to information and online procedures. Using AI automated solutions to problems can be offered, thus allowing local administrations to save costs and optimize their investments.[25]

In this context, analysis of Big Data can help organizations extract large amounts of information and thus improve both the analysis and performance of government decision making.[26] In the current interconnected ecosystem, management of smart cities by governments is directly linked to efficient information management. Thus, being efficient is defined as capable of optimizing and adapting to make administrative decisions and, above all, of protecting data from unauthorized access, and data leakage.[27]

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[23] S. Paiva et al., *Enabling technologies for urban smart mobility: Recent trends, opportunities and challenges*, in *Sensors*, Vol. 21(6), 2143, 2021, pp. 1-42.

[24] S. Ribeiro-Navarrete et al., *Towards a new era of mass data collection: Assessing pandemic surveillance technologies to preserve user privacy*, in *Technological Forecasting and Social Change*, Vol. 167, 120681, 2021, pp. 1-23.

[25] S. Chatterjee et al., *Harnessing the potential of artificial intelligence to foster citizens' satisfaction: An empirical study on India*, in *Government information quarterly*, Vol. 39(4), 101621, 2022, pp. 1-13.

[26] D.S. Battina, *Research on Artificial Intelligence for Citizen Services and Government*, in *International Journal of Creative Research Thoughts (IJCRT)*, 2017, pp. 2320-2882.

[27] N.R. Hogan et al., *On the ethics and practicalities of artificial intelligence, risk*

In terms of administration, AI can be effectively used by governments to improve the security of databases and all other information in governments. Intelligent decisions can identify security issues or prevent threats that could adversely affect citizen data. However, one of the challenges for public administration focused on administrative decision making is the processing of citizen service requests and procedures,[28] and AI is generally believed to be very useful for increasing efficiency in these activities. Not only on the administrative level, but also in terms of research and development, AI can drive research in areas or industries where predictions indicate higher profitability and efficiency for governments.[29] Accordingly, due to the analysis of large amounts of data and their prediction with AI, it is possible to make better administrative decisions focused on understanding profitability of investments for public and local services.[30]

2.2. *Types of predictive algorithms to be used in intelligence governance*

While the use of AI in governments provides new opportunities for machine learning and the development and application of new algorithms,[31] AI's most widely used functionality in a variety of industries has been its ability to enhance event prediction,[32] which

assessment, and race, in *Journal of the American Academy of Psychiatry and the Law*, Vol. 200116-20, 2021, pp. 1-9.

[28] P. Henman, *Improving public services using artificial intelligence: possibilities, pitfalls, governance*, in *Asia Pacific Journal of Public Administration*, Vol. 42(4), 2020, pp. 209-221.

[29] J. Bullock et al., *Artificial intelligence, bureaucratic form, and discretion in public service*, in *Information Polity*, Vol. 25(4), 2020, pp. 491-506.

[30] B.W. Wirtz et al., *Artificial intelligence and the public sector—applications and challenges*, in *International Journal of Public Administration*, Vol. 42(7), 2019, pp. 596-615.

[31] J. Butcher and I. Beridze, *What is the state of artificial intelligence governance globally?*, in *The RUSI Journal*, Vol. 164(5-6), 2019, pp. 88-96.

[32] G.D. Sharma et al., *Artificial intelligence and effective governance: A review, critique and research agenda*, in *Sustainable Futures*, Vol. 2, 100004, 2020, pp. 1-6.

is one of the key aspects. Through training on historical data, AI algorithms can evaluate the likelihood of future events.[33]

Such predictive algorithms enable anticipation of a multitude of activities. Therefore, the application of predictive algorithms can be applied to a multitude of events that could occur locally. From citizen care to the improvement of services to citizens, the prediction of actions—as well as demand and competition—can allow governments to propose more efficient strategies for the administrative management of their activities.

There are several types of commonly used prediction algorithms. *Regression algorithms* are important because they predict continuous numerical values.[34] Therefore, they could be used to predict the demand or price of a particular product or service, as well as the time in which an event will end or appear. Furthermore, as argued by Danaher et al.,[35] *classification algorithms* can be used to link a variable to a class or category. Practical examples here include classifying documents or creating their typology for subsequent automatic classification.

Furthermore, *clustering algorithms* can also be used as predictive algorithms to group similar indicators visually into sets.[36] Using such algorithms, it is possible to create clusters based on collective attributes and establish corresponding variables. Another type of predictive algorithms is *association algorithms*, which can be used to

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[33] A. Zuiderwijk et al., *Implications of the use of artificial intelligence in public governance: A systematic literature review and a research agenda*, in *Government Information Quarterly*, Vol. 38(3), 101577, 2021, pp. 1-20.

[34] D. Li et al., *Supply forecasting and profiling of urban supermarket chains based on tensor quantization exponential regression for social governance*, in *PeerJ Computer Science*, Vol. 8, e1138, 2022, pp. 1-19.

[35] J. Danaher et al., *Algorithmic governance: Developing a research agenda through the power of collective intelligence*, in *Big data & society*, Vol. 4(2), 2017, pp. 1-21.

[36] X. Zhao, *Legal governance countermeasures for social problems based on the clustering algorithm under the application of big data technology*, in *IET Networks*, 2022.

identify unsuspected relationships between different elements.[37] A practical example here could be getting to know the type of citizen services that a government should offer based on previously provided services. Using association algorithms, products or services that a user has already purchased can be identified and thus offer a logistics process with the highest likelihood of the user making another purchase.

Another group of predictive algorithms based on AI embraces the so-called *time series analysis algorithms*.[38] These algorithms are focused on predicting the behavior of a variable over time. Such algorithms can be used to determine traffic levels in a city or demand for a product or service in a particular industry. Time series analysis algorithms can be used to demonstrate how the quantity of a given variable increases or decreases over a certain time horizon. Furthermore, predictive algorithms that may be of a long-term importance are *neural network analysis algorithms*[39] that, using machine learning, can learn and develop knowledge to make predictions based on the patterns identified in the analyzed data.

Another relevant type of prediction algorithms are *decision tree algorithms*,[40] which work with machine learning and are used to support decision making when a set of conditions and characteristics are given in the same database. Furthermore, there are also *support vector machine algorithms* (SVM), which also work with

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[37] A. Yamada and M. Peran, *Governance framework for enterprise analytics and data*, in *2017, IEEE International Conference on Big Data*, IEEE, 2017, pp. 1-9.

[38] V.A. Chanley et al., *The origins and consequences of public trust in government: A time series analysis*, in *Public opinion quarterly*, Vol. 64(3), 2000, pp. 239-256.

[39] F. Bodendorf et al., *Artificial neural networks for intelligent cost estimation–a contribution to strategic cost management in the manufacturing supply chain*, in *International Journal of Production Research*, Vol. 60(21), 2022, pp. 6637-6658.

[40] R. Machen and E. Nost, *Thinking algorithmically: The making of hegemonic knowledge in climate governance*, in *Transactions of the Institute of British Geographers*, Vol. 46(3), 2021, pp. 555-569.

machine learning and are relevant in scientific literature.[41] These algorithms can identify patterns and trends in the data and predict a percentage of possibility in the results. Relevant examples include sentiment analysis or topic modeling.[42] A summary of the types of predictive algorithms, their descriptions and main uses is presented in Table 1.

Table 1. Types of predictive algorithms, description and uses

Predictive algorithm	Description and uses	Authors
Regression algorithms	■ Used to find a relationship between the input data and the output value; the established relationship is then used to make predictions on new data ■ Used to predict continuous numerical values from a given input	Li et al.[43] Stulp and Sigaud[44] Loterman et al.[45]
Classification algorithms	■ Used in a wide variety of applications, including image and speech recognition, natural language processing, and financial analysis ■ Used to link the belonging of a variable to a class or category	Melhem et al.[46] Aggarwal and Zhai[47]

[41] A. Garcia and L. Lacatan, *Sentiment Analysis of Facebook Posts Towards Good Governance Using SVM Algorithm: A Framework Proposal*, in *2021 The 4th International Conference on Machine Learning and Machine Intelligence*, 2021, pp. 140-144.

[42] H. Sun et al., *Learning to optimize: Training deep neural networks for interference management*, in *IEEE Transactions on Signal Processing*, Vol. 66(20), 2018, pp. 5438-5453.

[43] D. Li et al., *Supply forecasting and profiling of urban supermarket chains...*, *op. cit.*, pp. 1-14.

[44] F. Stulp and O. Sigaud, *Many regression algorithms, one unified model: A review*, in *Neural Networks*, Vol. 69, 2015, pp. 60-79.

[45] *Idem*, *ibidem*.

[46] M.K.B. Melhem et al., *Comparative study on arabic text classification: challenges and opportunities*, in *Classification Applications with Deep Learning and Machine Learning Technologies*, 2022, pp. 217-224.

[47] C. C. Aggarwal and C. Xiang Zhai, *A survey of text classification algorithms*, in *Mining text data*, 2012, pp. 163-222.

Predictive algorithm	Description and uses	Authors
Clustering algorithms	■ Unsupervised machine learning algorithms used to divide a cluster based on the patterns or similarities among the data points. ■ Used as predictive algorithms to group similar indicators visually into sets	Xu and Tian [48] Rokach [49]
Association algorithms	■ Used to identify patterns in data and establish relationships between variables ■ Used to identify unsuspected relationships between different elements	Patel and Thakral [50] Yamada and Peran [51]
Time series algorithm	■ Useful for identifying trends and patterns in data to inform decision making processes ■ Focused on predicting the behavior of a variable over time	Chanley et al. [52]
Neural network analysis algorithms	■ A model made up of layers of interconnected nodes trained to recognize patterns in data by adjusting the weights and biases of the connections between the nodes ■ Used to learn and develop insights on their own to make predictions based on the identified patterns	Bodendorf et al. [53]Liu et al. [54]

[48] D. Xu and Y. Tian, *A comprehensive survey of clustering algorithms*, in *Annals of Data Science*, Vol. 2, 2015, pp. 165-193.

[49] L. Rokach, *Data mining and knowledge discovery handbook*, Springer Science, Business Media, Incorporated, 2005.

[50] K.M. Archana Patel and P. Thakral, *The best clustering algorithms in data mining*, in *2016 International Conference on Communication and Signal Processing (ICCSP)*, IEEE, 2016, pp. 1-5.

[51] A. Yamada and M. Peran, *Governance framework for enterprise analytics and data*, *op. cit.*

[52] V.A. Chanley et al., *The origins and consequences of public trust in government...*, *op. cit.*

[53] F. Bodendorf et al., *Artificial neural networks for intelligent cost estimation...*, *op. cit.*

[54] C. Liu et al., *Algorithms for verifying deep neural networks*, in *Foundations and Trends® in Optimization*, Vol. 4.3-4, 2021, pp. 244-404.

Predictive algorithm	Description and uses	Authors
Decision tree algorithms	■ Work by building a tree-like model of decisions based on features of the data ■ Used to support decision making when a set of conditions and characteristics are given in the same database	Priyam et al. [55]Patel and Prajapati [56]
SVM	■ Useful with highly unbalanced data or when there are multiple classes to predict ■ Used to learn inputs made by humans and inputted into the machine to improve by learning	Collobert and Bengio [57]
Deep Neural Network Algorithms	■ Successful in achieving state-of-the-art results in many applications ■ Used in a variety of tasks, including image and speech recognition, natural language processing, and machine translation. ■ Enhance their capacity using multiple layers of artificial neurons capable of predicting patterns and trends in data Raskar [58]Birunda et al. [59]	Gupta and

Source: The authors

[55] A. Priyam et al., *Comparative analysis of decision tree classification algorithms*, in *International Journal of current engineering and technology*, Vol. 3(2), 2013, pp. 334-337.

[56] H.H. Patel and P. Prajapati, *Study and analysis of decision tree-based classification algorithms*, in *International Journal of Computer Sciences and Engineering*, Vol. 6(10), 2018, pp. 74-78.

[57] R. Collobert and S. Bengio, *SVMTorch: Support vector machines for large-scale regression problems*, in *Journal of machine learning research*, Vol. 1.Feb, 2001, pp.143-160.

[58] G. Otkrist and R. Raskar, *Distributed learning of deep neural network over multiple agents*, in *Journal of Network and Computer Applications*, Vol. 116, 2018, pp. 1-8.

[59] S.S. Birunda et al., *Fake Image Detection in Twitter using Flood Fill Algorithm and Deep Neural Networks*, in *2022 12th International Conference on Cloud Computing, Data Science & Engineering (Confluence)*, IEEE, 2022.

3. *Methodology*

3.1. *Bibliometric analysis*

The main methodology used in the present study was bibliometric analysis. In general, bibliometric analysis is conducted to identify different connections existing in a database. In the present study, the data were collected from WoS.[60] WoS is globally known for containing the prestigious Journal Citation Report (JCR) ranking, which indexes the most prestigious research journals. Using bibliometric analysis, it is possible to understand the set of publications and contributions related to a specific theme and, from the quantitative metrics perspective, link their indicators and variables in order to quantitatively and visually identify patterns and trends in the data.[61]

Furthermore, bibliometric analysis allows for the identification of changes in the understanding of theoretical concepts over time through the analysis of published contributions on the subject. In addition, the creation of dynamic network visualization maps of journals and authors can provide important insights into the primary sources of articles published on a given topic.[62] Bibliometric analysis also aids in the classification and categorization of database content, enabling the identification of the most pertinent sources authors—in our case, publications on the use of AI in governments for administrative decision making.

Bibliometric analysis is focused on understanding the state-of-the-

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[60] G. Shi et al., *Bibliometric analysis of medical malpractice literature in legal medicine from 1975 to 2018: Web of Science review*, in *Journal of Forensic and Legal Medicine*, Vol. 66, 2019, pp. 167-183.

[61] J. Gorraiz and C. Schloegl, *A bibliometric analysis of pharmacology and pharmacy journals: Scopus versus Web of Science*, in *Journal of information science*, Vol. 34(5), 2008, pp. 715-725.

[62] N. Donthu et al., *How to conduct a bibliometric analysis: An overview and guidelines*, in *Journal of Business Research*, Vol. 133, 2021, pp. 285-296.

art of one or several interconnected research themes.[63] Using the citation analysis of the studies included in the sample, it is possible to understand and evaluate scientific rigor, quality and quantity of relevant research, as well as reputation factors linked to the publication source of the study. In the present study, different bibliometric approaches were applied using the VOSViewer software. This software allows for performing co-citation analysis that identifies major academic publications and creates a dynamic neural network based on relevance of the works included in the dataset. In this case, relevance is determined by the number and quality of citations.[64]

In this study, we also used the analysis called bibliographic coupling. This analysis is generally conducted to identify the main references in terms of academic journals that have published studies on these topics within the temporal horizon indicated in the query. In addition, to complete the procedure, other types of analysis can also be performed, such as co-occurrence analysis of keywords that identifies the most frequently used terms in the database. Co-occurrence analysis of keywords identifies the authors in the keywords and abstracts of academic contributions. Accordingly, both techniques and strategies for administrative decision making can be identified when working with AI in governments.

Likewise, co-occurrence analysis of keywords also helps to identify the main links and keywords that are centered and related to each other. In our case, these links and keywords pertained to the topic of the development of administrative decision making in governments. We also used this analysis to understand which

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[63] S. Kraus et al., *The sharing economy: A bibliometric analysis of the state-of-the-art*, in *International journal of entrepreneurial behavior & research*, Vol. 26(8), 2020, pp. 1769-1786.

[64] J.T. Mcallister et al., *Mapping a discipline: a guide to using VOSviewer for bibliometric and visual analysis*, in *Science & Technology Libraries*, Vol. 41(3), 2022, pp. 319-348.

journals published more contributions. Specifically, the keywords that appeared the most frequently in the visual graphics showed, through their weight and relevance in the database, their importance. [65] To this end, the variable of the link strength was used. This variable measures, in terms of weight, the importance of a connection between variables in bibliometric analysis; the resultant value depends on the sample size. [66]

All analyses were run using the VOSViewer software. This software makes it possible to analyze quantitative data visually and graphically, thus providing an understanding of the relevance of different concepts identified in the research theme. Through the analysis of neuron maps, matrices and graphs can be dynamically identified and used that explain the importance of the study topic for potential future contributions.

3.2. *Data sampling and description*

As mentioned previously, the data were collected from the WoS database, one of the most frequently used databases that contains the prestigious JCR ranking that indexes the best and most prestigious academic journals. The final queries were made on December 19, 2022. During this session, the data from the database were extracted and downloaded using a temporal horizon for the query with Boolean operators. In this way, the set of academic contributions made to date on AI, public governance, and administrative decisions were collected.

The subsequent search was performed using the Boolean operators "AND" and "OR". The query made in the WoS database

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[65] B. Hoppenstedt et al., *Techniques and emerging trends for state of the art equipment maintenance systems—a bibliometric analysis*, in *Applied Sciences*, Vol. 8(6), 2018, pp. 916-923.

[66] Y. Yu et al., *A bibliometric analysis using VOSviewer of publications on COVID-19*, in *Annals of translational medicine*, Vol. 8(13), 2020, pp. 816-828.

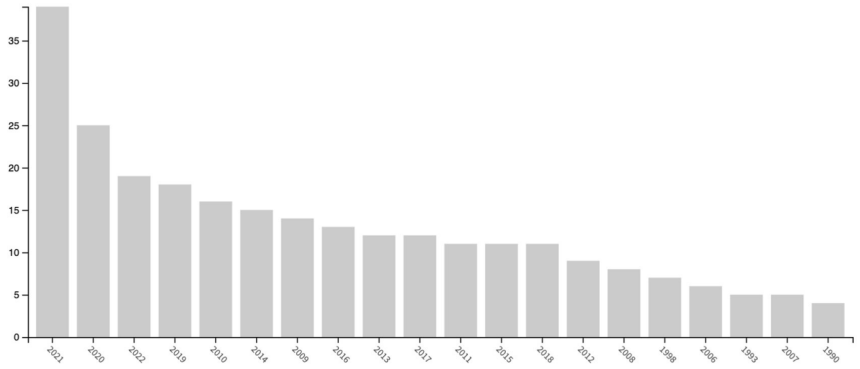
was as follows: "TS=(Artificial Intelligence) AND TI=(Public Governance) OR TI=(Administrative Decisions)". This search in the WoS Core Collection yielded a total of 539 studies. Furthermore, several filters were applied to increase the quality of the obtained sample. First, only articles, book reviews, book chapters, review articles, and early access articles were included in the dataset. This filter reduced the number of included studies to 444 articles. Next, only the publications published from 1990 to 2022[67] were selected, which further reduced the sample to 322 contributions. According to Gorraiz and Schloegl,[68] in bibliometric analyses, the sample is determined according to the number of valid contributions identified in the databases. In the present study, our dataset comprised a total of 322 valid studies.

Figure 1 shows the number of contributions published by year. The most publications (N = 39, 12.11%) appeared in 2021, followed by 2020 (N = 25, 7.76%). The year 2022 had a total of 19 contributions (5.90%), followed by 2019 (N = 18, 5.59%), 2010 (N = 16, 4.97%), 2014 (N = 15, 4.66%), and 2009 (N = 14, 4.35%). The next year, 2016, had 13 publications (4.03%). Finally, 2013 and 2017 each had 12 contributions (3.72%).

[67] While WoS has the data from 1950 to 2022, the first AI-based program was created in 1951, by Christopher Strachey, director of the Programming Research Group at the University of Oxford (Anyoha, 2017). However, no literature directly related to the objectives of the study was found until 1990. Accordingly, we focused on scientific contributions from 1990 to 2022.

[68] J. Gorraiz and C. Schloegl, *A bibliometric analysis of pharmacology and pharmacy journals...*, *op. cit.*, p. 717.

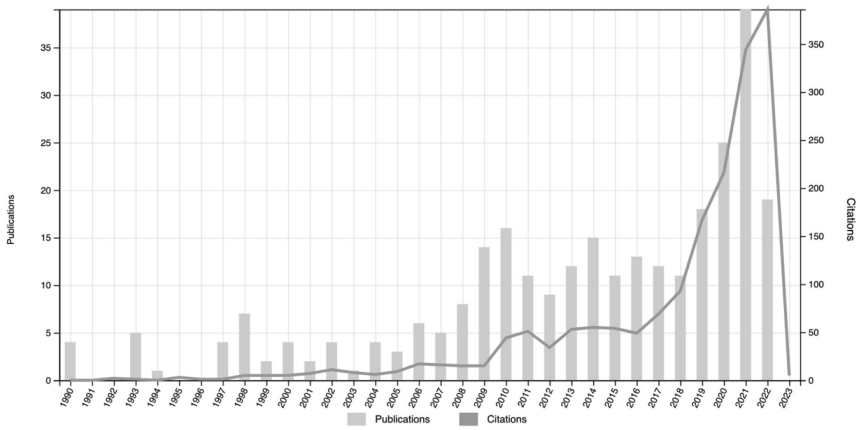
Fig. 1 Number of published articles by year (January 1998—December 2022)



Source: WoS, retrieved on January 4, 2023

As can be seen in Figure 1, the years 2021, 2020, and 2022 had the highest numbers of published on AI in good governance and administrative decision making. A similarly high contribution to the topic was made in 2019. Furthermore, as can be seen in Figure 2, while first studies on the topic started to appear after 2009, a considerably growth in such publications started around a decade later. The same pattern can be observed with regard to citation: while in 2010 a total of 44 citations were found, 2021 saw the citations of 386 relevant studies. Overall, a total of 1,747 citations linked to this research topic were obtained, with an average of 6.13 citations per indexed contribution in the WoS database.

Fig. 2 Times Cited and Publications over time from January 1998 to December 2022



Source: WoS, retrieved on January 4, 2023

Furthermore, in terms of the categories related to AI, public governance, and administrative decision making, the published studies can be categorized into the following groups: law (N = 132, 40.99%); public administration (N = 40, 12.42%), and political science (N = 24, 7.45%). Furthermore, 14 contributions (4.34%) were in the field of education research, 13 (4.03%) in international relations, and 10 contributions (3.10%) in economics, environmental studies, information science library science and sociology. Finally, 8 studies (2.48%) were in the domain of management. Table 2 below shows the main insights obtained in this bibliometric field, as well as the main publications in order of citations.

Table 2. WoS categories, percentage of records, and most cited articles

WoS Categories	Number of records	% of total
Law	132	40.90
Public Administration	40	12.42
Political Science	24	7.45
Education Research	14	4.34
International Relations	13	4.03
Economics	10	3.10
Article	**Author**	**Citations**
Regulating by Robot: Administrative Decision Making in the Machine-Learning Era	Coglianese and Lehr [69]	115
Controlling police decisions to use deadly force: Reexamining the importance of administrative policy	White [70]	75
AI governance in the public sector: Three tales from the frontiers of automated decision making in democratic settings	Kuziemski and Misuraca [71]	56
Artificial Discretion as a Tool of Governance: A Framework for Understanding the Impact o Artificial Intelligence on Public Administration	Young et al. [72]	42
Implications of the use of artificial intelligence in public governance: A systematic literature review and a research agenda	Zuiderwijk et al. [73]	40

[69] C. Coglianese and D. Lehr, *Regulating by robot: Administrative decision making in the machine-learning era*, in *Geo. LJ*, Vol. 105, 2016, pp. 1147-1224.

[70] M.D. White, *Controlling police decisions to use deadly force: Reexamining the importance of administrative policy*, in *Crime & delinquency,* 47(1), 2001, pp. 131-151.

[71] M. Kuziemski and G. Misuraca, *AI governance in the public sector: Three tales from the frontiers of automated decision-making in democratic settings*, in *Telecommunications policy*, Vol. 44(6), 101976, 2020, pp. 1-13.

[72] M.M. Young et al., *Artificial discretion as a tool of governance: a framework for understanding the impact of artificial intelligence on public administration*, in *Perspectives on Public Management and Governance*, Vol. 2(4), 2019, pp. 301-313.

Article	Author	Citations
The Dark Sides of Artificial Intelligence: An Integrated AI Governance Framework for Public Administration	Oswald [74]	38
Importance-performance analysis for public management decision making. An empirical study of China's Macao special administrative region	Lai et al. [75]	36
Improving public services using artificial intelligence: possibilities, pitfalls, governance	Henman [76]	30
Exploring the relation between evidence and decision-making—A political-administrative approach to health impact assessment	Bekker et al. [77]	26
Robots, standards and the law: Rivalries between private standards and public policymaking for robot governance	Villaronga and Golia [78]	24

[73] A. Zuiderwijk et al., *Implications of the use of artificial intelligence in public governance...*, *op. cit.*, pp. 1-19.

[74] B.W. Wirtz et al., *The dark sides of artificial intelligence: An integrated AI governance framework for public administration*, in *Int. J. Pub. Admin.*, 43, 2020, pp. 818–829.

[75] L. SL Lai and W.M. To, *Importance-performance analysis for public management decision making: An empirical study of China's Macao special administrative region*, in *Management Decision*, Vol. 48(2), 2010, pp. 277-295.

[76] P. Henman, *Improving public services using artificial intelligence...*, *op. cit.*, p. 209.

[77] M. PM Bekker et al., *Exploring the relation between evidence and decision-making: a political-administrative approach to health impact assessment*, in *Environmental Impact Assessment Review*, Vol. 24(2), 2004, pp. 139-149.

[78] E.F. Villaronga, *Robots, standards and the law: Rivalries between private standards and public policymaking for robot governance*, in *Computer Law & Security Review*, Vol. 35(2), 2019, pp. 129-144.

4. *Results*

4.1. *Co-citation analysis*

In analyzing the data, we followed Hoppenstedt et al.[79] to identify the references that were the most cited in our database. Table 3 lists the 10 most relevant articles selected based on their co-citation frequency; the high frequency of citation of these studies suggests that these studies are key in the field. These 10 contributions are specifically related to AI, public governance, and administrative decision making with a focus on predictive algorithms.

The first contribution with the most citation is the study by Epstein et al.,[80] with the link strength of 58.00. This study, which is one of the most relevant works in this field, focuses on the understanding of the common judicial space on the administrative level and decision making in government. The second in terms of the link strength (36) is Eubanks[81] that, in two case studies, explores the potential of automating processes afforded by the use of new technologies.

The third most cited research is a study by Gillingham,[82] with the link weight of 29.00. This study aims to analyze predictive models and their risks to prevent child abuse. The author also explores the negative aspects of using machine learning as a predictive technology that may pose risks in relation to the decisions made. Next, the fourth most cited research is Andrews,[83] with the link

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[79] B. Hoppenstedt et al., *Techniques and emerging trends for state of the art equipment maintenance systems...*, *op. cit.*

[80] L. Epstein et al., *The judicial common space*, in *The Journal of Law, Economics, and Organization*, Vol. 23(2), 2007, pp. 303-325.

[81] V. Eubanks, *Automating inequality: How high-tech tools profile, police, and punish the poor*, St. Martin's Press, 2018, pp. 1-272.

[82] P. Gillingham, *Predictive risk modelling to prevent child maltreatment and other adverse outcomes for service users: Inside the 'black box' of machine learning*, in *The British Journal of Social Work*, Vol 46(4), 2016, pp. 1044-1058.

[83] A. Leighton, *Public administration, public leadership and the construction of public value*

strength of 28.00. This study explores public administration and its leadership in building values centered on the era of algorithms and Big Data. The fifth study in terms of co-citation is the conducted research by Dunleavy et al.[84] is found, with the link strength of 28.00. In this study, through a discussion of the traditional model of governance and management in public administration, the authors highlight new skills that digital technologies and AI can bring to governments.

In the sixth place is the study by Wachter et al.[85] that explores an adequate automation process and outlines challenges that emerge in general data protection regulation. This study has 11 citations and the link strength of 27.00. Next, Pasquale,[86] with the link strength of 24.00, introduces the concept of "the black box society", defined as a society where algorithms control money and information from governments and large corporations.

In eighth place comes the study by Coglianese and Lehr[87] with the link strength of 22.00, which proposes regulations for administrative decision making using robots and AI. Next comes the study by Wirtz et al.,[88] with the link strength of 21.00, which explores the role of AI in the public sector and discusses its applications and main challenges for decision making. Finally, the 10th place is taken by the study by Busch and Henriksen,[89] with the link strength of 17.00, which

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in the age of the algorithm and 'big data', in *Public Administration*, Vol. 97(2), 2019, pp. 296-310.

[84] P. Dunleavy et al., *New public management is dead—long live digital-era governance*, in *Journal of public administration research and theory*, Vol 16(3), 2006, pp. 467-494.

[85] S. Wachter et al., *Why a right to explanation of automated decision-making does not exist in the general data protection regulation*, in *International Data Privacy Law*, Vol. 7(2), 2017, pp. 76-99.

[86] F. Pasquale, *The black box society: The secret algorithms that control money and information*, Harvard University Press, 2015, pp. 1-320.

[87] C. Coglianese and D. Lehr, *Regulating by robot...*, *op. cit.*, pp. 1147-1224.

[88] B.W. Wirtz et al., *Artificial intelligence and the public sector...*, *op. cit.*, pp. 596-615.

[89] P.A. Busch and H.Z. Henriksen, *Digital discretion: A systematic literature review of ICT and street-level discretion*, in *Information Polity*, Vol. 23(1), 2018, pp. 3-28.

investigates digital discretion and the main technology-based techniques for governmental decision making.

For the reference of co-citation analysis, at least 3 co-citation references were established as an inclusion criterion, and a total of 36 articles met this threshold. The number of co-citations and the total link strength are summarized in Table 3. For the author co-citation, a minimum of 8 citations for each author was used as the inclusion criterion, and, of a total of 7725 authors in the database, 41 met this threshold.

Table 3. Reference co-citation and author co-citation results

Reference co-citations				Author co-citations		
Title	Author(s)	Citations	Link strength	Author(s)	Citations	Link Strength
The judicial common space	Epstein et al. [90]	5	58.00	Coglianese, C.	19	127.00
Automating inequality: How high-tech tools profile, police, and punish the poor	Eubanks [91]	8	36.00	Goldman, S.	15	115.00
Predictive risk modelling to prevent child maltreatment and other adverse outcomes for service users: Inside the 'black box' of machine learning	Gillingham [92]	5	29.00	Songer, D.R.	16	99.00
Public administration, public leadership and the construction of public value in the age of the algorithm and 'big data'	Andrews [93]	6	28.00	Janssen, M.	11	84.00
New public management is dead—long live digital-era governance	Dunleavy et al. [94]	5	28.00	Mashaw, J.L.	13	79.00

[90] L. Epstein et al., *The judicial common space*, *op. cit.*, p. 305.

[91] V. Eubanks, *Automating inequality...*, *op. cit.*, p. 124.

[92] P. Gillingham, *Predictive risk modelling to prevent child maltreatment...*, *op. cit.*, p. 1045.

[93] A. Leighton, *Public administration, public leadership and the construction of public value...*, *op. cit.*, pp. 296-310.

[94] P. Dunleavy et al., *New public management is dead...*, *op. cit.*, p. 469.

Reference co-citations				Author co-citations		
Title	Author(s)	Citations	Link strength	Author(s)	Citations	Link Strength
Why a Right to Explanation of Automated Decision-Making Does Not Exist in the General Data Protection Regulation	Wachter et al. [95]	11	27.00	OECD	21	76.00
The black box society: The secret algorithms that control money and information	Pasquale [96]	5	24.00	Moe, T.M.	11	72.00
Regulating by Robot: Administrative Decision Making in the Machine-Learning Era	Coglianese and Lehr [97]	6	22.00	March, J.G.	11	69.00
Artificial intelligence and the public sector—applications and challenge	Wirtz et al. [98]	5	21.00	Simon, H.A.	24	58.00
Digital discretion: A systematic literature review of ICT and street-level discretion	Busch and Henriksen [99]	4	17.00	Sunstein, C.R.	15	57.00

Source: The authors

Figure 3 shows a visual and graphical map that identifies clusters related to the co-citation of references in the analyzed database. Figure 3 visualizes the different links between the variables that make up the clusters. In Figure 3, a total of 17 references form neural network. Different filters and criteria were used to select these studies for their subsequent inclusion into the neural network. The minimum number of citations obtained for each reference included in Figure 3 was 4. Based on this criterion, a total of 10,116 cited references were obtained. When this filter was applied, 36 optimal references to be included in the neural network were

[95] S. Wachter et al., *Why a right to explanation of automated decision-making...*, *op. cit.*, p. 76.

[96] F. Pasquale, *The black box society...*, *op. cit.*, p. 1.

[97] C. Coglianese and D. Lehr, *Regulating by robot...*, *op. cit.*, pp. 1147-1224.

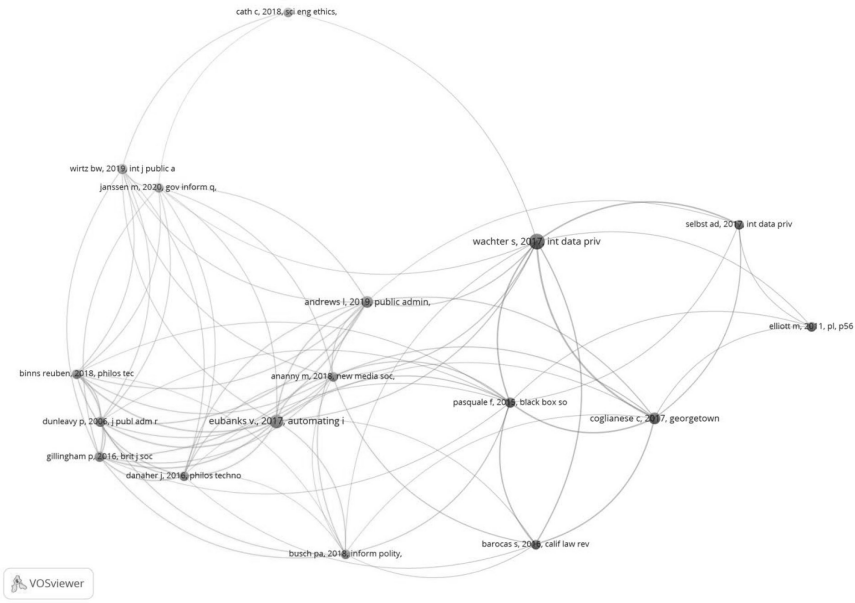
[98] B.W. Wirtz et al., *The dark sides of artificial intelligence...*, *op. cit.*, pp. 818-829.

[99] P.A. Busch and H.Z. Henriksen, *Digital discretion...*, *op. cit.*, p. 1.

obtained. Of these, 17 studies were included for being relevant and forming clusters between them. Based on the results, a total of 105 links representing 100% of the connections of the 17 identified contributions were obtained. Similarly, the total link strength considered was 346 points, in addition to the representation degree of 100.

According to Gorraiz and Schloegl (2008), visual representation of databases in bibliometric analysis is essential to understanding the connections between the contents published in each selected contribution. Figure 3 identifies a total of three clusters. The first of these clusters, marked in red in Figure 3, is formed by studies by the following authors: Andrews, L., Ananny, M., Binns R., Dunleavy, P., Eubanks, V., Gillingham, P., Busch, P., and Danaher, J. Next, the black cluster consists of the authors such as Wachter, S., Selbst, Ad., Elliott, M. Pasquale, F., Coglianese, C., and Borocas, S. Finally, the green cluster consists of the following three contributions: Cath, C., Wirtz, B.W., and Janssen, M.

Fig. 3 Reference co-citation analysis



Source: Authors based on the VOSViewer results

Furthermore, to complete the co-citation analysis of references, the most relevant authors in terms of citations and link strength were identified. Link strength is the variable that determines the importance of the connections between the authors and other studies published in this field. Therefore, these authors can be considered the most representative in a specific domain.

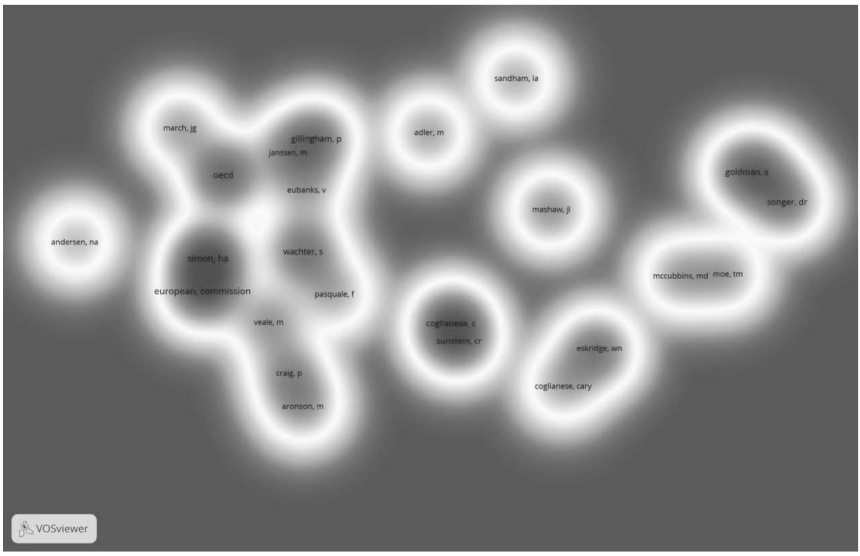
The most relevant authors are listed in Table 3. The first one is Coglianese, C., with 19 references and the link strength of 127.00. Second comes Goldman, S., with 15 citations and the total link strength of 115.00, followed by Songer, D.R. with 16 citations and the link strength of 99.00, Janssen, M., with 11 citations and the link strength of 84.00, and Mashaw, J.L. with 13 citations, and the link strength of 79.00. In the sixth place is the Organization for Economic Co-operation and Development (OECD), with 21

citations and the link strength of 76.00, followed by Moe, T.M. and March, J.G., with 11 citations each and the link strength of 72.00 and 69.00, respectively. The list concludes with Simon, H.A. with 24 citations and the link strength of 58.00 and Sunstein, C.R., with 15 citations and the link strength of 57.00.

In addition, we also computed the density neural map of author co-citation. To this end, relevant parameters were established: namely, the references that obtained at least 9 citations were identified as a variable. Applying this criterion resulted in selecting 23 authors out of a total of 7725. In this way, a total of 103 links representing 90% of density obtained in the map were identified. The total link strength of the connections represented in Figure 4 amounted to 871. Based on the results obtained after applying these criteria, a total of 5 clusters related to the author density neural map were identified. The centers of the clusters in Figure 4 are composed of connections among authors and groups of authors linked by mutual co-citation. The color of the density shows the relevance and number of citations obtained. Specifically, the most frequently cited authors are highlighted in red, while less frequently cited authors are highlighted in orange or yellow.

Of the identified clusters, the largest cluster, from left to right, is composed of the center (with the studies by Simon, H.A., the European Commission, and the OECD). Likewise, a cluster of a smaller size in the center features the authors such as Coglianese, C. and Sunstein, C.R. Finally, on the right of Figure 4 is another cluster formed by authors such as Goldman, S. and Songer, D.R.; this cluster is less significantly linked to the authors such as Mccubbins, M.D. and Moe, T.M.

Fig. 4 Density map of the author co-citation analysis



Source: Authors based on the VOSViewer results

4.2. *Bibliographic coupling*

In order to identify major journals that have published the most relevant works related to administrative decision making, AI, and governments, we conducted the so-called bibliographic coupling of sources. Using this analysis, we identified the most relevant documents in terms of citations and link strength. To correctly compute this analysis, the following filters were applied. The minimum number of documents per journal was set to the minimum of 2 points, and the minimum number of citations per source was set at 3. Of the total of 251 journals in our database, 25 met this criterion. Of these journals, 16 journals were selected (see Table 4).

However, 2 of these journals did not have connections with the remaining journals, so Figure 4 shows a total of 14 journals directly related to the objectives of the present study. Additionally, in terms of results, 8 clusters that had a total of 21 links were identified, with the total link strength of 142 points. Table 4 lists the journals with the corresponding metrics and indicators.

According to the results, the journals with the highest link strength were *American Politics Research* (92.00), *Justice System Journal* (73.00), and *Law & Policy* (52.00). These three journals are the main ones in terms of relevance for the themes of AI, public governance, and administrative decision making. With regard to the remaining journals, the *Journal of Legal Studies* had 56 citations, but the link strength of 1.00; furthermore, the *International Journal of Public Administration had* 41 citations in the analyzed period analyzed, followed by *Computer Law & Security Review*, with 23 citations. The remaining journals showed moderate results in terms of impact (see Table 4).

Table 4. Bibliographic coupling of sources

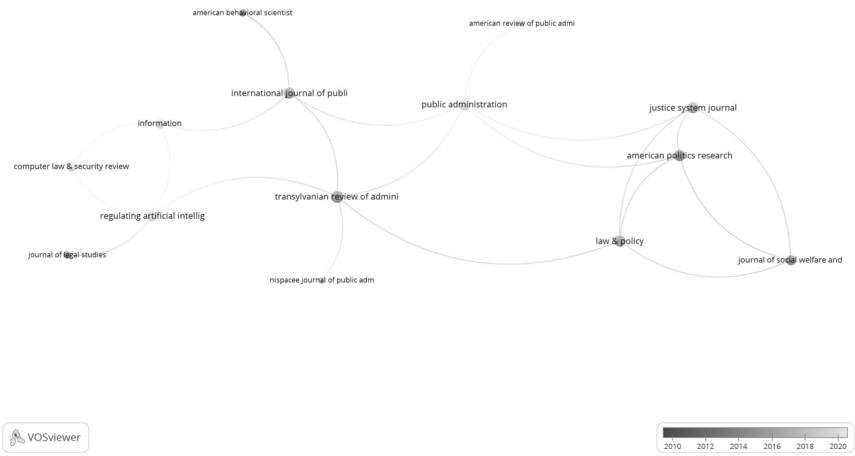
Source	Documents	Citations	Link strength
American Politics Research	2	20	92.00
Justice System Journal	2	7	73.00
Law & Policy	2	15	52.00
Public Administration	2	5	13.00
Journal of Social Welfare and Family Law	2	9	12.00
International Journal of Public Administration	2	41	9.00
Information	2	4	8.00
Transylvanian Review of Administrative Sciences	3	4	8.00
Regulating Artificial Intelligence	2	8	7.00
Computer Law & Security Review	2	23	6.00
Australian Review of Public Administration	12	10	3.00
Sydney Law Review	2	17	3.00
American Behavioral Scientist	2	3	1.00
American Review of Public Administration	2	4	1.00
Journal of Legal Studies	2	56	1.00
Nispacee Journal of Public Administration and Policy	2	4	1.00

Source: The authors, based on the VOSViewer results

Furthermore, in order to understand the scientific production in the investigated research area in recent years, we conducted the analysis of bibliographic coupling of sources. As can be seen in Figure 5, four clusters were identified. In relation to the analyzed temporal horizon, the blue cluster represents the year 2010 as the first year shown on the neuron map. Then, the color palette successively changes until reaching yellow, and, in this projection, dark blue represents the year 2012, light blue represents the year 2014, green represents the year 2016, light green represents the year 2018, and yellow represents the year 2020. The other years of publication are not shown in Figure 5 because their weight and relevance in terms on link strengths were lower.

As can be concluded from Figure 5, the years 2010 to 2020 were the most relevant for academic research on AI, decision making, and public governance. Furthermore, in relation to the journals that form the clusters, Cluster 1 is formed by *Computer Law & Security Review; Information* and *Regulating Artificial Intelligence*. Furthermore, Cluster 2 is formed by the following journals: *Justice System Journal, American Politics Research, Law and Policy, Journal of Social Welfare,* and *Family Law*. Next, Cluster 3 is formed by *American Review of Public Administration and Public Administration*. Finally, Cluster 4 is formed with journals with less weight and relation, including *American Behavioral Scientist, International Journal of Public Administration*, *Transylvanian Review of Administrative Sciences*, *Nispacee Journal of Public Administration* and *Policy and Journal of Legal Studies* (see Fig. 5).

Fig. 5 Bibliographic coupling of sources by average year of publication



Source: Authors based on the VOSViewer results

4.3. *Author keyword cooccurrence*

Next, we conducted the co-occurrence analysis of keywords. In this analysis, we focused on the keywords used by the authors in their academic contributions appearing in the database linked to AI, public governance and administrative decision making.

The author keyword co-occurrence analysis was developed to identify techniques, models, types of AI uses, types of algorithms, and other approaches or important categories linked to the objectives and research questions addressed in the present study. Table 5 shows the keywords selected as the most relevant in relation to their link to our objectives. With regard to the requirements for the publications to be included in this analysis, the minimum number of occurrences of these keywords was set at 4. Of the total of 926 keywords found, 79 met the established

requirement. These keywords were then studied and linked to the objectives of the research. Finally, a total of 20 keywords were selected.

Table 5. Author keyword co-occurrence

Keywords	Occurrences	Total link strength
Public administration	3	18.00
Technology	3	18.00
Automation	3	18.00
Impact	7	16.00
Public management	3	16.00
Risk	3	16.00
Data protection	4	14.00
Policy-making	3	14.00
AI	3	12.00
Information	3	12.00
Innovation	3	12.00
Rulemaking	4	11.00
Ethics	3	10.00
Machine learning	3	10.00
Model	4	10.00
Performance	3	10.00
Big Data	3	8.00
Administrative decisions	8	12.00
Administrative procedure	4	3.00
Administrative decision making	3	1.00

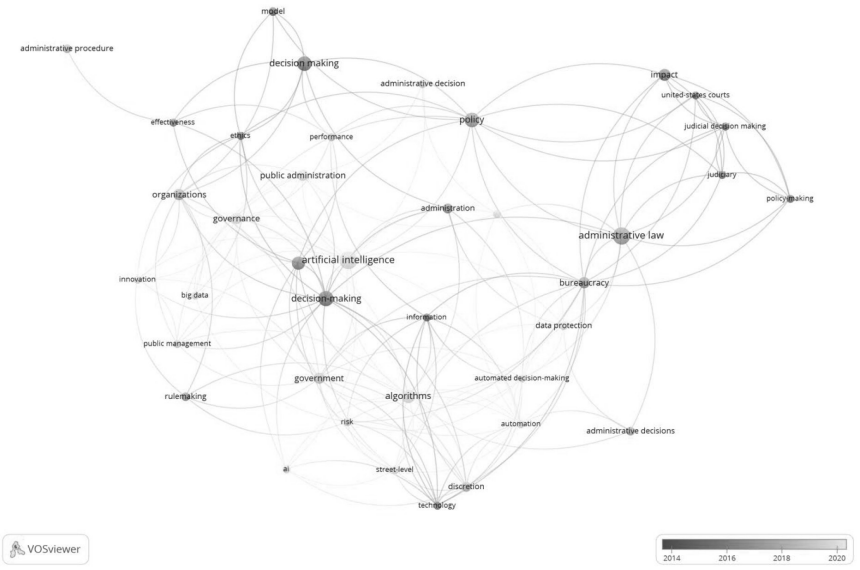
Source: The authors, based on the VOSViewer results

The representation of the data obtained in Table 6 and in Figure 6 highlights the importance of technology and automation in measuring and constructing the impact of public administration and decisions using AI and predictive algorithms. Furthermore, the development of models working with big data and AI linked to their performance and administrative decisions was also found to be

relevant. Based on this, we identified the problems related to the ethics of the implementation of such processes or the initiative to create new regulations that protect user privacy.

Based on these considerations and in order to adequately visualize the relationships between the keywords that would allow us to identify predictive algorithms models working with AI for decision making in governments, Figure 6 presents a neural network with the main connections between the keywords identified as the most relevant. The number of identified links was 178, with the total link strength of 233. An average of 12 clusters composed of 39 variables in the form of keywords emerged in the analysis.

Fig. 6. Author keyword co-occurrence by average year of publication

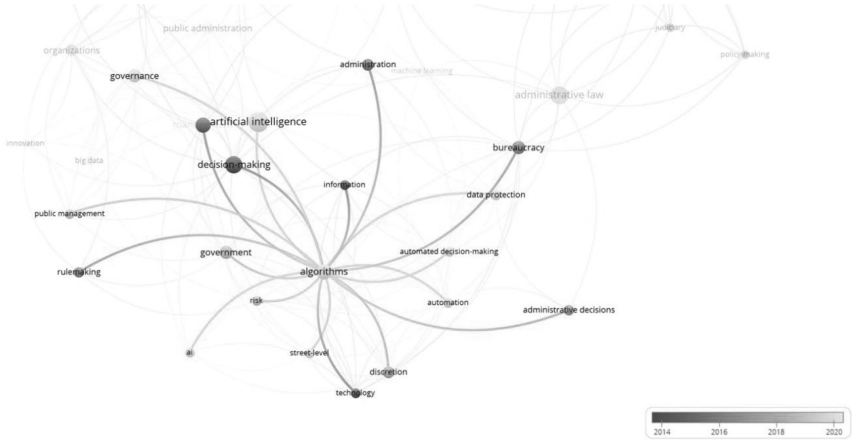


Source: The authors, based on the VOSViewer results

Furthermore, to link the research results to the identification of predictive algorithms for decision making and better understand the functioning of AI for decision making in local governance, the

relationships between keywords and identified clusters were highlighted with respect to the main connections within them. Regarding the keyword algorithms, keywords related to public management and administrative decision making were identified. Of note, however, decisions were made automatically based on information obtained from citizens. It should also be noted that there is an initiative to develop regulations in this field and that the applications are focused on the use of the technology of these algorithms automatically linked to a street level, i.e., real applications in citizenship.

Fig. 7 Algorithm cluster highlighted in the author keyword co-occurrence



Source: Authors based on the VOSViewer results

5. *Discussion*

5.1. *Government uses of predictive algorithms in administrative decision making*

The results of the bibliometric analysis conducted in the present study showed that the use of AI to improve administrative decision making in governments has been of relevance in scientific literature in recent years. The results also revealed that decision making processes using AI in public administration focus on improving performance and creating intelligent decision making models. As argued by Ribeiro-Navarrete et al.,[100] the use of technological innovation in the new forms of public management is important for public institutions.

For the creation of new regulations on the use of large databases for decision making, public administrations should better understand the importance of using predictive algorithms, which can help to more accurately evaluate the risk of adopting a technology or implementing automation algorithms and increase data protection or administrative issues.[101] Furthermore, in order to improve their administrative decision making and management processes, policy makers and local governments should adopt AI and automation algorithms for both analysis and task execution.

Public administrations can focus on promoting good governance within their organizations to ethically and effectively adopt new models for handling administrative procedures and tasks that increase the effectiveness of their governments.[102] However, data protection and technology adoption policies should adapt to a rapidly advancing ecosystem.[103] As indicated by Davis et al.[104] and

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[100] S. Ribeiro-Navarrete et al., *Towards a new era of mass data collection...*, *op. cit.*, p. 2.

[101] S. Wachter et al., *Why a right to explanation of automated decision-making...*, *op. cit.*, p. 76.

[102] P. Henman, *Improving public services using artificial intelligence...*, *op. cit.*, p. 212.

[103] N.R. Hogan et al., *On the ethics and practicalities of artificial intelligence...*, *op. cit.*, p. 6.

[104] R. Davis et al., *Industrial artificial intelligence...*", *op. cit.*, p. 11.

Cunningham et al.[105] through a multitude of algorithms and technologies such as machine-learning or Big Data analysis, AI can allow governments to take advantage of this technology to improve their services and process tasks more efficiently in terms of time, processes, and services to citizens.

As argued by Zuiderwijk et al.,[106] in the public administration field, the use of algorithms and AI is getting increasingly relevant. However, it is important to consider the ethical responsibility of using such technologies. Governments and policy makers must ethically adopt AI and predictive algorithms for both analysis and task execution in order to improve their administrative decision making and management processes. In addition, data protection and technology adoption policies should be aptly adapted to the constantly changing and evolving ecosystem.

It is important to note that AI can be used to improve services and develop tasks in a more cost-effective way in terms of time and processes. However, it is difficult to definitively determine the impact of AI on decision making in the future, and a continuous evaluation of its potential consequences is necessary. In this regard, it is equally important to consider transparency in the use of these technologies for administrative decision making and its understanding by citizens.[107]

Furthermore, as noted by Floridi,[108] governments should begin to use algorithms to improve services to citizens as such algorithms can boost efficiency and effectiveness of administrative processes and decision making. Predictive algorithms using AI can analyze large amounts of data and detect patterns and trends that can help

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[105] E. Cunningham, *Artificial intelligence-based decision-making algorithms...*, *op. cit.*, p. 34.

[106] A. Zuiderwijk et al., *Implications of the use of artificial intelligence in public governance...*, *op. cit.*, p. 18

[107] H. Mehr et al., *Artificial intelligence for citizen services and government*, *op. cit.*, p. 3.

[108] L. Floridi, *Artificial intelligence as a public service: Learning from Amsterdam and Helsinki*, in *Philosophy & Technology*, Vol. 33(4), 2020, pp. 541-546.

governments to make more informed decisions and identify areas for improvement in their administrative services. Additionally, the use of algorithms in local governance can effectively reduce unnecessary costs and increase the transparency and trust of citizens in the system. In summary, the use of algorithms in governments can contribute to a more efficient and effective management of public services and a greater citizen satisfaction.

Thus, Table 6 presents a summary of the main categories identified in the present study as variables linked to administrative decision making in local governments, their description, as well as the identification and explanation of some predictive algorithms that could be used in the future to improve specific actions in these areas. Table 6 also shows examples of possible uses of predictive algorithms working AI in local governance to improve administrative decisions in various relevant categories.

However, it should be highlighted that it remains a challenge to accurately determine which of the algorithms identified in the theoretical framework of the present study are most useful for the management and development of tasks related to administrative procedures and decision making in governments. In fact, each predictive algorithm can be used depending on the specific needs of the case and the type of data that the government or administration has at that time. Accordingly, before applying a predictive algorithm from public administrations, each unique case should be carefully considered, and a detailed analysis should be conducted in order to determine what type of algorithm or combination of algorithms would be the most relevant and effective for the task at stake.

Table 6 also presents the main conclusions of the present study and the proposals and recommendations for the use of predictive algorithms in the domain of local administration to improve administrative decisions. Descriptions and uses are proposed according to the following categories of administrative decision making: bureaucracy, information management, administrative

decisions, automated decision-making, evaluation risk, data protection, automations, and technology selection.

Table 6. Proposed government's uses of predictive algorithms in administrative decision making

Administrative decision making categories	Description	Possible type of predictive algorithm use	Predictive algorithms objectives	Examples of possible uses in local governance
Bureaucracy	Set of tasks related to management of activities and administrative procedures related to public governments	(i) Classification algorithms (ii) Decision tree algorithm (iii) Time series algorithms	▪ Make decisions based on certain criteria ▪ Predict the belonging of a record to a certain category ▪ Analyze trends over time and make decisions accordingly	(i) Classify requests for administrative procedures in different categories according to the type of procedure or the department in charge of processing it. (ii) Determine the best possibility of acting in a certain administrative procedure process based on different factors (e.g., complexity of the procedure, workload of the departments in charge of processing it, number of requests, etc.) (iii) Predict the workload of an administrative department in charge of processing procedures based on historical data of requests received in the past to optimize the allocation of resources and improving the efficiency of the process.
Information management	Management of volumes of information obtained from tasks stemming from administrative procedures	(i) Regression algorithms (ii) Classification algorithms (iii) Decision tree algorithms	▪ Predict the volume of information from a set of independent variables ▪ Assign each element of a dataset to one of several categories or classes ▪ Make decisions based on the value of one or more input variables	(i) Predict the time to complete an administrative procedure based on the time it has taken to complete such procedure in the past according to the volume of information. (ii) Classify procedures into categories (e.g., "high priority", "medium priority" and "low priority") based on the time and amount of information such procedures are expected to take to complete. (iii) Identify the most viable option to complete an administrative procedure based on the characteristics of the procedure and the information necessary to complete it.
Administrative decisions	Evaluation of administrative decisions focused on data analysis	(i) Classification algorithms (ii) Decision tree algorithm (iii) Time series algorithms	▪ Understand how a variable is affected by one or more independent variables ▪ Assign a label or class to a data set and identify patterns ▪ Make decisions about more efficient procedures	(i) Analyze the impact of the efficiency of administrative procedures (objective variable) on different variables (e.g., waiting time, number of procedures carried out per employee, number of available staff, etc.). (ii) Classify different types of administrative procedures (e.g., permit applications, license applications, etc.), or to identify patterns in most frequent procedures in a certain period of time. (iii) Make decisions on paperwork to be prioritized, or to identify patterns in the way paperwork is presented and how it is related to other factors (e.g., waiting time or number of employees available per department).

Administrative decision making categories	Description	Possible type of predictive algorithm use	Predictive algorithms objectives	Examples of possible uses in local governance
Automated decision making	Process automation tasks in governments to improve decision making	(i) Regression algorithms (ii) Classification algorithms (iii) Clustering algorithms (iv) Association algorithms (v) Time series algorithm (vi) Neural network analysis algorithms & SVMs	■ Predict future values to improve decision making ■ Classify and automate historical decisions ■ Group data dashboards to facilitate decision making ■ Classify time series	(i) Automatically predict the number of procedures to be carried out in a given month. (ii) Automatically classify strategies and decisions for supervision and classify actions according to their complexity. (iii) Group relevant information and variables into clusters in order to optimize the work and decision making process. (iv) Identify patterns in the actions implying the identification of problems and automated solutions. (v) Analyze time series and previous decisions so as to automate decisions based on the history of executed actions (vi) These algorithms could potentially be used to automate processes related to analyzing complex data and making decisions based on those data (e.g., identifying patterns in large datasets or the most appropriate action to take in a particular situation).
Evaluation risk	Evaluation of the percentage risk of a task, activity, event, or occurrence to be successfully completed	(i) Regression algorithms (ii) Classification algorithms (iii) Decision tree algorithm (iv) Neural network analysis algorithms & SVMs (v) Time series algorithm	■ Predict the impact of a decision on a certain variable (e.g., cost or benefit) ■ Classify decisions into different risk categories ■ Make decisions by analyzing different scenarios and their possible consequences ■ Evaluate the risk of a decision by analyzing patterns and correlations in large datasets ■ Analyze trends and patterns to assess the risk of long-term decisions	(i) Predict the impact of a new transport policy on citizens' travel time or a new traffic regulation on the level of congestion in a city. (ii) Classify decisions as "high risk" or "low risk" to determine whether a decision on a construction or urban impact project is high/low risk in terms of environmental, economic, or social impact. (iii) Evaluate the risk of an investment in an infrastructure project, the level of use, or its profitability. (iv) Assess the risk of a new financial, economic, social or environmental policy for the public.
Data protection	Optimization of citizen and user data protection management processes	(i) Neural network analysis algorithms & SVMs (ii) Regression algorithms (iii) Classification algorithms	■ Analyze and predict data patterns ■ Identify administrative security breaches ■ Understand and classify data according to their level of vulnerability	(i) Identify unusual data usage patterns that may indicate potential misuse of the data. (ii) Detect anomalous patterns in data and take measures to protect privacy and analyze historical data usage to predict what types of data usage are most likely to be misused. (iii) More efficiently group and segment data based on leak risk classifications to protect citizens' privacy
Automations	Execution of automation of tasks, processes, and administrative procedures	(i) Regression algorithms (ii) Classification algorithms (iii) Clustering algorithms (iv) Association algorithms (v) Time series algorithm (vi) Neural network analysis algorithms (vii) SVMs	■ Evaluation and automation of actions ■ Identification of patterns and automation focused on process optimization ■ Evaluation of inefficient tasks and automated improvement based on established rules	(i) Automatically predict the result of an administrative procedure based on certain variables. (ii) Automatically assign a specific category or group of workers, departments, or ministries to a task, process, or procedure. (iii) Automatically group similar administrative procedures in a large volume of requests. (iv) Detect patterns or relationships between different tasks, processes, or procedures and automate corresponding decisions. (v) Automatically analyze how time affects the result of an administrative process. (vi) Model and predict the results of a procedure, process, or administrative management using machine learning techniques. (vii) Classify tasks, processes, or administrative procedures in different groups using machine-learning techniques.

Administrative decision making categories	Description	Possible type of predictive algorithm use	Predictive algorithms objectives	Examples of possible uses in local governance
Technology selection	Selection of appropriate technologies to successfully complete requested actions	(i) Deep neural network algorithms (ii) Decision tree algorithms or SVM (iii) Regression algorithms (iv) Classification algorithms (v) Algorithms Clustering algorithms (vi) Association algorithms (vii) Time series algorithm (viii) Neural network analysis algorithms	■ Improve decision making by grouping and ordering large amounts of data ■ Evaluate the future of a technology and its strengths ■ Analyze complex databases to make appropriate decisions on the adoption and execution of a technology in government processes	(i) Model complex patterns in Big Data using deep learning techniques to facilitate complex decision making linked to technologies. (ii) Make decisions about technology use based on data analysis and machine learning. (iii) Predict which technologies will be the most effective in terms of proving the efficiency of a particular process carried out by the government by said technology. (v) Group different technologies into categories according to their characteristics and compare them in terms of strengths and weaknesses from Big Data databases. (vi) Identify patterns or relationships between different technologies so that to better understand their adoption. (vii) Predict the evolution of a technology in the future. (viii) Analyze large datasets on technologies to identify complex patterns so as to make a correct decision for the adoption of a technology.

Source: The authors

5.2. *Future Research Questions*

With the aim of providing future directions for the development of research in this field, Table 7 presents a list of future research questions that should be addressed in the future by researchers in relation to the 8 categories identified as relevant in relation to the use of predictive algorithms in governments.

Table 7. Future research questions

Administrative decision making categories	Future research questions
Bureaucracy	■ Is it possible to establish a standardized criterion for the selection of local government bureaucratic tasks to be processed with predictive algorithms? ■ What are the technical guidelines for the different types of predictive algorithms to successfully develop bureaucratic tasks? ■ Should the digitization of local governments consider the systematic use of predictive algorithms in their new forms of digital organization?

Administrative decision making categories	Future research questions
Information management	■ Is ethical the use of predictive algorithms to manage citizens' personal information? ■ What are the actions that should be developed by local governments to use predictive algorithms to avoid bias in the information processed? ■ What are the technological advances in terms of AI and predictive algorithms that can influence the identification of new forms of information management in local governments? ■ How does information management help governments make better decisions in situations of risk, terrorism, or chaos?
Administrative decisions	■ How should governments adapt their internal administrative organization to encourage the automation of their processes? ■ How is the correct application of predictive algorithms externally ensured when it is developed by local governments? ■ What are the barriers to implement new administrative procedures based on AI automation in local government decision making?
Automated decision making	■ Is it ethical that predictive algorithms can make administrative decisions automatically? If so, what kind of decisions? ■ Should the different political parties of the same state share the predictive algorithms used to avoid ideological biases in the future? ■ Is it possible to implement automated political decision making mechanisms or should the policymaker function be permanent over time?
Evaluation risk	■ What should be the measurement scale to calculate the specific risk of a decision made with AI? ■ Is risk assessment in local government a decision that should be taken by predictive algorithms or by humans?
Data protection	■ Should be regulated the types of predictive algorithms and their outputs independently? Or the technology itself such as AI or Machine learning? ■ How do governments ensure the ethical provenance of citizen data when it is analyzed to make predictive decisions? ■ What are the existing ethical barriers to predicting the behavior of citizens based on the study of their data?
Automations	■ Are predictive automations a risk for public services? ■ Should local governments implement task automation strategies even if it implies the loss of administrative jobs? ■ What are the levels of privacy, risk and evaluation criteria for an element or event to be automated?
Technology selection	■ What are the measurement scales that should be used to prevent a technology from leaking citizen data to third parties? ■ How should local governments adopt new predictive technologies without violating the right to privacy of citizens' behavior? ■ What are the criteria that governments should study to adopt a technology that allows them to improve decision making without AI?

Source: The authors

5.3. *Theoretical implications*

The theoretical implications of the present study are directly linked to the results of the bibliometric analysis. Based on our results, we identified an emerging field in research regarding the use of AI to improve administrative decision making in local governments. Decision making processes that use AI in public administration focus on improving performance and creating intelligent decision making models. As discussed earlier, the use of predictive algorithms can considerably improve the efficiency of administrative procedures, aid in classifying request for procedures into different categories, predict the volume of information required to complete a procedure, facilitate making decisions based on the value of one or more input variables, and assist the analysis of how a variable is affected by other independent variables.

Furthermore, algorithms can be meaningfully used to assign a label or class to a set of data. In theoretical terms, we identified several categories of administrative decision making where these algorithms can be applied, namely: (i) procedure management; (ii) bureaucratic activities; (iii) information management; (iv) administrative decision making; and (v) performance management. These categories of analysis can be used in future empirical studies or quantitative models to statistically determine whether the adoption of these technologies indeed allows for better results in governments. Relevant directions of further research could include the development of empirical models with partial least squares path modeling (PLS-SEM) or finite mixture partial least squares (PLS-FIMIX). Furthermore, in each of these categories, we found examples of how different predictive algorithms can be meaningfully used to improve decision making and optimize work processes, thus serving as a guide for future research that would formulate new questions and research objectives. Moreover, future research would be needed to explore the importance of considering ethics and responsibility in the use of these algorithms and technologies by local governments. This would be necessary not

only to improve decision making processes, but also to automate such tasks.

5.4. *Practical implications*

The results of the present study offer several practical implications for the use of algorithms in administrative decision making in local governments. First, algorithms can be useful for classifying and automating records of past decisions, which can improve efficiency of the decision making process and save time and resources. Policymakers should take these practices into consideration to encourage the adoption of new technologies, thereby increasing efficiency of public administrations. Additionally, the aforementioned algorithms can also be used to predict future values and make corresponding decisions, which can improve effectiveness of decisions and help avoid unnecessary risks that may adversely affect citizens.

The present findings can also be used by local governments to better understand the use and operation of predictive algorithms for better administrative decision making, as well as to get a better grasp on the relevance of this research area from a scientific perspective; similarly, based on the results, white papers on the importance of using algorithms for public management can be developed. In addition, the presented algorithms can help to classify and group data dashboards, thereby facilitating decision making and allowing for a better understanding of the available information for state administrators. All this will improve effectiveness and efficiency of administrative decision making on the governmental level.

6. *Conclusions*

In this study, we conducted a bibliometric analysis using VOSViewer on a dataset composed of scientific contributions

published and indexed in the WoS academic database. More specifically, the following three different analyses were carried out: co-citation of authors and references, bibliographic coupling, and co-occurrence of keywords. Based on the results, we identify and describe 8 categories of administrative decision making in governments and formulate 27 objectives for further optimization of administrative tasks with predictive algorithms in public governance. Moreover, 36 examples for the application of predictive algorithms to optimized administrative decision making in governance are proposed and X future research questions are presented. The paper concludes with a discussion of the theoretical and practical implications of the results. With regard to RQ1 (*What are the main techniques and artificial intelligence algorithms used to make administrative decisions in local governments?*), we identified the main techniques and types of AI that governments can use in their administrative tasks.

Furthermore, in relation to RQ2 (*How does the use of predictive algorithms to optimize administrative decisions using data-driven strategies affect smart and local governance*?), we identified different predictive algorithms outlined in in the literature and provided examples of their main uses reported thus far. Our results suggest that the use of algorithms in the making of administrative decisions in governments is an emerging field of research that has been a priority in scientific literature in recent years.

In summary, decision making using AI in public administration focuses on improving performance and creating intelligent decision making models. Predictive algorithms can be effectively used in a wide range of categories, such as risk assessment, data protection, automation of procedures, and the selection of the use of new technologies. Furthermore, AI and automation algorithms can be meaningfully applied to improve services and develop tasks in a more cost-effective way in terms of time, processes, and services to citizens. However, it is important that governments ethically and responsibly adopt AI and algorithms and consider factors such as data protection and transparency in decision making. If algorithms

in administrative decision making in governments are used in an ethical, scalable, and responsible manner, their use can be beneficial in terms of efficiency and service improvement.

6.1. *Limitations*

The present study has several limitations. First, the database we used for our bibliometric analysis was limited to publications indexed in the WoS database, so potentially relevant publications not indexed in this database were omitted from our analysis. Second, we considered only those studies that were published in English, thus overlooking publications in other languages. Third, we used the VOSViewer tool for bibliometric analysis, and this tool may have certain biases or limitations in the identification and analysis of relevant publications. Fourth, in this study, we explicitly focused on governments and administrative decisions, thus omitting the algorithms in other areas or contexts that may also be useful for their application in governments. The fifth limitation is that our investigation does not delve into the evaluation of effectiveness or results of using the algorithms for administrative decision making in governments; accordingly, this issue should be explored in further research. Finally, we did not thoroughly address ethical aspects of using algorithms in administrative decision making and do not provide specific recommendations to ensure the responsible and ethical adoption of these algorithms by governments.

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ADOPTING GOVERNMENT INTELLIGENCE DECISION SUPPORT SYSTEMS (IDSS): FROM CITIZENS' DATA TO LOCAL GOVERNMENT DATA-DRIVEN DECISIONS

José Ramón Saura *

1. *Introduction*

In the last few decades, the amount of data generated by citizens in their daily lives has exponentially increased. In an connected ecosystem, the actions taken by citizens are tracked and monitored with the goal of optimizing public services and improving efficiency in smart cities. Considering this paradigm, local governments have started to understand the importance of analyzing macro data to improve governmental decision making. In this regard, authors such as Janssen et al. [1] highlight that local government decision making processes can be improved if they adopt properly designed decision making systems centered on the use of artificial intelligence (AI),

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[1] M. Janssen et al., *Will algorithms blind people? The effect of explainable AI and decision-makers' experience on AI-supported decision-making in government*, in *Social Science Computer Review*, Vol. 40.2, 2022, pp. 478-493.

known as intelligence decision support systems (IDSS).[2] It is important to note that authors such as Duan et al.[3] define decision making systems as computer systems that drive data-driven decision making to improve the development of organizational and business activities with the goal of enhancing outputs over time.

In this context, it should be highlighted that there are a multitude of decision making systems and strategies focused on identifying variables and indicators that can be improved over time at the governmental level. Therefore, if governments use decision making systems that work with AI, they can improve pattern and trend recognition related to specific events, their ability to problem solve, and improve learning analysis after certain events or incidents.[4]

However, as indicated by Reis et al.,[5] local governments continue to integrate AI systems to improve their functional and workflow activities, but there are not many studies that critically analyze the public governance and whether the adoption of these technologies affects the decisions made by local governments in multiple ways. Authors such as Jarrahi[6] highlight that the adoption of intelligent decision making systems by governments helps save time and money by streamlining simple decision making processes.

Furthermore, for more complex decisions, it is public agents who should analyze the reports generated by decision making systems and

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[2] J. Fantuzzo and D.P. Culhane, *Actionable intelligence: Using integrated data systems to achieve a more effective, efficient, and ethical government*, Springer, 2015, pp. 50-59.

[3] Y. Duan et al., *Artificial intelligence for decision making in the era of Big Data–evolution, challenges and research agenda*, in *International journal of information management*, Vol. 48, 2019, pp. 63-71.

[4] C. Van Noordt and M. Gianluca, *Artificial intelligence for the public sector: results of landscaping the use of AI in government across the European Union*, in *Government Information Quarterly*, Vol. 39.3, 101714, 2022, pp. 1-13.

[5] J. Reis et al., *Artificial intelligence in government services: A systematic literature review*, in *New Knowledge in Information Systems and Technologies*, Vol. 1, 2019, pp. 241-252.

[6] M.H. Jarrahi, *Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making*, in *Business horizons*, Vol. 61.4, 2018, pp. 577-586.

learn based on the probabilities offered to make one decision or another. However, the early adoption of AI through these systems, which is not yet completely secure in administrative and management terms, can lead to numerous errors or injustices in social, economic, and behavioral terms.[7] Authors such as Hogan-Doran[8] also highlight that information bias when making decisions through an algorithm can be linked to a judgment of experience or lack of ethics that is not perceived in the results used to make a decision.

Local governments need to focus their strategies on trial and error so that the administrative structures of states can evade any type of algorithmic discrimination, for example, gender and economic discrimination in activities developed as a result of analysis and decision making based on reports generated by decision making systems. However, themes related to economy, culture, society, gender, and welfare state are the main points highlighted in the scientific literature as interests to understand the impact of the adoption of information systems in state public and local administrations.[9] Nonetheless, in the face of this paradigm, this research analyzes decision making systems that work with AI to improve decision making in governments.[10]

The originality of this research is linked to its innovative and up-to-date character in relation to the emerging development of AI and information technologies. Additionally, it aims to promote creativity

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[7] S. Feuerriegel et al., *Fair AI: Challenges and opportunities*, in *Business & information systems engineering*, Vol. 62, 2020, pp. 379-384.

[8] D. Hogan-Doran, *Computer says 'no': Automation, algorithms and artificial intelligence in Government decision-making*, in *Judicial Review: Selected Conference Papers: Journal of the Judicial Commission of New South Wales*, Vol. 13(3), 2017, pp. 345-382.

[9] R.-X. Ding et al., *Large-Scale decision-making: Characterization, taxonomy, challenges and future directions from an Artificial Intelligence and applications perspective*, in *Information fusion*, Vol. 59, 2020, pp. 84-102.

[10] Y.K. Dwivedi et al., *Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy*, in *International Journal of Information Management*, Vol. 57, 101994, 2021, pp. 1-47.

by linking not only decision making systems that work with AI and IDSS but also citizens' data, which can be extracted to improve input decision making, without data in local governments. As presented by Ribeiro-Navarrete et al.,[11] intelligence processes have been applied in government to improve decision making processes. In a connected era, governments have adopted a multitude of decision making systems that help them make data-driven decisions using citizens' digital data. In this context, this study aims to identify which IDSS are used by governments to generate insights and create knowledge about local services. To achieve the research goal, the following objectives are presented:

- Identify the main government-making IDSS used to date
- Develop future guidelines for the correct use of government-making decision systems
- Create knowledge and explore citizens' digital data privacy issues when governments use data-driven decision strategies using IDSS

In terms of methodology, this study develops a Systematic Literature Review (SLR) to explore the main government IDSS studied in the scientific literature to date. Following Stieglitz[12], the SLR is based on the papers published in reputed the academic databases: ACM Digital Library, IEEE Explore, ScienceDirect, Web of Sciences (WoS) and AIS Electronic Library. The terms use in the SLR are "Decision systems" OR "government-making decision systems" OR "government systems" OR "government" AND "artificial intelligence" OR "data-driven decision" OR "IDSS" OR

[11] S. Ribeiro-Navarrete et al., *Towards a new era of mass data collection: Assessing pandemic surveillance technologies to preserve user privacy*, in *Technological Forecasting and Social Change*, Vol. 167, No. 120681, 2021, https://doi.org/10.1016/j.techfore.2021.120681.

[12] S. Stieglitz et al., *Social media analytics–Challenges in topic discovery, data collection, and data preparation*, in *International journal of information management*, Vol. 39, 2018, pp. 156-168.

"intelligence decision support systems". After the SLR is applied a risk bias assessment of the studies is included considering: (i) study design; (ii) random sequence generation; (iii) blinding of outcome assessment; (iv) withdraw and drop out; (v) inclusion-exclusion criterion; and (vi) reporting adverse events.

The remainder of this chapter is structured as follows. After the introduction and the theoretical framework, the methodology is presented. This is followed by reporting the main results. The results are then discussed, and their theoretical and practical implications are analyzed. The chapter concludes with conclusions and a discussion of limitations.

2. *Theoretical framework*

As indicated by Phillips-Wren et al.,[13] IDSS are systems designed to help companies and organizations manage the volume and variety of information to improve decision making. When these systems are optimized and improved using AI, they are referred to as intelligent IDSS.[14] IDSS are not only programmed to organize information but can also be structured to make sense of it and identify crucial variables and indicators for making specific decisions based on mathematical algorithms that offer success probabilities for each action.[15]

In this way, these systems can reproduce and develop new data, identify specific parameters, build predictive business models,[16] and

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[13] G. Phillips-Wren et al., *An integrative evaluation framework for intelligent decision support systems*, in *European Journal of Operational Research*, Vol. 195(3), 2009, pp. 642-652.

[14] S. Gupta et al., *Artificial intelligence for decision support systems in the field of operations research: review and future scope of research*, in *Annals of Operations Research*, 2022, pp. 1-60.

[15] W. Wen et al., *A knowledge-based intelligent decision support system for national defense budget planning*, in *Expert Systems with Applications*, Vol. 28.1, 2005, pp. 55-66.

[16] L.F. Yie et al., *Collaborating Decision Support and Business Intelligence to Enable Government Digital Connectivity*, in *Web 2.0 and Cloud Technologies for Implementing Connected Government*, IGI Global, 2021, pp. 95-112.

program visualizations [17] related to product or service profitability, [18] inventory and location management, [19] or the organization of historical data related, for example, to accounting, finance, health, or well-being. Local governments can use these types of systems in many cases, as they obtain information from citizens through multiple administrative channels and from national security programs, among others. [20]

As indicated by Zhuang et al., [21] this type of information system can be focused, for example, on optimizing and planning movement in cities through the analysis of multiple GPS routes with the goal of optimizing distance and time spent from one point to another. For example, as indicated by Valle-Cruz et al., [22] they can be used in geological terms or related to weather analysis, for instance, to help farmers understand the best times to plant, fertilize, and manage farms based on the multitude of criteria that come into play in this industry. [23] In this context, governments could even offer estimates for the proper development of these types of activities.

However, as indicated by Fernandes et al., [24] another industry in

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[17] E. Siskos et al., *Multicriteria decision support for global e-government evaluation*, in *Omega*, Vol. 46, 2014, pp. 51-63.

[18] K. Zong et al., *Or-based intelligent decision support system for e-commerce*, in *Journal of Theoretical and Applied Electronic Commerce Research*, Vol. 16.4, 2021, pp. 1150-1164.

[19] J. B. Pick et al., *Location analytics and decision support: Reflections on recent advancements, a research framework, and the path ahead*, in *Decision Support Systems*, Vol. 99, 2017, pp. 1-8.

[20] Z.-J. Chen et al., *How to satisfy citizens? Using mobile government to reengineer fair government processes*, in *Decision Support Systems*, Vol. 82, 2016, pp. 47-57.

[21] Z.Y. Zhuang et al., *A framework for an intelligent decision support system: A case in pathology test ordering*, in *Decision Support Systems*, Vol. 55(2), 2013, pp. 476-487.

[22] D. Valle-Cruz et al., *From E-budgeting to smart budgeting: Exploring the potential of artificial intelligence in government decision-making for resource allocation*, in *Government Information Quarterly*, Vol. 39.2, 101644, 2022, pp. 1-19.

[23] Z. Zhai et al., *Decision support systems for agriculture 4.0: Survey and challenges*, in *Computers and Electronics in Agriculture*, Vol. 170, 105256, 2020, pp. 1-16.

[24] M. Fernandes et al., *Clinical decision support systems for triage in the emergency*

which local governments can participate to improve decision making is the healthcare industry. In this way, by using intelligent support systems, hospitals and doctors can be advised on medical diagnoses, monitoring, successful treatments, and prescription of the correct medications based on the analysis of the history of numerous patients in a time tree. [25]

Thus, depending on the IDSS used and its characteristics, they may vary, for example in terms of user interface, where there may or may not be facilities for understanding and programming, and the knowledge base on which incoming information can be structured. [26] Also, in terms of format and knowledge management, or in terms of management systems and models in which data can be manipulated to interfere with the results offered by the IDSS algorithm. [27] Therefore, in order to understand the systems commonly used in Table 1, those identified in the scientific literature most commonly used in public organizations, local governments, and companies are presented.

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department using intelligent systems: a review, in *Artificial Intelligence in Medicine*, Vol. 102, 101762, 2020, pp. 1-22.

[25] T.J. Bright et al., *Effect of clinical decision-support systems: a systematic review*, in *Annals of internal medicine*, Vol. 157(1), 2012, pp. 29-43.

[26] M.J. Yuan et al., *Evaluation of user interface and workflow design of a bedside nursing clinical decision support system*, in *Interactive journal of medical research*, Vol. 2(1), e2402, 2013, pp. 1-15.

[27] N. Nwiabu et al., *User interface design for situation-aware decision support systems*, in *2012 IEEE International Multi-Disciplinary Conference on Cognitive Methods in Situation Awareness and Decision Support*, IEEE, 2012.

Table 1. Intelligence decision support systems models (IDSS)

IDSS	Description	Authors
Statistical systems	Systems designed to identify statistical connections between events and events that occur in the system.	Trommershäuser et al. [28] Phillips et al. [29]
Optimization systems	Use statistics and mathematics to calculate the optimal solution to solve an organizational problem.	Ridha et al. [30] Ghasab et al. [31]
Forecasting systems	Analyze the history of actions or events to understand the current situation and make predictions.	Steere et al. [32] Nikolopoulos et al. [33]
Sensitivity systems	These systems are used to make predictions of hypothetical situations and based on these, make complex decisions.	Pirrone et al. [34] Biros et al. [35]

[28] J. Trommershäuser et al., *Decision making, movement planning and statistical decision theory*, in *Trends in cognitive sciences*, Vol. 12(8), 2008, pp. 291-297.

[29] D.E. Phillips et al., *Are well functioning civil registration and vital statistics systems associated with better health outcomes?*, in *The Lancet*, Vol. 386(10001), 2015, pp. 1386-1394.

[30] H.M. Ridha et al., *Multi-objective optimization and multi-criteria decision-making methods for optimal design of standalone photovoltaic system: A comprehensive review*, in *Renewable and Sustainable Energy Reviews*, Vol. 135, 110202, 2021, pp. 1-23.

[31] M.A.J. Ghasab et al., *Feature decision-making ant colony optimization system for an automated recognition of plant species*, in *Expert Systems with Applications*, Vol. 42(5), 2015, pp. 2361-2370.

[32] D.C. Steere et al., *Research challenges in environmental observation and forecasting systems*, in *Proceedings of the 6th annual international conference on Mobile computing and networking*, 2000.

[33] K. Nikolopoulos et al., *Forecasting systems for e-government*, in *Electronic Government, an International Journal*, Vol. 1.4, 2004, pp. 374-383.

[34] A. Pirrone et al., *Magnitude-sensitivity: rethinking decision-making*, in *Trends in cognitive sciences*, Vol. 26(1), 2022, pp. 66-80.

[35] D.P. Biros et al., *Inducing sensitivity to deception in order to improve decision making performance: A field study*, in *MIS quarterly*, 2002, pp. 119-144.

IDSS	Description	Authors
Expert systems	They are used to develop approaches focused on improving decision making using skills from other expert systems.	Humphreys [36] Chai [37]
Business intelligence systems	Establishes organizational variables to identify trends and predictions centered on the intelligence of the organization or business.	Aruldoss [38]
Simulation and modeling systems	Analyzes the impact of applying a policy or strategy to a given industry or area.	Sokolowski and Banks [39] Wee Kwan Tan [40]

Source: The authors

2.1. *Data-driven decisions in local governments and Intelligence Decision Support Systems*

In the face of a new era where data has become the fundamental source of information for governments and intelligence organizations, these information points that use technological innovation as their fundamental pillar have developed new foundational elements that

[36] P.R. Humphreys et al., *An expert system for evaluating the make or buy decision*, in *Computers & Industrial Engineering*, Vol. 42(2-4), 2002, pp. 567-585.

[37] J. Chai et al., *Application of decision-making techniques in supplier selection: A systematic review of literature*, in *Expert systems with applications*, Vol. 40(10), 2013, pp. 3872-3885.

[38] M. Aruldoss et al., *A survey on recent research in business intelligence*, in *Journal of Enterprise Information Management*, Vol. 27(6), 2014, pp. 831-866.

[39] S. Rouhani et al., *The impact model of business intelligence on decision support and organizational benefits*, in *Journal of Enterprise Information Management*, 29(1), 2016, pp. 19-50.

[40] A.W.K. Tan and K. Arun, *A decision-making model for reverse logistics in the computer industry*, in *The International Journal of Logistics Management*, Vol. 17(3), 2006, pp. 331-354.

combine infrastructure and organization in local governments.[41] The strategies of any governments to use intelligent decision making systems as well as the objectives they set should be taken in a consensual and studied manner,[42] but they must correctly identify their limits, weaknesses, and possible violations of citizens' privacy. It should be noted that these digital ecosystems will allow local governments to collect and store data on citizens' daily lives.

With the digitization initiatives in local governments, the processing of this data and its constant, random, and real-time measurement and study will become a technique for automated decision making in the medium to long term in a widespread manner.[43] However, public governments and local agencies should identify and determine rules to distinguish access to this data, and above all, the protection and privacy of this source of information from citizens, their movements, their ideologies or support for social movements.[44]

However, the importance of the processes and strategies developed to store data that may come from any point connected in a smart city or directly from administrative procedures developed by citizens in their personal affairs and issues should be emphasized. It should also be considered that the responsibility for local governments to have access to this information and automate these processes using AI. Authors such as Harrison and Luna-

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[41] S. Fatima et al., *What explains governments interest in artificial intelligence? A signaling theory approach*, in *Economic analysis and policy*, Vol. 71, 2021, pp. 238-254.

[42] H.-W. Liu et al., *Beyond State v Loomis: artificial intelligence, government algorithmization and accountability*, in *International journal of law and information technology*, Vol. 27(2), 2019, pp. 122-141.

[43] E. Dobrolyubova et al., *Digitalization and effective government: what is the cause and what is the effect?*, in *International Conference on Digital Transformation and Global Society*, Springer, Cham, 2019.

[44] J. Longo, *# OpenData: Digital-era governance thoroughbred or new public management Trojan horse?*, in *Public Policy & Governance Review*, Vol. 2.2, 2011, pp. 38.

Reyes [45] highlight that, in the use of IDSS, one of the most relevant issues is to promote transparency in decisions that are made automatically or in a context in which an algorithm may have encouraged and supported one decision or alternative over another.

Authors such as Yigitcanlar et al. (2021) point out that one of the challenges for local governments in the medium and long term is to provide citizens with the analyzed information and the ethical work developed to establish fair procedures from automated decisions that use AI. Real-time decisions are valid actions but must preserve legality and fair access to the treatment of data collected from citizens.

However, governments in their improvement and innovation processes must understand the need to acquire new technological infrastructure services and connected ecosystems that allow them to manage large volumes of data daily to keep the AIs participating in their decision making processes trained and with high efficiency in their results.

As indicated by Margetts and Dorobantu, [46] both the acquisition of software and hardware for the boost of these systems in local governments will require properly trained technicians and regulations that protect individuals' data that is collected and stored in governments. This fact is of vital importance, as in events that may damage national security, intelligent agencies may have access to a multitude of data. The visualization, processing, and management of these are directly linked to the adoption of IDSS that will allow local governments to take risks in multiple situations of public interest. [47]

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[45] T.M. Harrison and L.F. Luna-Reyes, *Cultivating trustworthy artificial intelligence in digital government*, in *Social Science Computer Review*, Vol. 40(2), 2022, pp. 494-511.

[46] H. Margetts and D. Cosmina, *Rethink government with AI*, in *Nature*, Vol. 568(7751), 2019, pp. 163-165.

[47] W. Zhang et al., *Factors influencing the use of artificial intelligence in government: Evidence from China*, in *Technology in Society*, Vol. 66, 101675, 2021, pp. 1-16.

3. *Methodology*

3.1. *Systematic review of literature*

Following studies that have conducted systematic literature reviews such as Narbón-Perpiñá and De Witte [48] and Yigitcanlar et al., [49] this research proposes the development of this method with the aim of understanding how governments use IDSS to make data-driven decisions. In this way, a systematic review has been carried out on the main and most relevant academic contributions related to the previously highlighted objective. It should be noted that authors such as Zuiderwijk et al. [50] highlight the importance of this type of methodological approach for the study of emerging themes in the literature.

The use of IDSS in local governments is emergent not only due to its originality as a field of study but also due to its novelty and impact on public services to citizens. Considering these scientific assumptions, this method can potentially benefit the identification of a theoretical framework that proposes the development of theoretical variables with scientific foundation for the future study of this research field. To develop the methodology correctly, the study proposed by Saura [51] is followed, in which the main theoretical foundations previously published on the object of study are reviewed in the first place. This step has been presented in the

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[48] I. Narbón-Perpiñá and K. De Witte, *Local governments' efficiency: a systematic literature review—part I*, in *International Transactions in Operational Research*, Vol. 25(2), 2018, pp. 431-468.

[49] T. Yigitcanlar et al., *Responsible urban innovation with local government artificial intelligence (AI): A conceptual framework and research agenda*, in *Journal of Open Innovation: Technology, Market, and Complexity*, Vol. 7(1), 2021, pp. 1-16.

[50] A. Zuiderwijk et al., *Implications of the use of artificial intelligence in public governance: A systematic literature review and a research agenda*, in *Government Information Quarterly*, Vol. 38(3), 101577, 2021, pp. 1-19.

[51] J.R. Saura, *Using data sciences in digital marketing: Framework, methods, and performance metrics*, in *Journal of Innovation & Knowledge*, Vol. 6(2), 2021, pp. 92-102.

theoretical framework of the research, in which the main typologies of IDSS and their characteristics linked to their possible use in government and decision making have been identified. Next, the main topics discussed are identified to be represented in the form of keywords. These keywords are used subsequently in the databases that are part of the study to identify the most relevant academic contributions in this research area.

3.2. *Data sampling*

Following authors such as Stieglitz et al.,[52] the following academic databases have been chosen to be part of the study: ACM Digital Library, IEEE Explore, AIS Electronic Library, ScienceDirect and WoS. In relation to the terms used, those that are inclusive with the study and its proposed objectives have been chosen. These are presented in Table 2.

The search was conducted on February 6th, 2023. To structure the phases of the systematic review process, the studies of Moher et al.[53] and the PRISMA guide[54] are followed for the development of the methodology. In this way, the terms used are predefined and selected, and the results obtained in the queries are analyzed in depth in relation to the title, abstract, and keywords sections. In this step, irrelevant results are eliminated. It should be noted that original articles, reviews, book chapters, and edited books are used in the study. Proceedings and conferences were not part of the study because they did not meet a sufficient evaluation criterion.

Next, in order to identify potentially relevant articles to be included in the review, the aforementioned fields are read in detail

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[52] S. Stieglitz et al., *Social media analytics...*, *op. cit.*

[53] D. Moher et al., *Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement*, in *Systematic reviews*, Vol. 4(1), 2015, pp. 1-9.

[54] R. Sarkis-Onofre et al., *How to properly use the PRISMA Statement*, in *Systematic Reviews*, Vol. 10(1), 2021, pp. 1-3.

and linked to the study's objectives. In this way, the types of approaches used in the contributions, as well as the selected methodologies, are understood and analyzed. The types of methodologies were not considered as exclusion criteria, but rather as a sample of the quality of the results obtained. Afterwards, articles containing inadequate terms or without a clear relationship with the objectives of this research are eliminated. Here, the researchers analyze the quality of the evaluation and the descriptions contained in the study's specifications. [55]

Additionally, it should be noted that studies that, although not directly addressing the objective of this research using the same keyword, do address the subject matter and objectives outlined in the research questions indirectly, are sometimes considered valid. These studies were taken into account and were not excluded from the database that forms part of the study. Table 2 identifies the terms used, databases, and fields analyzed as the first step in the methodology. [56]

Table 2. Search terms used in the SLR

Search terms			Data Bases	Fields
"Decision systems" OR "government-making decision systems" OR "government systems" OR "government"	AND	"artificial intelligence" OR "data-driven decision" OR "IDSS" OR "intelligence decision support systems"	■ ACM Digital Library ■ IEEE Explore ■ AIS Electronic Library ■ Science-Direct ■ Web of Sciences	Title Abstract Keywords

Source: The authors

[55] Idem, p. 2.
[56] Idem, ibidem.

After conducting the searches indicated in the databases, the following results were obtained for each of the databases used. In the ACM Digital Library, 92 out of 2 selected results were obtained; in Science Direct, 485 out of 5 selected results were obtained; and in Web of Science, 398 out of 21 selected results were obtained.[57] In order to summarize each of the selected contributions from the searches conducted, Table 3 presents the main results divided by database, selection of relevant contributions, and total. AIS Electronic Library and IEEE Access scientific databases were also consulted but not relevant results related to the object of study were found.[58]

Table 3. SLR results

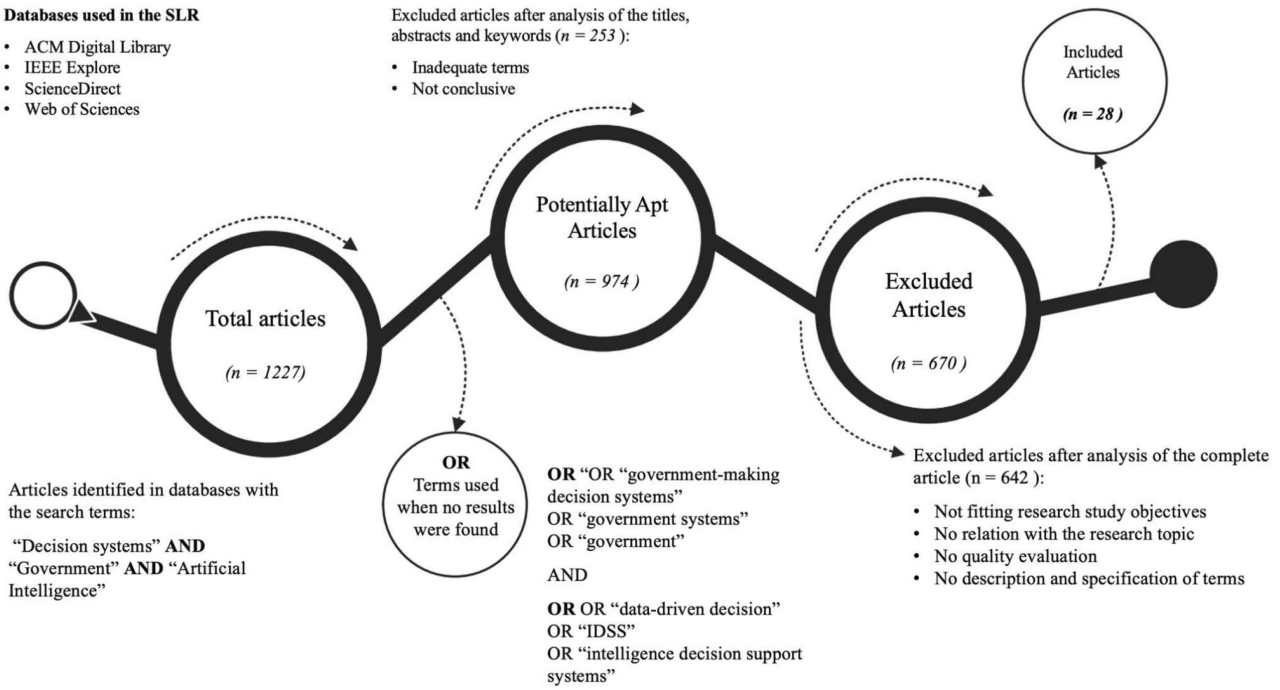
Database	Number of results	Number of relevant results
ACM Digital Library	92	2
ScienceDirect	485	5
Web of Sciences (WOS)	398	21
Total	1227	28

Source: The authors

Likewise, in order to summarize the process carried out for the identification of the sample and the selection of the main criteria that are part of the selection process in the presented systematic literature review, Figure 1 below identifies said process.

[57] D. Moher et al., *Preferred reporting items...*, *op. cit.*, p. 7.
[58] S. Stieglitz et al., *Social media analytics...*, *op. cit.*, p. 157.

Figure 1. Systematic literature review process developed and results by phase



Source: The authors

4. *Analysis of results*

Of the total of 1227 articles that are part of the literature review, a multitude of topics discussing the adoption of IDSS in governments have been found. Among all these topics that can be consulted in Table 4, the most relevant in terms of study importance and impact are highlighted in the discussion of this study. Among these topics are the problems of (i) Ambiguity issues in smart decision making, (ii) Urban design and Sustainable city development, (iii) Natural disaster and Nuclear emergencies management, (iv) Transportation improvement and Electronic service delivery, (v) Smart bureaucratic tasks, (vi) Smart account management, (vii) Public Engagement and Resource allocation, (viii) National defence and Crime scenario prediction and (ix) Real-time decision support dashboards.

Table 4. Results included in this study

Article Title	Journal	Main goals related to IDSS
Will Algorithms Blind People? The Effect of Explainable AI and Decision-Makers' Experience on AI-supported Decision making in Government	*Social Sciences Computer Review*	■ To evaluate decision making effectiveness across different support contexts: no algorithm, business rules, and machine learning. ■ To emphasize the importance of careful algorithm adoption, selection, and decision-maker training for accountability and transparency.
The perils and pitfalls of explainable AI: Strategies for explaining algorithmic decision making	*Government Information Quarterly*	■ To examine explainable artificial intelligence's potential and limitations in addressing opaque algorithmic decision making in government contexts. ■ To propose decision-specific strategies for enhancing societal acceptance and understanding of AI-based decisions, emphasizing collaboration and value sensitivity.

Article Title	Journal	Main goals related to IDSS
AI governance in the public sector: Three tales from the frontiers of automated decision making in democratic settings	*Telecommunications Policy*	■ To investigate how AI deployment in the public sector may intensify existing power asymmetries in relation to data governance and national regulations. ■ To advocate for a common framework to evaluate AI's potential impact in the public sector, emphasizing the importance of harnessing technology's benefits while mitigating negative effects.
New Pythias of public administration: ambiguity and choice in AI systems as challenges for governance	*Ai & Society*	■ To examine the potential benefits and challenges of adopting AI systems in public administration, focusing on justice and values. ■ To explore ambiguities and uncertainties in algorithmic results and public managers' decision making processes regarding AI systems' design.
A shallow defence of a technocracy of artificial intelligence: Examining the political harms of algorithmic governance in the domain of government	*Technology in Society*	■ To examine the potential for AI to enhance decision making in the complex realm of politics and government. ■ To argue that AI technocracy can be viable if control mechanisms are in place and humans retain control over society's fundamental goals.
Automated Decision Systems: Why Human Autonomy is at Stake	*Collective Decisions: Theory, Algorithms and Decision Support Systems*	■ To examine the impact of automated decision systems on human autonomy in various sectors, including government and public institutions. ■ To identify requirements for automated decision systems to protect the interests of individuals and society as a collective.

Article Title	Journal	Main goals related to IDSS
More than a digital system: how AI is changing the role of bureaucrats in different organizational contexts	*Public Management Review*	■ To investigate the effects of AI implementation on public sector innovation, focusing on the role definition of bureaucrats. ■ To analyze the observed administrative process innovation and conceptual innovation in these cases, as well as the transformation of organizational structures and tasks.
Opportunity for renewal or disruptive force? How artificial intelligence alters democratic politics	*Government Information Quarterly*	■ To analyze how AI capabilities affect the informational requirements of the democratic process, focusing on information deficits for citizens and decision-makers. ■ To discuss the need for suitable governance mechanisms to address AI-related challenges and maintain transparency and accountability in the democratic process.
Applications of artificial intelligence for disaster management	*Natural Hazards*	■ To review current applications of AI in disaster management across its four phases: mitigation, preparedness, response, and recovery. ■ To present examples of AI techniques and their benefits for supporting various phases of disaster management, including AI-based decision support tools.
Toward a More Equal World: The Human Rights Approach to Extending the Benefits of Artificial Intelligence	*IEEE Technology and Society Magazine*	■ To advocate for a human rights framework over an ethics framework for AI design, development, and deployment to promote equity and enforceability. ■ To emphasize the potential of AI to reduce inequality, improve access to public services, and advance human potential if guided by a human rights approach.

Article Title	Journal	Main goals related to IDSS
Abort or retry - A role for legal knowledge-based systems in electronic service delivery?	*Knowledge Management in Electronic Government*	■ To explore the connection between electronic service delivery and legal decision making, highlighting the complexity of legal decisions. ■ To discuss the potential of legal knowledge-based systems in automating legal decisions within the context of e-Government.
From E-budgeting to smart budgeting: Exploring the potential of artificial intelligence in government decision making for resource allocation	*Government Information Quarterly*	■ To explore the potential of AI in improving decision making within the public budget process, particularly in budget allocation. ■ To develop an algorithmic approach for processing budget inputs and generating economic, political, and social outcomes.
Algorithmic decision making and system destructiveness: A case of automatic debt recovery	*European Journal of Information Systems*	■ To examine the destructive effects of governmental through a case study of Australia's Robodebt program and its consequences on citizens and staff. ■ To develop a research model that explains the initiation, sustainment, and delegitimization of socially destructive government programs, using systems thinking and organizational limits perspectives.
Public engagement and AI: A values analysis of national strategies	*Government Information Quarterly*	■ To analyze how the prominence of commercial vendors and consultants in AI discourse impacts the consolidation of AI governance regimes and decision making by public administrators. ■ To highlight the congruence of engagement values with professionalism and private sector values and raise concerns about technology frames that normalize AI, obscuring policy complexity and trade-offs.

Article Title	Journal	Main goals related to IDSS
Examining the Implications of Process and choice for Strategic Decision Making Effectiveness	*International Journal of Decision Support System Technology*	■ To examine the relationship between decision making processes, response choices, and effective outcomes in strategic decision making. ■ To explore the effectiveness of an intelligent agent-based decision making support system in crisis response training.
Data intelligence and analytics: A bibliometric analysis of human-Artificial intelligence in public sector decision making effectiveness	*Technological Forecasting and Social Change*	■ To investigate the role and potential of data intelligence and analytics to improve decision making processes in the public sector through AI, big data, and human-AI interface. ■ To extend an ambidexterity theory in decision support, which enlightens how this ambidexterity can be encouraged and how it affects decision outcomes and emphasize the importance of the public sector adoption of data intelligence and analytics for effective decision making.
Issues and Prospects of AI Utilization in the Defense Field: Organizational Capability, Technology Maturity, Institutional Congruence	*Korean Journal of Defense Analysis*	■ To evaluate factors for each arm of service and analyze the results of the evaluation through a survey of experts ■ To propose measures to improve limitations such as security issues related to data utilization and training of professional AI personnel.
Intelligent decision support of urban design	*Journal of Architectural And Planning Research*	■ To present a decision support framework for urban design that employs intelligent knowledge-based systems for modeling, utilization, and management of specialized expertise. ■ To provide modeling and implementation examples with preliminary experimental results and assess the usefulness of the proposed methodology framework.

Article Title	Journal	Main goals related to IDSS
Co-Designing Participatory Tools for a New Age: A Proposal for Combining Collective and Artificial Intelligences	*International Journal of Public Administration in the Digital Age*	■ To describe a participatory prototyping process of an online participation tool for citizen preferences in local policy making. ■ To propose a decision making process that incorporates artificial intelligence techniques into a collective decision process and whose result is mainly based on standard optimization techniques rather than vote-counting
Design and evaluation of an intelligent decision support system for nuclear emergencies	*Decision Support Systems*	■ To classify methods for assessing intelligent IDSS based on literature review. ■ To discuss experiences in developing, operating, and evaluating an intelligent decision support system for nuclear emergencies.
How can AI systems deal with large and complex problems?	*International Journal of Pattern Recognition and Artificial Intelligence*	■ To propose a computer-led interactive system to manage problem-solving processes and record individual decisions made by humans. ■ To discuss the requirements for such a system, including autonomy, generality, and practicality.
The brain of the future and the viability of democratic governance: The role of artificial intelligence, cognitive machines, and viable systems	*Futures*	■ To assess the potential challenges posed by the fundamental change in the nature of economic wealth creation and the reduction in the effectiveness of human communication. ■ To explore the potential role of artificial cognitive machines in addressing these challenges, proposing the idea of a future brain for public governance.

Article Title	Journal	Main goals related to IDSS
Decision support system (DSS) for traffic prediction and building a dynamic internet community using Netnography technology in the city of Amman	*Journal of Experimental & Theoretical Artificial Intelligence*	■ To apply a dynamic approach for the Jordanian community to lessen traffic congestion on the roads in Amman by utilizing social media, artificial intelligence efficiency methods, and decision support. ■ To communicate directly with social media users to cut down on the time and effort needed to make traffic predictions, which will help to relieve the congestion of areas and roads in Amman.
A narrative-based reasoning with applications in decision support for social service organizations	*Expert Systems with Applications*	■ To address the increasing demand for incorporating unstructured narratives in decision support for knowledge-intensive industries such as healthcare and social service organizations. ■ To present a narrative-based reasoning (NBR) algorithm that incorporates knowledge-based system, computational linguistics, and AI for automatic processing unstructured narratives and inferring useful knowledge for decision support.
Knowledge-based models for emergency management systems	*Expert Systems with Applications*	■ To propose the use of advanced knowledge models to support environmental emergency management ■ To describe a generic architecture that embodies the knowledge pieces required to manage emergencies in different problem scenarios
Knowledge based crime scenario modelling	*Expert Systems with Applications*	■ To introduce a new methodology for constructing crime scenarios from evidence using a decision support system. ■ To generate a network of plausible scenarios from a description of the available evidence, allowing for effective evidence collection strategies.

Article Title	Journal	Main goals related to IDSS
Strategic Decisions: Survey, Taxonomy, and Future Directions from Artificial Intelligence Perspective	*ACM Computing Surveys*	■ To discuss the challenges of strategic decision making and the potential benefits of leveraging AI and machine learning technologies to support it. ■ To argue that creating a comprehensive taxonomy of decision frames as a representation space is essential for AI to offer surprising insights beyond current boundaries.
A Multi-Disciplinary Perspective for Conducting Artificial Intelligence-enabled Privacy Analytics: Connecting Data, Algorithms, and Systems	*ACM Transactions on Management Information Systems*	■ To present a multi-disciplinary research framework connecting data, algorithms, and systems to tackle emerging AI-enabled privacy analytics challenges ■ To summarize selected funding sources and conference and journal venues that can support high-impact privacy analytics research

Source: The authors

5. *Discussion*

As previously noted, AI has emerged as a significant component in decision support systems across various sectors, including local government organizations.[59] Its adoption has led to increased efficiency, enhanced data analysis, and improved decision making. Nonetheless, integrating AI into decision making processes brings about concerns related to transparency, mobility, and the potential for biased outcomes. As outlined in the literature review, AI has been employed in disaster management, resource allocation, and transportation systems, among other domains, to optimize responses and mitigate adverse effects.[60] For example, IDSS can be

[59] S. Feuerriegel et al., *Fair AI: Challenges and opportunities*, *op. cit.*, p. 380.

[60] J. Lin et al., *Privacy concerns and digital government: exploring citizen willingness to adopt*

applied in areas such as smart urban design, nuclear emergency management, extreme weather events, and crime scenario modeling, resulting in more informed and effective actions. Moreover, AI has been harnessed in the defense sector to augment organizational capabilities and technology maturity, as previously discussed.

Despite these advantages, the impact of IDSS on democratic politics and governance warrants careful examination. Factors such as public and local engagement, human rights approaches, and the influence of AI on bureaucratic structures must be taken into account when implementing IDSS. [61] Ensuring transparency is vital for maintaining trust and avoiding the erosion of societal foundations. To tackle these concerns, collaborative efforts should be made to develop participatory tools that combine collective intelligence and social knowledge. This may entail creating knowledge-based models for emergency management systems, urban sustainability assessments, and privacy analytics. Furthermore, examining AI's potential in areas like e-budgeting and local sector decision making effectiveness should be conducted through a multidisciplinary lens, considering the implications of process and choice for strategic decision making. These actions are integral to everyday government activities. [62]

As the adoption of IDSS continues to progress and integrate into local government operations, prioritizing ongoing research and development is essential to address emerging challenges and opportunities. Several areas of interest should be investigated to ensure responsible and effective AI adoption in government decision making. In this study, based on the reviewed literature, the most researched topics have been identified (see Figure 2) and are discussed below. The 9 research areas highlighted in Figure 2 and

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the COVIDSafe app, in *European Journal of Information Systems*, Vol. 30(4), 2021, pp. 389-402.

[61] S.N. Giest and K. Bram, *More than a digital system: how AI is changing the role of bureaucrats in different organizational contexts*, in *Public Management Review*, 2022, pp. 1-20.

[62] J. Reis et al., *Artificial intelligence in government services...*, *op. cit.*, p. 247.

their relationship to the types of IDSS presented in Table 1 are presented below.

As previously highlighted, the development of IDSSS by government will make them be capable of tackling large and complex problems. Advancements in data intelligence, analytics, and knowledge-based models can facilitate better decision making in challenging situations. This will be particularly critical for addressing pressing issues such as climate change (extreme weather), global security, and public health crises. In this context, promoting collaboration across disciplines is crucial for establishing comprehensive frameworks for IDSS implementation. By utilizing AI to connect data, algorithms, and systems, a multidisciplinary approach can help identify and address potential risks, biases, and gaps in AI-driven decision making processes. Consequently, government-adopted IDSS can be geared toward enhancing decision making and minimizing risks associated with data breaches or severe consequences during public health crises, such as COVID-19.[63]

Similarly, the potential of AI in areas such as (i) *transportation improvement and electronic service delivery*, local traffic prediction, and social service organizations can lead to innovative solutions that enhance public services and overall quality of life.[64] Local governments can harness the full potential of AI to improve decision making capabilities and better serve their citizens when they invest in research and development within these domains using IDSS. Consequently, adopting IDSS can substantially improve decision making, streamline processes, and enhance public service delivery. Optimization systems and simulation and modeling systems can be employed to analyze traffic patterns, predict congestion, and suggest optimal routing for vehicles.

Moreover, local governments have adopted IDSS to optimize (ii) *natural disaster and nuclear emergencies management*. Quick and effective

[63] H.-W. Liu et al., *Beyond State v Loomis...*, *op. cit.*, p. 123.

[64] T. Yigitcanlar et al., *Responsible urban innovation...*, *op. cit.*, p. 5.

responses to natural disasters such as hurricanes, earthquakes, and wildfires are crucial for governments in order to minimize loss of life, economic damage, and environmental impact. IDSS can enhance disaster response by analyzing vast amounts of data, identifying patterns, and providing real-time decision support through interactive dashboards. [65]

This allows policymakers to make faster decisions. For instance, the Federal Emergency Management Agency (FEMA) in the United States has utilized AI-powered DSS for improved disaster management. [66] These systems can analyze satellite imagery, weather data, and social media feeds to predict storm trajectories, identify high-risk areas, and allocate resources more effectively. IDSS empowers local governments to make better-informed decisions, leading to more efficient and effective disaster response efforts by providing real-time situational awareness, such as through the development of real-time decision support dashboards. Forecasting systems and expert systems can improve disaster response by analyzing big amounts of data and providing real-time decision support.

Linked to local transportation improvement and natural disaster, the used of IDSS to create (iii) *real-time decision support real-time dashboards* by local governments will allow them to make better decision in real time. In this context, statistical systems and business intelligence systems can provide real-time decision support through dashboards by collecting, analysing, and visualizing data from various sources. These systems can enhance situational awareness, enabling decision-makers to respond quickly and

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[65] F. Balbo and S. Pinson, *A transportation decision support system in agent-based environment*, in *Intelligent Decision Technologies*, Vol. 1(3), 2007, pp. 97-115.

[66] M.Z. Naser, *Systematic integration of artificial intelligence toward evaluating response of materials and structures in extreme conditions*, in *Intelligent Data Analytics for Decision-Support Systems in Hazard Mitigation: Theory and Practice of Hazard Mitigation*, 2021, pp. 183-212.

effectively to changing conditions in areas such as disaster management, transportation, and public health.[67]

Furthermore, (iv) *public engagement and resource allocation* are critical tasks for governments, as they involve distributing limited resources among competing priorities. IDSS can assist governments in making more informed decisions about resource allocation by analyzing historical data, identifying trends, and predicting future needs. An example of this can be seen in the European Union, where IDSS have been used for e-budgeting and resource allocation.[68] These systems analyze data on population growth, economic indicators, and public service demands to provide decision-makers with insights into the most effective ways to allocate local resources. This approach helps local governments identify areas of inefficiency, streamline budgeting processes, and ensure that public funds are spent in the most impactful manner. Forecasting systems and optimization systems can assist governments in making more informed decisions about resource allocation by analyzing historical data and predicting future needs.

Additionally, local governments are responsible for monitoring and responding to public health issues, including infectious disease outbreaks. AI-driven decision support systems can be utilized to identify early warning signs, predict the spread of diseases, and optimize the allocation of healthcare resources.[69] A notable example is the use of IDSS for tracking and predicting the spread of infectious diseases like the COVID-19 pandemic.

Similarly, (v) *urban design and sustainable city development* are domains where IDSS can play a significant role. For instance, IDSS can offer critical insights into the most efficient ways to use resources and optimize urban and local space utilization. These insights can

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[67] J. Truby et al., *A sandbox approach to regulating high-risk artificial intelligence applications*, in *European Journal of Risk Regulation*, Vol. 13(2), 2022, pp. 270-294.

[68] D. Valle-Cruz et al., *From E-budgeting to smart budgeting...*, *op. cit.*, p. 2.

[69] J. Lin et al., *Privacy concerns and digital government...*, *op. cit.*, p. 391.

guide city planners in designing sustainable and environmentally friendly urban landscapes that support citizens' needs.[70] Furthermore, IDSS can support data-driven decision making processes related to local transportation and infrastructure development. For instance, IDSS can provide insights into the most suitable locations for local transportation hubs or guide city officials on developing smart roads and parking systems that reduce congestion and emissions. Simulation and modelling systems, as well as optimization systems, can provide critical insights on resource utilization and urban space optimization.[71]

Moreover, (vi) *smart bureaucratic* tasks are other areas where IDSS can substantially improve decision making processes. IDSS can automate routine administrative tasks, such as data entry, processing, and storage. IDSS can help bureaucratic agencies save time and resources while reducing the risk of human error. Furthermore, IDSS can support decision making processes related to employee performance, workflow optimization, and customer service. For instance, IDSS can analyze employee data and identify patterns that affect job satisfaction or productivity, providing insights for organizational changes that lead to higher performance. Business intelligence systems and expert systems can automate routine administrative tasks, such as data entry, processing, and storage.[72]

In this context, (vii) *smart account management* is another domain in which IDSS play a significant role within AI tool environments. For example, IDSS can analyze customer data and provide insights on optimizing account management, reducing costs while increasing

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[70] H. Mehr et al., *Artificial intelligence for citizen services and government*, in *Ash Cent. Democr. Gov. Innov. Harvard Kennedy Sch.*, Vol. August 2017, pp. 1-12.

[71] T.M. Harrison and L.F. Luna-Reyes, *Cultivating trustworthy artificial intelligence...*, *op. cit.*, p. 494.

[72] H.M.K.K.M.B. Herath and M. Mamta, *Adoption of artificial intelligence in smart cities: A comprehensive review*, in *International Journal of Information Management Data Insights*, Vol 2(1), 100076, 2022, pp. 1-21.

customer satisfaction. IDSS can also support decision making processes related to fraud prevention, risk management, and security.[73] For instance, IDSS can detect fraudulent transactions or identify potential security breaches, providing insights for developing policies and procedures that enhance security measures. Business intelligence systems and expert systems can analyze customer data and provide insights on how to optimize account management, reducing costs while increasing customer satisfaction.

Simultaneously, (viii) *national defense and crime scenario prediction* can offer critical support to government agencies when developed using IDSS. For instance, IDSS can support decision making processes related to military operations, identifying the most efficient and effective strategies for national defense.[74] Furthermore, IDSS can provide insights on local crime scenario prediction, helping law enforcement agencies prevent crimes before they occur.[75] IDSS can analyze data related to past crimes and identify patterns that can help predict future criminal activity, providing insights for developing policies and procedures that enhance public safety. Simulation and modelling systems, along with expert systems, can support decision making processes related to military operations and crime scenario prediction.[76]

Lastly, addressing (ix) *ambiguity issues in smart decision making* is an essential area of research related to IDSS. Ambiguity arises when data is incomplete, inconsistent, or uncertain, making it difficult to make informed decisions. IDSS can play a critical role in addressing ambiguity issues by providing decision-makers with comprehensive and accurate data analysis. For instance, IDSS can offer insights on

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[73] J. Truby et al., *A sandbox approach...*, *op. cit.*, p. 272.

[74] S. Mori, *US defense innovation and artificial intelligence*, in *Asia-Pacific Review*, Vol. 25(2), 2018, pp. 16-44.

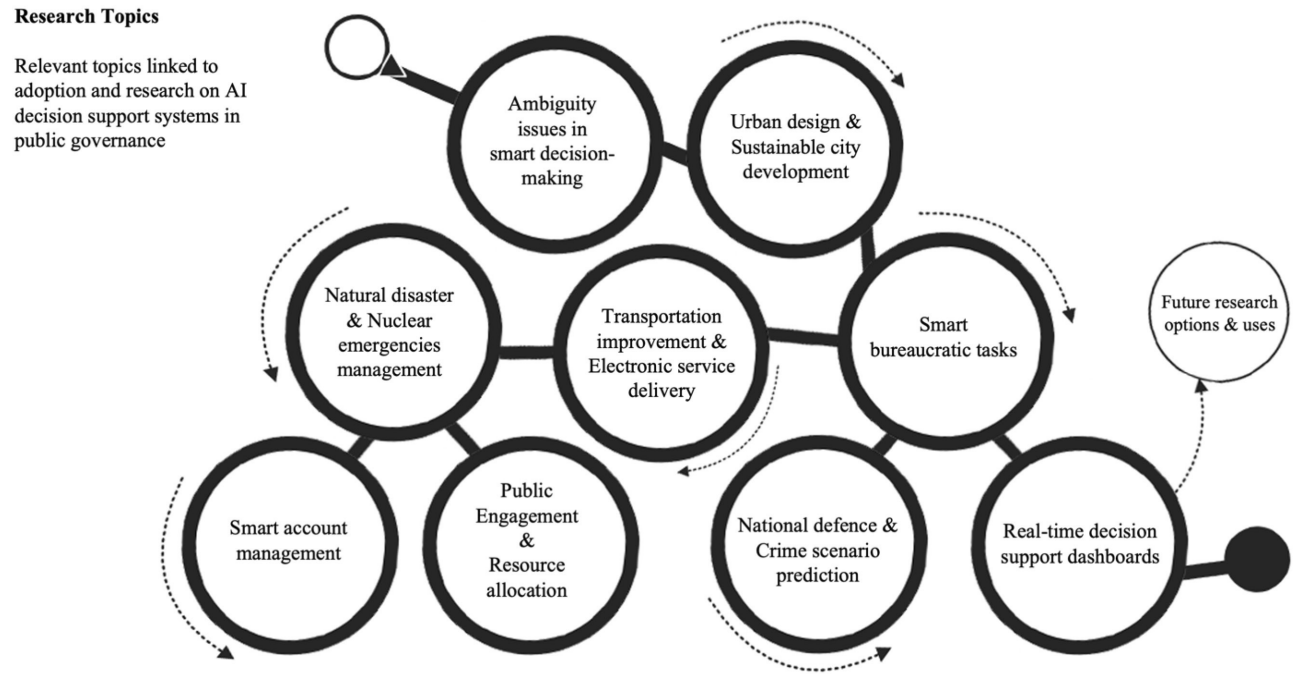
[75] A. Ingrams et al., *In AI we trust? Citizen perceptions of AI in government decision making*, in *Policy & Internet*, Vol. 14(2), 2022, pp. 390-409.

[76] Y. Pi, *Machine learning in governments: Benefits, challenges and future directions*, in *JeDEM-eJournal of eDemocracy and Open Government*, 13(1), 2021, pp. 203-219.

the most likely outcomes of different decision scenarios, even when data is incomplete or uncertain. Therefore, IDSS can support decision making processes related to risk assessment, allowing decision-makers to assess the likelihood of different outcomes and develop strategies to mitigate potential risks.[77] IDSS sensitivity systems and expert systems can address ambiguity issues developing comprehensive and accurate data analysis, even when data is incomplete or uncertain.

[77] J. Lin et al., *Privacy concerns and digital government...*, *op. cit.*, p. 392.

Figure 2. Main research topics linked to IDSS adoption in local governments



Source: The author

6. *Conclusions*

This research has conducted a systematic literature review on the use of IDSS in local governments. In total, a sample composed of 28 articles selected from a total database of 1227 articles from Wos, ScienceDirect, and ACM Digital Library was used. The academic databases AIS Electronic Library and IEEE Access were also included in the study, but no comparable results were found. The main findings of the research are reflected in the 9 areas of government action related to the use of IDSS, which are: (i) Ambiguity issues in smart decision making, (ii) Urban design and Sustainable city development, (iii) Natural disaster and Nuclear emergencies management, (iv) Transportation improvement and Electronic service delivery, (v) Smart bureaucratic tasks, (vi) Smart account management, (vii) Public Engagement and Resource allocation, (viii) National defense and Crime scenario prediction and (ix) Real-time decision support dashboards.

This study has demonstrated that IDSS has become a crucial component in various sectors of local government competences, where it enhances efficiency, data analysis, and decision making. However, transparency, mobility, privacy of data and potential biases remain concerns. In the literature, it has been found that IDSS has been employed in disaster management, local resource allocation, transportation systems, and other domains to optimize responses and mitigate adverse effects. Despite these advantages, the impact of IDSS on democratic politics and governance necessitates careful examination, with transparency being vital for maintaining trust.

As the adoption of IDSS continues to progress, prioritizing ongoing research and development is essential to address emerging challenges and opportunities. Several areas of interest should be investigated to ensure responsible and effective IDSS adoption in local government decision making including the nine areas of research found in the literature. Also, as highlighted in the discussion, promoting collaboration across disciplines is crucial for

establishing comprehensive frameworks for IDSS implementation in governments. Finally, it should be highlighted that IDSS have immense potential to improve government decision making processes across various domains. However, ensuring transparency and addressing concerns related to biases and other challenges is critical to find the society trust and acceptance. The 9 areas of research identified in this study can be used in the future as a roadmap for governments and public institutions to understand the main areas of action and use of IDSS in public governance, as well as their potential outcomes for society and local service to citizens.

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BRAZILIAN LETTER FOR SMART CITIES – DIGITAL TRANSFORMATION AND URBAN DEVELOPMENT

Lilian Regina Gabriel Moreira Pires *

1. *Introduction*

The Brazilian Letter for Smart Cities was prepared taking into consideration the sensitivity of technicians from the former Ministry of Cities, currently the Ministry of Regional Development, aiming to integrate/captain discussions related to information technology and cities. The group's concern began: i) with the reality of information technologies in people's daily lives; (ii) due to the fact that the world was already thinking about Smart Cities; iii) that there was no consensus around the definition of Smart Cities; iv)

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that in Brazil, the discussions on the so-called Smart Cities had technicians in the area of information technology and in this debate professionals specialized in urban development were not consulted. Digital Transformation and Urban Development lacked a joint approach, in one hand because the Brazilian reality is very diverse, and on the other hand, because answers were needed for the following questions: (i) what is the vision of a Smart City in Brazil? (ii) how to group the various perspectives and the various knowledge around this subject? (iii) how to consolidate the understanding around this subject, so that it will result in an effectiveness in the area of sustainable urban development? The process was long but executed with mastery by the technicians of the Ministry of Regional Development, resulting in a political document, which consolidated a vision on the topic of the Brazilian Smart City, which constituted as a starting point to induce the improvement of public services, in order to promote citizens' quality of life. This article presents, although in general, the process of drafting the Letter and the principles established therein.

2. *Urban policy in the Brazilian Constitution of 1988 and related legislation*

The Brazilian Urban Policy was inserted in the Constitution of the Republic of 1988 (also known as just "CF"), in Chapter II of 'Title VII – Of the Economic and Financial Order', covering actions related to the ordering of habitable spaces, in addition to encompassing the planning and management of cities. The Constitution unequivocally prescribes, in its article 18, that the "political-administrative organization of the Federative Republic of Brazil comprises the Union, the States, the Federal District and the Municipalities, all autonomous" in the provisions of our Fundamental Law.

Public functions are performed by the Union, States, the Federal District and Municipalities, each of which in its respective spheres of competence. Political decentralization materializes through the

division of competences established due to the primacy of interest, added to that of territoriality. Thus, the Union has a general interest, the Member States and the Federal District have both regional and local interests and, finally, the municipality, likewise, local interest. [1-2]

The design of the competencies is verticalized, it removes any determination of hierarchy, and it is divided into legislative and non-legislative. [3]

The competence to legislate can either be private or concurrent. It is for the Union, the States, and the Federal District to legislate concurrently (Article 24, I) and, in this case, "the Union's competence shall be limited to establishing general rules" (Article 24, §1).

Article 182 of the Magna Carta sets forth:

> "Article 182. The urban development policy, implemented by the municipal government, according to general guidelines established by law, aims to order the full development of the social functions of the city and ensure the well-being of its inhabitants." [Our griffins.]

It is the competence of the Municipal Government, by express constitutional determination, to implement the urban development policy, according to the general guidelines established by federal law (CF, art. 182, caput). [4]

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[1] Art. 1 - The Federative Republic of Brazil, formed by the indissoluble union of states and municipalities and the Federal District, constitutes a Democratic State (...).

[2] Following articles of the Federal Constitution: 21 (Union); 25 §1 (State), 32, § 1st (Regional and local); 30, I (local/municipality).

[3] Arts. 21, 22, 23, 24, 25, 29 and 30 of the Federal Constitution.

[4] Among the normative diplomas aimed at establishing the general guidelines of Urban Policy, in addition to the Statute of City in the form of Federal Law 10,257/2001, we have the Urban Mobility Law, Federal Law 12,587, issued in 2012, and the Statute of the Metropolis, issued in 2015 in the form of Federal Law 13,089.

The municipality lays down the fundamental requirements of the city's ordination and the criteria for urban property to fulfill its social function (CF, art. 182, § 2), through the master plan, which is mandatory for cities with a population of more than twenty thousand inhabitants (cf, art. 182, § 1). It also delimits the areas in which the municipal government may require, by specific law, the proper use of unbuilt, unused, or underused urban land, through the application of the instruments listed in Article 182, § 4, of the Constitution, which are: notification for compulsory installment, construction, or use; property and land tax progressive over time; and expropriation-sanction.

On the other hand, urban development policy brings together two constitutional objectives: the ordering of the full development of the city's social functions, in the form that the Master Plan is available, and the guarantee of the well-being of its inhabitants (cf. art. 182, caput). These objectives are directly related to the realization of the social rights set forth in Article 6 of the Constitution of the Republic, in particular with the social rights to work, housing, transport and leisure, which, in the classification proposed by the Athens Letter, correspond to the four essential functions of the city. [5-6]

Still, the guarantee of the well-being of the inhabitants of the city

[5] For cities with less than 20,000 inhabitants, the Master Plan can be adopted, and this is coupled with the advantage of using the instruments of Federal Law No. 10,257/2022 – City Statute. In not adopting the Master Plan, these cities chalk up their ordering through a set of laws – land planning, code of works and others.

[6] "The Athens Letter defined the functions of the city: housing, transportation, work and leisure. Article 182 of the Constitution did not clearly list such items, but established that urban policy must guarantee the well-being of its inhabitants, that is, to all who live in the territory of the municipality. Thus, we understand that the social function of urban property will be fulfilled at the moment that functions are fully implemented in a coordinated and harmonic manner." – In *Social Function of Urban Property and the Master Plan*, São Paulo: Editora Forum, 2007, p. 95.

refers to the caput of Art. 225 of the Federal Constitution, which sets forth the right of all to the ecologically balanced environment, well of common use of the people and essential to the healthy quality of life, imposing on the Public Administration and the collectivity the duty to defend it and preserve it for the present and future generations.

Considering Articles 182 and 225 of the Constitution of the Republic, it is possible to affirm that the development model to be promoted by the Brazilian Urban Policy is that of sustainable urban development, based on the balance between economic growth, social inclusion and environmental preservation and intergenerational solidarity.

Federal Law No. 10,257/2002 – Statute of the City, after 13 years of the promulgation of the Constitution of 88, regulated the chapter of Urban Policy and the legislative framework, from the perspective of general norms, is thus disciplined:

Source: Author's elaboration

The urban development model was explained in Article 2, item I, of the Statute of the City, and defines the guarantee of the right to sustainable cities as a general guideline of Brazilian Urban Policy. As expressed as a constitutional provision, it is for the Federal Government to make the general rules available.

Thus, in Brazil we currently have:

> "The National Secretariat of Mobility and Regional and Urban Development is the result of the merger of the former National Secretariat of Regional and Urban Development and the National Secretariat of Mobility and Urban Services. The new secretariat is responsible for promoting regional and urban development, acting intensively in strengthening innovative local and regional production systems; in irrigated production; investments in urban rehabilitation; in the management of the territory; strengthening federative capacities and investments in urban mobility to promote universal access to the city in a safe, socially inclusive, and sustainable way."[7-8]

On the other hand, Brazil is a continental country with inequalities and asymmetries. Although 60% of the municipalities are rural, 80% of the Brazilian population lives in urban areas.[9]

In light of the digital transformation and urbanization of urban centers, which is a reality in the contemporary world, the need to incorporate this technology in the discussions involving the city and

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[7] October 2022.

[8] https://www.gov.br/mdr/pt-br/composicao/secretarias-nacionais/secretaria-nacional-de-desenvolvimento-regional-e-urbano, access on 28.10.2022.

[9] Report: In the typology proposed in this study, we see that 76.0% of the Brazilian population is in municipalities considered predominantly urban, corresponding only to 26.0% of the total municipalities. Most Brazilian municipalities were classified as predominantly rural (60.4%), 54.6% as adjacent rural and 5.8% as remote rural. CLASSIFICATION AND CHARACTERIZATION OF RURAL AND URBAN SPACES IN BRAZIL, https://www.ibge.gov.br/apps/rural_urbano, access on October 2022.

making use of its competence, a collaborative effort began, led by the National Secretariat of Mobility and Regional and Urban Development – SMDRU, to build an agenda for the digital transformation of Brazilian cities in the sense of sustainable urban development.

3. *The agenda for digital transformation in Brazil*

We recall here that the United Nations General Assembly, in December 2001, approved the proposal for the establishment of a global group for the preparation of the declaration of principles and action plan on Information and Communication Technology (ICT) issues. The work was discussed and drafted at the World Summit on the Information Society (WSIS) which took place in Geneva (2003) and then in Tunisia (2005). [10]

Brazil was a signatory to the 2030 Agenda, approved in 2015, which established the Sustainable Development Goals (SDGs) and defined a set of 17 Goals and 169 objectives to be achieved by nations, with the aim of eradicating poverty and promoting a dignified life for all. The 'SDGs11 – Sustainable Cities and Communities' aims to make cities and human settlements inclusive, safe, resilient and sustainable. [11]

The United Nations Conference on Housing and Sustainable Urban Development (Habitat III), in 2006, approved the New Urban Agenda on urban challenges, how to plan and manage cities towards sustainable development. [12]

Since 2000, Brazil has been evolving when it comes to using ICT

[10] https://www.cgi.br/media/docs/publicacoes/1/CadernosCGIbr_DocumentosCMSI.pdf, access on 30.10.2022.

[11] https://brasil.un.org/pt-br/91863-agenda-2030-para-o-desenvolvimento-sustentavel, access on 30.10.2022.

[12] https://habitat3.org/wp-content/uploads/NUA-Portuguese-Brazil.pdf, access on 30.10.2022.

for its processes and to improve the quality of the provision of public services.

Federal Law No. 14,129/2021 regulates the principles, rules and instruments for increasing the efficiency of public administration, especially through debureaucratization, innovation, digital transformation and citizen participation. In addition, it produces every three-year a document that materializes the Digital Government Strategy and that sets goals for digital transformation. At this time, we have in force Federal Decree No. 10,332/2022, updated by Decree No. 10,996/2022, which execution can be accompanied in the government's website, this trajectory is clear in this timeline: [13-14-15-16-17]

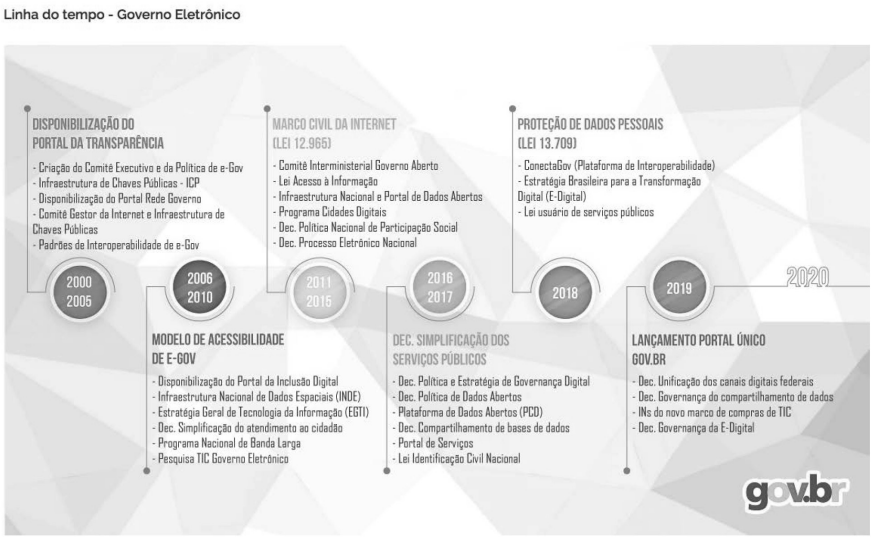
[13] http://www.planalto.gov.br/ccivil_03/_ato2019-2022/2021/lei/L14129.htm, access on 28.10.2022.

[14] Year 2022.

[15] https://www.gov.br/governodigital/pt-br/EGD2020, access on 28.10.2022.

[16] https://app.powerbi.com/view?r=eyJrIjoiZjc2ODA0YjEtM2FlNi00ZDIzLWJiNGItNDU5Zjk4MDM1MzFjIiwidCI6IjNlYzkyOTY5LTVhNTEtNGYxOC04YWM5LWVmOThmYmFmYTk3OCJ9&pageName=ReportSection5c 02b7b41052063a073, access on 28.10.2022.

[17] https://www.gov.br/governodigital/pt-br/estrategia-de-gove rnanca-digital/do-eletronico-ao-digital, access on 28.10.2022.



In Brazil, the introduction of new technologies in public administration has been taking place gradually. Federal Law No. 10,973/04 – also known as Innovation Law – set forth that innovation can be understood as the "Introduction of novelty or improvement in the productive or social environment that results in new products, processes or services". Federal Law 11.196/05 – Practical guide of the "Law of Good" – establishes technological innovation as:

> "The design of a new product or manufacturing process, as well as the aggregation of new features or characteristics to the product or process that implies incremental improvements and effective gain in quality or productivity, resulting in greater competitiveness in the market."

The National Development Bank – BNDES, together with the Ministry of Science and Technology – MCTIC, commissioned a study on the Internet of Things (IoT) called: An action plan for Brazil. This document brings with it a series of recommendations for the country to identify bottlenecks in the development of IoT

and propose solutions, aiming at strengthened production chains, competitiveness, and improvement in quality of life. [18]

Provisional Measure 2.200/2001 established the Brazilian Public Keys Infrastructure – ICP-Brazil – and the National Institute of Information Technology is the body that "guarantees the authenticity, integrity and legal validity of documents in electronic format, of support applications and enabled applications using digital certificates, as well as the realization of secure electronic transactions". Federal Law No. 14,063/20 legally established the operation of electronic and digital signatures, which are simplifying and important instruments nowadays. [19-20]

It is a fact that sustainable development brings with it many challenges and the State is a protagonist in consolidating a favorable and safe environment for the development of sustainable economies and efficiency in the provision of public services. Since 2000, this activity is moving on and incorporating administrative practices. [21]

Not for any other reason, it was found the need to insert the city and urban development in this digital approach that was incorporated as an imperative in the role of the State.

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[18] L.R.G.M. Pires, *Cidade Inteligente and the Apparent Regulatory Crisis*, in André Luis Azevedo Guedes, Carlos Alberto Pereira Soares, Martius Vicente Rodriguez y Rodriguez (Orgs.), *Intelligent Cities in the Dimensions: Planning, Governance, Mobility, Education and Health*, Digital format, 2020, pp. 73/74, https://smart.rio.br/wp-content/uploads/2020/07/E-BOOK-SMART-CITIES_2020_UFF_UNISUAM_RBCIH.pdf.

[19] https://www.gov.br/pt-br/servicos/validador-de-documentos-digitais, access on 30.10.2022.

[20] http://www.planalto.gov.br/ccivil_03/mpv/Antigas_2001/2200-2.htm, access on 30.10.2022.

[21] Inequality, extreme poverty, climate change, access to decent housing, health, education, transformation, and digital inclusion.

4. *The Brazilian Letter for Smart Cities*

As stated on the electronic website of the Ministry of Regional Development, the result of the Letter was as it follows:

> A "collaborative process with the support of the German Cooperation Agency GIZ and in partnership with the Ministry of Science, Technology and Innovations (MCTI), with the Ministry of Communications (MCom) and 126 other institutions, of a public and private nature, including federative entities of the different spheres and other Powers, in addition to numerous professionals involved mainly with urban investments and public policies of territorial, technological and environmental development." [22]

The collaborative process of the Letter was a different and relevant experience regarding participatory process, to the extent that it brought together academia, market, public power, a diversity of specialists in different topics. It was a space for exchanging knowledge, listening, learning, sensitizing, and paying attention to/ with different realities and the importance of understanding what each locality aspires to, needs, and is dedicated to.

Before bringing the concept of Smart Cities developed by the Letter, it is important to remember that there is no universal concept for the so-called Smarts Cities. The movement known for intelligent growth that advocated the creation and implementation of new urban planning policies in the 1990s was responsible for the terminology with its first statement with the Kyoto Protocol. Technology companies (Siemens, in 2004; Cisco, in 2005; and IBM, in 2009) adopted the expression and associated them with the use

[22] https://www.gov.br/mdr/pt-br/assuntos/desenvolvimento-urbano/carta-brasileira-para-cidades-inteligentes, access on 30.10.2022.

of complex urban technological systems in the areas of transportation, health, education, environment, governance. [23–24–25]

Conceptualizing Smart City is a complex task and there are a series of definitions:

> "There is no universally accepted definition of a smart city. It means different things to different people [...], depending on the level of development, the willingness to change and reform, resources and aspirations of the city's residents. A smart city can have a different connotation in India than it has in Europe, and even in India there is no way to define a smart city." [26]

Thus, the so-called Smart Cities depend on the design chosen by each State. And this was one of the missions of the Brazilian Letter for Smart Cities to outline a local and tropicalized concept for digital transformation of Brazilian cities, resulting in the following terms: [27]

> "Smart Cities are: Committed to sustainable urban development and digital transformation, in their economic, environmental and sociocultural aspects that act in a planned, innovative, inclusive

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[23] The study of Yigitcanlar et al. presents a review of the literature bringing an evolution of the concept of smart cities, over 16 years of research acadêmicas – T. Yigitcanlar et al., *Understanding 'SMART cities': Intertwining development Drivers With desired outcomes in a multidimensional framework*, in *Cities*, Vol. 81, November 2018, pp. 145-160, available at https://www.sciencedirect.com/science/article/abs/pii/S0264275117313367?via%3Dihub, access on 30.10.2022.

[24] https://unfccc.int/sites/default/files/resource/docs/spanish/cop3/kpspan.pdf, access on 30.10.2022.

[25] C. Harrison and I. A. Donnelly, *A Theory of Smart Cities*, in *Proceedings of the 55th Annual Meeting of the International Society for the Systems Sciences*, 2011, available at https://journals.isss.org/index.php/proceedings55th/article/view/1703/572, access 30.10.2022.

[26] Smart Cities Mission, 2017, available at https://smartcities.gov.in/about-the-mission, access 31.10.2022.

[27] The Letter can be accessed digitally at https://www.gov.br/mdr/pt-br/assuntos/desenvolvimento-urbano/carta-brasileira-para-cidades-inteligentes

> and networked way, promote digital literacy, collaborative governance and management and use technologies to solve concrete problems, create opportunities, offer services efficiently, reduce inequalities, increase resilience and improve the quality of life of all ensuring the safe and responsible use of data and information and communication technologies." [28]

The Letter's epicenter is outlined in establishing a common project to address digital transformation and endorse that Brazilian cities should be: diverse, fair, for people, inclusive and welcoming, connected and innovative, safe, resilient, self-regenerative and economically fertile, environmentally responsible, articulating different senses of learning time, conscious and reflective, responsible with their principles.

There are 8 strategic objectives in the Letter that articulate and enable actions and as a backdrop tracing the imperative need for broad connectivity, that is, the real possibility of all people being able to access the internet and quality digital tools.

[28] https://www.gov.br/mdr/pt-br/assuntos/desenvolvimento-urbano/carta-brasileira-para-cidades-inteligentes/VersoResumidadaCarta.pdf, access on 31.10.2022.

Source: MDR website. [29]

Strategic objective #1 deals with the integration of digital transformation in policies, programs and actions of sustainable urban development, respecting the diversity and considering the inequalities present in Brazilian cities.

In the sense of contextualizing this objective, two points can be brought for reflection **(i)** the importance of the database – formatted in territorial registers – which functions are fundamental for various fiscal, spatial, and legal purposes. There are those

[29] https://www.gov.br/mdr/pt-br/assuntos/desenvolvimento-urbano/carta-brasileira-para-cidades-inteligentes/VersoResumidadaCarta.pdf, access on October 2022.

registered so-called multifinalitarians, and that reverberates in possibility of effective public policies decisions and these registers are formatted from technology;[30] **(ii**) digital structure infrastructure that enables access to quality and accessible internet at all levels to everyone.

We could bring reflections here for each objective, it is not the purpose of the present study, and we leave this challenge to another opportunity. Nevertheless, it is certain that technology must be at the citizen's service and its unfolding is the provision of high-quality public services, and for this excellence to materialize, municipalities need to appropriate new technologies and the Letter can be an aid and foundation for this process.

After the completion of the Letter, a work of dissemination and collaboration began, and the group participating in the process remains connected and several actions are ongoing.[31]

Among the initiatives, there is the Project TraDuz (which stands for "translate + DUS" (Sustainable Urban Development) which is an initiative of the Federal Rural University of the Semi-Arid (UFERSA) and have the support of the Ministry of Regional Development (MDR). The mission of this project is to communicate, empower and provide tools to help people and institutions build better cities in a collective way and have produced important and useful material.[32]

Another important initiative is conducted by the National

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[30] "The Multifinalitarian Technician Registration it can be understood as a system of recording the spatial elements that represent the urban structure, consisting of a geometric and descriptive component that give it agility and diversity in the provision of data to meet different functions, including urban planning" – T. Blachut et al., *Register as a basis of a general land inventory of the country*, in *Sign: various functions characteristics techniques and the planning of land record system*, Canada: National Council, 1974.

[31] This group has been named after the Letter ambassadors, who are connected exchanging knowledge, experiences, and bringing information.

[32] https://projetotradus.org/

Confederation of Municipalities (CNM), an independent, non-partisan and non-profit rganization, which is a reference in municipal representation, and has political and technical initiatives aimed at excellence in management and the quality of life of the population. [33]

CNM launched a support material that provides explanations about intelligent, human, and sustainable municipalities. And it also produced a series of virtual meetings relating to the objectives of the Letter. [34-35]

From the collaborative process of the construction of the Letter, a network was formed that remains active with exchanges of experiences and call for actions.

5. *Conclusion*

The Brazilian Letter for Smart Cities was a rich and participatory process, its production aspect has characteristics that deserve congratulations. The document has a political approach, and it is an embryo of the induction process for the inclusion of digitization in Urban Policy in Brazil.

There is a set of actions ongoing that will certainly lead to the path of sustainable development (environmental, economic, and social). May the Brazilian experience of building the Letter be an inspiration to other States and that every day the challenge of having human and sustainable cities becomes a reality.

[33] https://www.cnm.org.br/municipios/transferencias

[34] Available at https://www.cnm.org.br/biblioteca/exibe/15039

[35] Available at https://youtu.be/BUVzQDapW2Q

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THE CHALLENGE OF DEPLOYING CLOUD COMPUTING IN ORGANIZATIONS

Teófilo Teixeira Branco Júnior *

1. *Introduction*

Adopting cloud computing can provide benefits, opportunities, and advantages by adopting more modern and feature-rich technology. Cloud Computing can provide significant benefits to organizations that adopt this technology if they know how to take advantage of the benefits of the CC. To do so, it is necessary to evaluate the deployment model and the most appropriate service models for each case.

Organizations that choose to adopt public clouds should be aware of some limitations to which they will be subject, such as heavy

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dependence on the cloud provider, difficulties in maintaining very particularized applications, and lack of interoperability and portability between different providers. Typically, the solutions of each public cloud provider are very particularized and this exacerbates dependence on a particular provider, even making it difficult to migrate your services to another provider if necessary. [1-2]

Another issue to ponder concerns the location of data and application hosting in public cloud cases. There is less control of data usage and storage location in a public cloud environment and there is a need to verify the jurisdiction of the location of this data to ensure that it does not violate current laws related to personal data protection. There may also be risks regarding application security and privacy if the public cloud provider is not competent to manage these issues. [3]

Companies that are not willing to establish control over the consumption of computing resource usage are also at serious risk of consuming more resources than they need, and their costs may increase rather than decrease when hiring public clouds. Consumption costs may become high and not compensate for the migration performed. It is necessary to forecast and make consumption projections to evaluate the financial convenience of adopting CC. [4]

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[1] A. Gutierrez and R. Lumsden, *Key Management Determinants For Cloud Computing Adoption*, in *UK Academy for Information Systems Conference Proceedings 2014*, 2014.

[2] Y. Li and K.-C. Chang, *A Study on User Acceptance of Cloud Computing: A Multi-Theoretical Perspective*, in *Proceedings of the Eighteenth Americas Conference on Information Systems, Seattle, Washington (AMCIS 2012)*, August 9-12, 2012, 1–10, http://aisel.aisnet.org/amcis2012/proceedings/AdoptionDiffusionIT/19/.

[3] L. Rocha, *Cloud Computing: Governação, riscos e auditoria dos serviços de TI*, in *Blog.Cionet.Com*, 2014, 1–14, http://blog.cionet.com/wp-content/uploads/2014/07/LF_2014_Cloud_Computing_Governance_and_Auditing_IS-CIONET-2.pdf.

[4] C. Weinhardt et al., *Cloud Computing – A Classification, Business Models, and Research Directions*, in *Business & Information Systems Engineering*, 1(5), 2009, 391–399, https://doi.org/10.1007/s12599-009-0071-2.

Because of these factors, the adoption of CC must be well planned and well analysed in economic, organizational and strategic aspects so that organizations are able and well prepared for the cloud deployment process. [5]

2. *The Cloud Computing Life Cycle*

The life cycle of cloud computing is divided into four phases, which are in turn divided into stages. [6] Each stage contains challenges to be overcome. Each challenge is preparatory to the next stage, and it is important that the sequence in which they are solved is followed to achieve a successful outcome. This incremental approach aims to reduce the risk associated with deploying cloud computing in organizations. The phases and stages of this life cycle are described below.

Phase 1 – Architect

Phase 1, called "Architecting," covers a series of activities that characterize a decision-making process about the deployment of cloud computing in the organization involving all stakeholders. This phase covers the following steps:

1) Investigate – The objective of this stage is to provide insight and an understanding of what an organization wants to achieve and what goals and expectations need to be met. This will be based on an analysis of the business segment, with insights from experts and

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[5] T. Branco, F. De Sá-Soares and A.L. Rivero, *Key Issues for the Successful Adoption of Cloud Computing*, in *Procedia Computer Science*, 121, 2017, 115–122, https://doi.org/10.1016/j.procs.2017.11.016.

[6] G. Conway and E. Curry, *Managing Cloud Computing: A Life Cycle Approach*, in *2nd International Conference on Cloud Computing and Services Science CLOSER 2012*, January, 2010, 198–207, http://www.edwardcurry.org/publications/Conway_CloudLifeCycle_2012.pdf.

experiences from partner organizations, along with knowledge of potential suppliers. A clear vision and strategy of what can be achieved by moving to cloud computing is needed. Once the strategy and vision are clearly defined and communicated, it is possible to identify what services are available and what providers can offer.

2) Identify – The purpose is to assess which areas of the enterprise are appropriate for outsourcing to the cloud and what impact this will have on the current delivery model and how it will be managed. To do this, there is a need to understand the current state so that it can be compared to the desired future state. With this, the impact on service, people, cost, infrastructure, and stakeholders can be assessed. The resources used in the identification step include Enterprise Architecture Management (EAM) techniques. It is important to choose the right service to migrate to the Cloud, as well as its functionality. For the organization to be successful in migrating to cloud, it must have a well-defined enterprise architecture. Organizations that try to fix problems with their existing services simply by moving them to the cloud tend to fail, as they end up transferring the problem to the new environment.

3) Define – This consists of defining at a strategic level, how the Cloud services that will be outsourced will be implemented. This will document how key decisions will be made later, defining strategies on: staffing, communication, program deployment, organizational rules, and risk assessment. Organizations that want to migrate to the Cloud need to fully understand the impact of migration on the user community and IT support staff. Organizations that have not understood this impact and have not planned adequately will lose key resources or face resistance from their IT staff and users during and after the migration.

4) Design – Establish what should be outsourced to the Cloud and what the future state will look like. Detail the new service, how it will be managed, how it will interact with existing or remaining systems, and how it will be monitored and reported. Provide requirements in sufficient detail to negotiate with vendors and so that they can

be compared, based on cost and quality of service. Organizations that have developed clear and concise tender documentation have improved discussions with suppliers without placing undue limitations and restrictions on what could be provided. On the other hand, organizations that have poorly defined requirements spent too much time in discussions with suppliers and were driven by the supplier's agenda.

Phase 2 – Contract

This phase, called Contracting, involves the activities of evaluating and selecting suppliers, establishing commercial conditions and defining contractual clauses (SLAs), and defining back-out alternative strategies (return to the traditional environment) and contingency security plans. This phase is composed of the following steps:

1) Select – In this stage the best vendor is selected based on value, sustainability, and quality, based on the requirements and criteria defined in Phase 1 - Architect. Organizations should accept only solutions that have the required functionality. Active involvement of the user community through surveys and through validation of the proposed solution is very important, and it is necessary to choose vendors prepared to work and solve problems before migration. Organizations that compromise by accepting partial functionality with the promise of enhanced functionality at a later stage, or that have ignored proper validation to meet deadlines, have ended up with problems that led to the failure of cloud services or that were too expensive to fix.

2) Negotiate – The goal of this stage is to complete the final negotiation, select the chosen vendor, get internal approval, and sign the contract. Some vendors offer only their standard service offering and the standard SLA, while other cloud vendors invest significant time and effort to ensure that customers meet the key requirements to deploy CC. Organizations that invest time in the due diligence steps, user engagement, and negotiating their

requirements and criteria can get good approval without major last-minute problems. The simple promise of cost savings can result in the signing of a flawed contract. As a result, major problems can occur during implementation, which can lead to a contractual dispute with the vendor in the legal arena.

Phase 3 – Operationalize

This phase aims to provide all the resources necessary to operationalize the Cloud environment in line with the strategic and operational goals of the organization. This phase is composed of the following stages:

1) Develop **–** The goal of this stage is to manage the transition of services to the cloud. This will require transitioning the service itself, managing the impacted personnel, communicating with all stakeholders, imparting knowledge, and approving acceptance from the parties involved. Organizations that have good planning, full user involvement, and a strong partnership with the vendor are likely to have a successful transition.

2) Manage – It is important to manage the new cloud service as well as possible. The organization will need to adapt to the new set-up, especially at the IT management level, because instead of directly managing internal resources, the requirement will be to manage the cloud provider and in particular the relationship with the provider. This will require effective monitoring and control so that issues, variations and disputes can be resolved to the satisfaction of both parties. Building a relationship with the cloud provider is the key to success. Some companies have gone further and built a strategic partnership with their vendors, which has further increased their success.

Phase 4 – Update

1) Review – This phase aims to regularly review cloud service requirements based on experiences and the need for business

updates, changes in the provider's organization or the need to change the provider. A clear vision of the future can provide an understanding of how cloud service offerings can be improved through the use of common standards, the use of cloud agents and an integrated architecture.

3. *Influencing Factors in the Decision to Adopt CC*

Although cloud computing (CC) has been discussed as a new technology that can provide several advantages, a quantitative survey was conducted in Taiwan, involving large enterprises, to investigate what factors influence the adoption process of this technology by enterprises.[7]

The results indicated that the factors affecting the decision to adopt CC can be classified into technological, organizational, and environmental contexts, specific to each company. As these assumptions are in line with the Diffusion of Innovation Theory (DIT),[8] it becomes possible to apply the structure of the Technology-Organization-Environment (TOE) framework.[9]

Top management support and company size are significant discriminators between adopters and non-adopters of cloud computing. It is clear that adoption of new technology requires top management support and adequate technology integration capability.

Expected benefits can provide positive motivation for innovation technology adoption and expansion, because employees' appreciation of the relative advantages of the new system increases work efficiency.

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[7] C. Low, Y. Chen and M. Wu, *Understanding of determinants of cloud computing adoption*, in *Industrial Management & Data Systems*, 111(7), 2011, 1006–1023, https://doi.org/10.1108/02635571111161262.

[8] E.M. Rogers, *Diffusion of innovations*, in *Newyork Free Press*, 3nd ed., The Free Press, 1995, https://doi.org/citeulike-article-id:126680.

[9] L.G. Tornatzky and M. Fleischer, *The Processes of Technological Innovation*, Lexington Books, Lexington, 1990.

The relative advantage of implementing cloud computing services can improve the speed of business communications, the efficiency of inter-firm coordination, communication with customers, and access to market information mobilization.

4. *Organization Maturity Level*

Organizations need to have a level of maturity for cloud computing adoption. Several models and frameworks were found in the literature review, all of which are designed to assist organizations in the cloud migration process. The following proposed model has been selected for presentation purposes in this study as it provides clarity, robustness, and detail for good understanding. [10]

Maturity is related to CMMI (Capability Maturity Model Integration). [11] The Cloud Maturity Model (CMM) is a model similar to this understanding and measures cloud capability against six defined maturity levels. The Cloud Maturity Model defines the following key concepts: capabilities, domains, maturity, and adoption. The maturity levels progress from "None" to "Optimized." These levels define the path an organization generally takes toward cloud computing maturity.

The Cloud Maturity Model uses the concept of domains to classify and organize the related resources. Eight domains are defined, four related to the organizational dimension and four related to the technological dimension.

The "Strategy and Business" domain represents the resources that

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[10] S. Mattoon, B. Hensle and J. Baty, *Cloud Computing Maturity Model Guiding Success with Cloud Capabilities*, in *Computing*, December, 2011, 13.

[11] M.B. Chrissis, M. Konrad and S. Shrum, *CMMI: guidelines for process integration and product improvement*, Addison-Wesley, 2003, https://dl.acm.org/citation.cfm?id=773274.

provide the high-level constructs that enable the cloud initiative to proceed. This includes things like business motivation, expected benefits, guiding principles, expected costs, funding model, etc. Features like service selection and service level agreements also gain relevance in Cloud initiatives.

The "Organization" domain refers to the resources related to developing organizational competence around Cloud computing, including organizational structure and skill development, as well as executive sponsorship and organizational authority.

The "Governance" domain covers resources related to governance structures and processes that support and guide cloud efforts. This includes policy management, risk management, and auditing capabilities. The maturity and adoption of appropriate governance is an important indicator of the overall success of a cloud computing strategy.

The "Projects and Services" domain refers to capabilities related to planning and building cloud services and managing the service portfolio.

The "Architecture" domain refers to resources related to the overall architecture definitions and covers capabilities such as interoperability and self-service.

The infrastructure domain encompasses the resources related to the service infrastructure and tools that provide the technical foundation for the cloud initiative. Shared services and provisioning are particularly important in cloud infrastructure.

The information domain relates to the information aspects of the cloud, such as metadata management, as well as customer rights and data durability.

The "Management, Administration and Operation" domain refers to the post-deployment aspects of the cloud service, i.e., the operations, administration and management aspects of the cloud environment. This includes capabilities for the delivery of self-service and change management functions.

5. *Organization Readiness*

In your proposed model for cloud adoption, Trivedi [12] also listed a number of essential elements for verifying an organization's readiness for cloud adoption.

Executive support refers to cloud adoption must be an enterprise-wide initiative and requires executive support at the highest levels to articulate program objectives, maintain the pace of deployment, catalyse solutions to problems, and provide oversight.

Business definition and budgeting encompass the need to formulate a clear articulation of the business objectives to be achieved and the corresponding investments required.

Governance is key. The emerging pattern is that cloud programs need a mix of governance styles for deployment. IT governance is responsible for establishing policies for defining IT solutions that can be imposed by a program or manager.

Regarding organizational change, the cloud involves changes in the IT organization, in the way business groups transact with the IT organization and meet requirements, in job descriptions, vendor perspectives, and the use of IT resources, among others. Cultural change is also an important issue to be addressed.

Process improvement addresses the benefits of the cloud that are spread across horizontal infrastructures, platforms, and software. The horizontal software benefits are the most significant when accompanied by process analysis and improvement. Process analysis and improvement align business processes with changes in software applications and enable business processes to better utilize the capabilities offered by software applications.

Application modernization refers to the opportunity that cloud migration provides for organizations to assess their application

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[12] H. Trivedi, *Cloud Adoption Model for Governments and Large Enterprises [MIT Sloan School of management, USA]*, in *Mit*, Issue May 2013, https://doi.org/10.11113/jt.v73.4193.

landscape and understand the utility of their application landscape. Application rationalization and modernization are part of the move to the cloud and this is especially critical because in a post-cloud world, it is highly likely that there will be two environments, the cloud environment and the legacy environment. Maintaining these two environments will not be user-friendly. Modernization follows when the applications being moved to the cloud conform to the standards that have been defined by the organization.

Hardware and software standardization in the cloud implies a new service arrangement involving infrastructure, platform, and enterprise software. Hardware and software standardization is essential to realize the benefits of the cloud.

Regarding the definition of service levels, in the cloud, all technological requirements are parameterized and measured in the form of services.

6. *Cloud Migration Challenges*

ISACA's COBIT 5 framework [13] is a framework for managing IT management that addresses corporate governance throughout the entire life cycle of a program. COBIT 5 ensures systematic governance and management through the use of seven enabling topics.

A Controls and Assurance in Cloud COBIT-5 publication [14] lists a sequence of processes for solving various problems related to deploying cloud computing in organizations. It guides the completion of steps to guide migration to the cloud. The

[13] ISACA (ed.)., *COBIT 5 - Modelo Corporativo para Governança e Gestão de TI da Organização*, 5th ed., 2012, http://www.isaca.org/COBIT/Pages/COBIT-5-Framework-product-page.aspx.

[14] ISACA, *Controls and Assurance in the Cloud: Using COBIT-5*, 2014, www.isaca.org/controls-and-assurance-in-the-cloud.

publication guides on the importance of preparing the organization's internal environment so that the CC can be successfully deployed. The recommendations regarding adjustments to organizational processes and structures reinforce the importance of the organization being prepared, including aspects related to organizational culture, people, and competencies, and also provide guidance on the procedures that should be adopted so that the selection of deployment models and cloud service models are the most appropriate for the organization.

7. *Security Management*

Information security is one of the most relevant points cited by experts and entities specializing in cloud switching. Through the literature, review, we identify several entities that develop relevant studies on the establishment of standards, procedures and recommendations through their research working groups for the deployment of cloud computing. The entities Cloud Security Alliance (CSA), National Institute of Standards and Technology (NIST), Information Systems and Control Association Inc. (ISACA), work to develop standards for cloud computing deployment in organizations, such as governance audit roadmaps and recommendations for information security.

8. *Choosing Cloud Providers*

Choosing good cloud solution providers is important to ensure good products and good services. In choosing vendors, some researchers specifically address this process, recommending criteria that should be taken into account to guide the vendor hiring decision process.

The evaluation and selection of cloud providers becomes key issue in making a proper choice. With the help of a decision model, cloud

providers can be selected to provide infrastructure, platform, or software services. Applying a decision model can reveal the differences and similarities between services provided by different providers, although most enterprises have similar requirements for underlying systems and standard use cases for the cloud.

9. *Service Level Agreements – SLAs*

A service level agreement is a formal contract between a service provider and a customer, stating the nature of the underlying service, the target performance levels, and the obligations of the parties involved in the agreement. The complexity and scope of an SLA are closely related to the type and complexity of the service provided. [15]

The general, warranty, and excess clauses represent the main contractual clauses that should be spelled out in a cloud services contract. Including and describing these clauses clearly and objectively produces a fair contract with strong legal foundations for both parties.

10. *Conclusions*

To realize the benefits and advantages of cloud computing and overcome the challenges faced by organizations wishing to migrate their applications and data to cloud computing, it is necessary to define a strategy for a successful migration.

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[15] I. Stankov, R. Datsenka and K. Kurbel, *Service level agreement as an instrument to enhance trust in cloud computing - An analysis of infrastructureas-a-service providers*, in *18th Americas Conference on Information Systems 2012, AMCIS 2012*, 5, 2012, 3813–3822, http://www.scopus.com/inward/record.url?eid=2-s2.0-84877883333&partnerID=40&md5=e305a859e5a4389c520e3136d142a752

Cloud computing is a new technology that has a variable billing mechanism, and there are fears that if the costs of the service are passed on, the price of the systems themselves may become comparatively high compared to those not in the cloud. The complexity and difficult compatibility of cloud computing deployment may pose barriers to CC adoption.

Business partner power also has a positive effect on IT adoption decisions. This power can be compelling or compelling. Companies adopt cloud computing depending on whether they have been influenced by convincing power, such as financial incentives for their trading partner, or through compulsory power, whereby the company with greater bargaining power puts pressure on the company with less bargaining power to adopt cloud computing.

However, Cloud Computing, while it may bring benefits to some organizations, may also not be a good solution for companies that do not know how to properly evaluate the decision-making of deploying CC in their organizational environment. [16]

The lack of support from a competent consulting firm to guide the deployment process and the lack of a well-planned strategy can create uncertainty and fear regarding the adoption of CC in companies that do not have these conditions. In these cases, it is not interesting to adopt the cloud until there is available the investment in a consultancy and to conduct the necessary studies for a well-planned deployment. [17]

CC implementation is also not recommended for companies that have problems regarding organizational processes. Companies that do not have their processes well defined or that present operational

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[16] A. Gutierrez and R. Lumsden, *Key Management Determinants For Cloud Computing Adoption*, *op. cit.*

[17] J. Repschlaeger et al., *Decision model for selecting a Cloud provider: A study of service model decision priorities*, in *19th Americas Conference on Information Systems, AMCIS 2013 - Hyperconnected World: Anything, Anywhere, Anytime*, 2, 2013, 1031–1041. http://www.scopus.com/inward/record.url?eid=2-s2.0-84893212243&partnerID=40&md5=e34e7e572ada9ed0cf965d55a776f6a2.

inconsistencies, will probably not be successful with CN. Besides not solving organizational problems, CC requires that the organization has a minimum level of organizational maturity for its implementation. [18]

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BEHIND SMART CITIES: TERRITORIAL GOVERNANCE OF GEOREFERENCING IN PORTUGAL

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Isabel Celeste Fonseca **

1. *Framework of the Smart City as an (Geo)Informational System*

The technological revolution, which occurred mainly in the last two decades of the 20th century, brought a huge leap in computer science studies that promoted profound changes in the economic, social, and legal practices of cities. This construction dictated by the historical accumulation of techniques for the transport and storage of goods (b), information (i), and people (p), which form the 'bip' system [1] is at the center of urban dynamics, from writing

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[1] F. Ascher, *Os Novos Princípios do Urbanismo*, Lisboa: Livros Horizonte, 2010.

to the internet, passing through numerous technical layers of space transformation, such as the wheel, the press, the telegraph, the railway, electricity, reinforced concrete, sterilization, pasteurization, the elevator, the automobile, the sanitation system, telephony, etc. The planimetric and altimetric growth of cities, which conditions their verticality or horizontality, is made possible using these techniques intertwined in the city.

After all, information, in all its forms, is the fundamental engine of the social process, and the territory is also equipped to facilitate its circulation,[2] characterizing a technical-scientific-informational environment, which, through technology, forms information that is spatializable, establishing a type of geographical link that allows its location by Euclidean geometry, whether by a point, a line, or an area.

The Right to Information is ancient.[3] If initially it was manifested by the mere quantification of goods and resources with economic value, the universalization of censuses, attributed by the Icelandic Manntalið[4] of 1703, aimed to precisely identify and describe the large number of poor people in each place, as for the first time there was the perception that the geographical criterion, of spatialization, assumed informational centrality. The promulgation of the Swedish Freedom of the Press Act of 1766, frequently pointed out as the oldest legislative piece on freedom of information in the world, only occurred after Sweden structured its census system, the Office for Compilation of Tables (Tabellverket) of 1749.

Much has already been said about the disruption of our time in the

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[2] M. Santos, *A urbanização brasileira*, 5. Edição, São Paulo: Editora da Universidade de São Paulo, 2018, p. 38.

[3] The collection of information, which would come to be known as censuses, emerged in Babylon in 3,800 BC, with the population count being carried out every six or seven years, registering the number of people, animals, quantities of butter, honey, milk, wool, and vegetables.

[4] See https://skjalasafn.is/gallery/manntalid_1703, including the image of the document produced at the time.

technological bias, mainly in producing information about information, metadata. And this case fits perfectly with the use of the numerous censuses, cartographies, statistics, geodesies, topographies, toponymies, among other data that, when overlaid on geographic information systems, allow for the elaboration of multiscale analyses, with the possibility of cumulating layers (layers) practically infinitely.

And the 2030 Agenda was attentive to this (geo)informational revolution. It contains two statements that bring centrality to the informational issue and its linkage with locational aspects. In Sustainable Development Goal 16 - Peace, Justice and Strong Institutions, there is an expressed understanding that public access to information must be ensured, and fundamental freedoms protected, in accordance with national legislation and international agreements (item 16.10). And this public access to information must follow a logic of significantly increasing the availability of high-quality, current, and reliable data disaggregated at the level of income, gender, age, race, ethnicity, migratory status, disability, geographic location, and other relevant characteristics in national contexts (item 17.18).

2. *The legal nature of Geoinformation*

Analyzing the legal aspects of geoinformation refers to a form of abbreviation of the right to geographic information, which is the right to geoinformation. It is not any type of information, as it is measurable and refers to a location in space. It is territorially measured and manifested digitally and can be a category of what Gomes Canotilho [5] calls the digitalization of fundamental rights. It has x, y, and z axes, it is information with latitude, longitude, and

[5] J.J. Gomes Canotilho, *Direito Constitucional e Teoria da Constituição*, 7.ª edição, Coimbra: Almedina, 2003, pp. 514-515.

altitude, together or separately and under completely disruptive resources. Thanks to technical geoinformation and its various applications, it is possible to achieve legal geoinformation.

The constant technological evolution creates utilities with exponential speed, challenging the existing normative framework in the face of the evolution of society's complexity. The information society has an apparently limitless capacity for knowledge, storage, and transfer of informative data, becoming indispensable in all domains of economic and social life.[6] In the specific case of the right to geoinformation, it can be considered a right of an individual intended to meet the new needs of an information society.[7]

Geoinformation brings smart cities to life just as electrons power our electrical appliances. The "BIP system" needs to be "vertebraized" by geographic coordinates, and the European Union has been skillful in its construction. As an example, the establishment of Galileo, which is the EU's global satellite navigation and positioning system (GNSS), upon which numerous EU economic sectors depend, from transportation and agriculture to border management and search and rescue; and its terrestrial counterpart allows the European Union to have autonomy in streamlining the mapping of its territory.

In turn, the INSPIRE Directive, created by Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007, which established the creation of the European Spatial Data Infrastructure, obliges Member States to manage and provide geographic information data and services according to common principles and rules, was detailed by Regulation (EC) No 1205/2008. The three annexes of the Directive cover 34 thematic categories of geographic data.

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[6] J.C. Vieira de Andrade, *Os direitos fundamentais na Constituição Portuguesa de 1976*, 5.ª edição, Coimbra: Almedina, 2017, p. 63.

[7] M. Jankowska and M. Pawełczyk, *The right to geoinformation in the information society*, in *Geoinformation, Law and Practice*, Warsaw, 2014, p. 29.

The availability of Galileo, as well as the INSPIRE Directive and its regulations, enables the promotion of the availability of geospatial information to its public policies, with a robust set of specific legislation on the subject, especially on metadata,[8] interoperability,[9] network services,[10] data and service sharing,[11] as well as monitoring and reporting.[12]

To enable Portuguese cities to become intelligent, understanding this "intelligence" to materialize the management of metadata systems, as an intangible public good that needs to be valued,[13] the Assembly of the Republic has recognized that municipalities need a structured national support to deal with data. After all, offering interoperable network services, monitoring, and evaluating urban

[8] See Regulation (EC) No 1205/2008 of the Commission of 3 December 2008, which lays down implementing rules for Directive 2007/2/EC of the European Parliament and of the Council concerning metadata, as well as the Corrigendum to INSPIRE Metadata Regulation, of 15/12/2009.

[9] See Regulation (EU) No 1089/2010 of the Commission of 23 November 2010, which sets out the implementation provisions for Directive 2007/2/EC of the European Parliament and of the Council regarding the interoperability of spatial data sets and services; and Regulation (EU) No 102/2011 of the Commission of 4 February 2011, which amends Regulation (EU) No 1089/2010.

[10] See Regulation (EU) No 1088/2010 of the Commission of 23 November 2010, which amends Regulation (EC) No 976/2009, regarding download services and transformation services; and Commission Regulation (EC) No 976/2009 of 19 October 2009, which sets out the implementing rules for Directive 2007/2/EC of the European Parliament and of the Council as regards services.

[11] See Commission Regulation (EU) No 268/2010 of 29 March 2010, which lays down the implementing rules for Directive 2007/2/EC of the European Parliament and of the Council as regards the access, in harmonised conditions, of Community institutions and bodies to the geographical data sets and services of the Member States.

[12] See the Commission Decision of 5 June 2009, which lays down the implementing provisions for Directive 2007/2/EC of the European Parliament and of the Council regarding monitoring and reporting.

[13] J. Miranda, *Direito Administrativo dos Bens – Introdução à Teoria Geral dos Bens Públicos*, Lisboa: AAFDL, 2021, p. 216.

system and services, their logistics, mobility, energy efficiency, environmental protection, among other layers, is a task that deserves collective effort and scale gain.

3. *The production of Portuguese geoinformation: The role of the Directorate-General for Territory for Smart Cities*

The territorial planning and urbanism policy is based on the Territorial Management System (SGT), established by Law no. 31/2014, of May 30, which is organized, in a coordinated interaction framework, at the national, regional, intermunicipal, and municipal levels, and is implemented through the corresponding territorial management instruments, highlighting the differentiation between territorial programs and plans.

Territorial programs (art. 38, 1, a) essentially include instruments of government competence aimed at establishing the strategic framework for territorial development, programmatic guidelines, or spatial incidence of national policies, corresponding to the National Program of Territorial Planning Policy (PNPOT), sectoral programs, special programs, regional programs, and intermunicipal programs.

Territorial plans (art. 38, 1, b) include instruments of municipal competence aimed at establishing concrete planning and organization options and actions for the territory and defining land use, corresponding to municipal and intermunicipal master plans, urbanization plans, and detailed plans.

For the vector and georeferenced digital transcription of graphic pieces of municipal plans, making them available on their respective websites, they must follow the data model to be approved by the Directorate-General for Territory – DGT (art. 94, 1 and 2). Similarly, the municipal master plan (art. 97, 3, f), urbanization plan (art. 100, 3, g), and detailed plan (art. 107, 4, g) are accompanied by statistical data sheets in a model provided by the DGT.

The Directorate-General for Territory (DGT) is a central service

of the Portuguese state administration, as stated in art. 4, c, of DL no. 17/2014, of February 4. It is part of the Organic Law of the Ministry of Environment, Territorial Planning, and Energy and is responsible for managing public policies on territorial planning and urbanism, as well as creating and maintaining reference geographic databases (art. 11).

Among its broad responsibilities, which range from property registration to investigation and experimentation for innovation, the DGT must support the definition and implementation of city policies through technical cooperation and financial programs aimed at promoting good practices in territorial management and the qualification of territory and urban management (item c). It must also develop, coordinate, and manage national systems for territorial information, geographic information, and portals for territorial planning and urbanism, as well as geographic information (item l).

The DGT follows the guidelines of the National Territorial Commission (CNT), created by article 184 of Decree-Law No. 80/2015 of May 14, which coordinates the implementation of the national policy for territorial planning, supported by qualitative and quantitative indicators of territorial management instruments, public utility restrictions, and administrative servitudes. In turn, the CNT is chaired by the Director-General of the Territory, and includes representatives from each of the regional coordination and development commissions; the Portuguese Environment Agency; the Institute for Nature Conservation and Forests; the National Association of Portuguese Municipalities, represented by a municipal entity, intermunicipal entity, or association of municipalities when matters of their respective competence are at stake, and by a representative of non-governmental organizations for the environment and spatial planning.

About smart cities, the CNT[14] approved on December 17, 2020,

[14] The Directorate-General for Territory provides logistical, administrative, and

the "PDM GO - Good Practices for Municipal Master Plans," which is composed of different thematic notebooks related to the smart city agenda: adaptation to climate change, ecosystem services, landscape, mobility in low-density territories, circular economy, sustainable use of rural land, and economic and financial sustainability.

Among other functions, the CNT recommends guidance to the DGT on the National Territorial Planning Policy Program (PNPOT),[15] which is the top-level instrument of the territorial management system, as it defines strategic objectives and options for territorial development and establishes the national territory organization model. The PNPOT is the reference framework for other territorial programs and plans and the guiding instrument for strategies with territorial impact. The PNPOT,[16] currently governed by the 1st revision of the PNPOT,[17] published on September 5, 2019, applies to the entire national territory, including the Azores and Madeira archipelagos, without prejudice to the specific competences of the Autonomous Regions.

Briefly outlining this intricate geoinformational system, the Government ensures, through the DGT, the use of the following electronic platforms (art. 190, 1 and 2): (i) Collaborative platform for territorial management, intended to support the monitoring of territorial programs and plans, both by the entities responsible for their preparation, amendment or revision, and by the entities representing public interests present in the respective intervention area; and (ii) Automatic submission platform, intended for sending territorial programs and plans for publication in the Official

technical support for the functioning of the National Commission for Territory (article 186, paragraph 5, Decree-Law no. 80/2015, of May 14th).

[15] See https://pnpot.dgterritorio.gov.pt/

[16] The first National Spatial Planning and Urban Development Policy (PNPOT) (Law no. 58/2007, of September 4th, corrected by Declarations of Rectification no. 80-A/2007, of September 7th, and no. 103-A/2007, of November 23rd) was created by the Basic Law of Spatial Planning and Urbanism of 1998.

[17] See Law No. 99/2019.

Gazette and for deposit in the Directorate-General for Territory, as well as for sending for publication in the Official Gazette all acts constituting the processes for the formation of the territorial programs and plans identified in the following article.

In the latter case, there is express mention in art. 191, 7, of the need to ensure permanent accessibility and legibility in the National Territorial Information System (SNIT)19[18] of the maps and graphic pieces. The SNIT aims to monitor and evaluate the policy of territorial planning and urbanism, being a Modular System that integrates several applications respecting national and international norms and standards. Its evolution has made it possible to provide georeferencing tools that allow the user to obtain a Location Plan, particularly for the instruction of procedures provided for in the Entrepreneur's Counter.

There is also the possibility of: (i) accessing the Overlays Portal focused mainly on the possibility of overlapping information on matters of Territorial Planning that companies, institutions, and citizens in general need to obtain to know and evaluate the possibility of realizing their projects and initiatives; and (ii) accessing the module dedicated to Easements and Restrictions of Public Utility (SRUP), as well as the respective WFS services, for each of its typologies.

In addition to the SNIT, the DGT manages at least three other platforms:

(i) The National Geographic Information System (SNIG), which implements the INSPIRE Directive in Portugal and consists of the registration and search of geographic data and data services produced by public and private entities in Portugal. It is in the National Register of Geographic Data (RNDG), created by DL 180/2009, that public entities must document the geographic data sets they produce or maintain, related to the territory or waters under national jurisdiction;

[18] More information at https://www.dgterritorio.gov.pt/ordenamento/snit

(ii) The National Cadastral Information System (SNIC), which promotes knowledge of the land structure of the territory covered by registered buildings and land ownership. It is responsible for consolidating the Cadastre Map and the geometric cadastre system of rustic property, which culminated in the Single Property Desk (eBUPi),[19] as well as the information contained in the databases of property descriptions of the Institute of Registries and Notaries (IRN) and the databases containing the matriculation registrations of the Tax Authority (AT); and

(iii) The Land Use Monitoring System (SMOS), which innovates by continuously, collaboratively, openly, and multifunctionally producing cartographic information on land use and occupancy, essential for smart cities. The SMOS employs space technologies and Artificial Intelligence to create products with greater detail, quality, and speed, including expert knowledge in satellite images and geographic information.

4. *Conclusion*

The DGT plays a fundamental role in the establishment of smart cities in Portugal. Despite not being a municipal entity, it is the legally constituted authority to integrate Portuguese geoinformation and allow municipalities to access standardized statistical, locational, and georeferenced data for the exercise of activities related to the municipal master plan, urbanization plan, and detailed plan, in accordance with CNT guidelines and the PNPOT.

[19] The Task Force for the Expansion of the Simplified Cadastral Information System was created by the Council of Ministers Resolution no. 45/2020 and is jointly supervised by the Ministries of Justice and Environment, as well as by partners from different sectorial areas of the Public Administration.

Often, we think of smart cities as "software" that deals with specific layers and reflects the social functions of cities: human rights, housing, work, leisure, mobility, education, health, safety, preservation of cultural and natural heritage, urban sustainability, etc.

However, it is essential to address geoinformational issues as a major "hardware" that precedes all these debates, which are crucial but will not interoperate if they do not have the geometric and algorithmic logic resulting from the Right to Geoinformation. There must be a legal construction as sophisticated as the geoinformational platforms available to citizens, resulting in obtaining territorial justice in a broad sense and the Right to Smart City in a strict sense.

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THE CULTURAL HERITAGE THAT SHAPES THE SMART CITY MODEL IN SPAIN *

Josep Ramon Fuentes i Gasó **

1. *Preface*

The city as a legal institution and as a space where an important multiplicity of social phenomena originates and develop —family, employment, social relationships, commerce, school/education, among others— it adapts and transforms according to the global dynamic context. We have traveled through the Greek *polis* and the medieval city [1] and now we enter the smart cities, cities that are characterized by the use of technology as a tool to improve the

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[1] F. Chueca Goitia, *Introducción al estudio de la ciudad*, in *Revista de Estudios Políticos*, 83, 1955, p. 45.

quality of life of citizens and for the interrelation of the different actors that make it up —the government, citizenship, private sector, among others—[2]

With the emergence of smart cities, mobility, social networks, cloud computing and big data are generating a connected and collaborative society, developing new formulas to communicate, consume, work and enjoy leisure and free time.[3] More and more facets of our lives are mediated by technology, to the point that we would not understand our day to day without it.[4] This new city model can generate shared prosperity and wellness, or suppose new barriers for the exercise of human rights or for the preservation and conservation of cultural heritage. As Garcia Rubio states:

> "No area of Western society is oblivious to the transformation process promoted by the digital revolution that also reaches all activities and public policies of public administrations, which are being transformed to the extent that they must incorporate this digital reality and therefore Smart Cities cannot be understood in their full scope without taking into account digital technologies."[5]

As a result, public administrations face the challenge of incorporating information and communication technologies (ICTs) to ensure the improvement of citizens' living conditions, ensuring the effective enjoyment of their fundamental rights and promoting the knowledge, use and enjoyment of cultural heritage, which, generation after generation, has been placed at their service.

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[2] Vid. J.R. Fuentes i Gasó, *Patrimonio cultural y* smart city*: la transformación integral de la ciudad*, in *Cuadernos de Derecho Local*, 39, 57, 2021, pp. 124-171.

[3] J.R. Fuentes i Gasó, *El modelo smart city y el patrimonio cultural en una nueva era globalizada*, in A. Monagas de Masiá (coord.), *Ciudades inteligentes: un reto para Iberoamérica*, AVEDA, Caracas, 2023, p. 327.

[4] Fundación Telefónica, available at: https://www.fundaciontelefonica.com/cultura-digital/. Retrieved June 27, 2023.

[5] F. García Rubio, *El urbanismo del suelo urbano. Por un desarrollo urbano inteligente, inclusivo y que preserve la belleza en tiempos postpandémicos*, Atelier, Barcelona, 2023, p. 162.

In this paper we will review the role of culture and cultural heritage in the development and construction of smart cities and the need to incorporate cultural heritage into new organizational models, every time that the city is either "traditional" or "smart" should seek the survival of culture as a necessary element in the construction and development of humanity. [6]

2. *New models of cities*

In *smart cities* as natural evolution of the traditional city on the one hand, ICT and on the other, the companies and corporations involved in the process of creation and adaptation thereof implementing infrastructures and devices aimed at a broad framework of action with a wide range of influences: energy efficiency, urban spending, mobility, reduction of pollution, political transparency, greater agility of administrative and bureaucratic processes, among others. [7]

2.1. *Origin and concept*

It is difficult to determine the historical moment of the emerge of Smart Cities as well as to define their meaning. [8] For Klauser et al. [9] followed by Tello [10] the origins of the term *smart cities* date back to

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[6] F. Bonete Vizcaino, *Smart Cities y patrimonio cultural. Una integración necesaria para el desarrollo*, in *Revista TELOS*, 102, 2015-2016, p. 63.

[7] Ibidem, p. 59.

[8] Vid. among others: R. Hollands, *Will the real smart city please stand up? Intelligent, progressive or entrepreneurial?*, in *City: Analysis of Urban Change, Theory, Action*, 12, 3, 2008, pp. 303-320. V. Mosco, *The Smart City in a Digital World*, Emerald Publishing, Bingley, 2019. Jathan Sadowski and Frank Pasquale, *The spectrum of control: A social theory of the smart city*, in *First Monday*, 20, 7-6, 2015, pp. 1-22.

[9] F. Klauser et al., *Smart cities as corporate storytelling*, in *City: Analysis of Urban Change, Theory, Action*, 18, 3, 2014, pp. 307-320.

[10] A. Tello, *Programar y gobernar: Disputas tecnológico-políticas en la época de las smart cities*, in *Arbor: Ciencia, pensamiento y cultura*, 198, 803-804, 2022, p. 3.

the second half of the 20th century, specifically in: 1. The computerization project of the registers and operations of the city of Los Angeles, 2. In the American movements to create *wired cities* in the seventies, 3. In the ideas of the so-called New Urbanism, or, 4. In pioneering urban planning projects that used ICTs in cities in Australia and Malaysia during the 1990s. [11]

For their part Carrato Gómez and Roig Segovia say that the concept smart city was first introduced in 1994 [12] while Guerra de los Ríos considers that smart cities were born approximately in 2008 with the financial crisis at which time technology companies found a new niche in the local market. [13]

Regardless of the historical beginning that wants to be assigned to them, it was only in the first decade of the 21st century when the concept of *smart city* begins to configure a more homogeneous story, from the confluence of certain factors such as political intuition, the opportunism of ICT entrepreneurs and the emergence of the megacities of the twentieth century. [14]

Regarding its definition, there have been high expectations since *smart cities* have been considered a driving force of the European economy but also a speculative bubble. [15] Lombardi et al. consider that the notion of smart city puts its emphasis on the use of technology in everyday life to offer innovative solutions to daily

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[11] Ibidem.

[12] A. Carrato Gómez and E. Roig Segovia, *De la ciudad sostenible a la ciudad hub: obsolescencia y renovación de indicadores urbanos*, in *Ciudad y territorio: Estudios territoriales*, 213, 2022, p. 569.

[13] B. Guerra de los Ríos, *Ciudades inteligentes, más que tecnología*, in *Cultura económica*, 38, 100, 2020, p. 44. Vid. in this sense: A. Romero Tarín, *El paradigma de las smart cities en el marco de la gobernanza urbana*, in *Gestión y Análisis de Políticas Públicas*, 20, 2018, p. 32.

[14] *Vid.* among others: M. Foucault, *La arqueología del saber*, Siglo XXI, México, 2009. A. Tello, *Programar y gobernar...*, *op. cit.*, p. 3. B. Cathelat, *Smart Cities. Shaping the Society of 2030*, UNESCO, Paris, 2019.

[15] J.R. Fuentes i Gasó, *Patrimonio cultural y smart city...*, *op. cit.*, p. 129.

transport problems, infrastructure and logistic, and more environmentally friendly energy supplies.[16] One of the most extended definitions, points that a s*mart city* is that city:

> "Whose investments in human and social capital, as well as in traditional transport and ICT infrastructures promote sustainable economic growth and a high quality of life, with wise management of natural resources through participatory governance."[17]

This definition is interesting in that it connects the most common idea of smartness linked to urban development, as a dynamic, computerized, instrumentalized, interconnected and intelligent system, with a social aspect, which aims to increase the participation of citizens in public management through the use of ICTs with a view to improving transparency in the functioning of Public Administrations[18] "by making more information available to citizens for decision-making, and by encouraging public authorities to be accountable for their management".[19] A city that is committed to placing "people and their needs at the center of the system's action", through its assessment and personal development,[20] and for the development of environmental sustainability of the actions implemented therein.[21]

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[16] P. Lombardi et al., *An analytic network model for Smart cities*, available at: http://isahp.org/uploads/63_0116_giordano.pdf. Retrieved June 27, 2023.

[17] A. Caragliu et al., *Smart cities in Europe*, in *Journal of urban technology*, 18, 2, 2011, pp. 65-82.

[18] J.R. Fuentes i Gasó, *El modelo smart city y el patrimonio cultural*..., *op. cit.*, p. 328.

[19] D. Santiago Iglesias, *La implementación de proyectos* smart city *en núcleos urbanos de tamaño medio: análisis de experiencias en Castilla y León*, in *Revista Jurídica de Castilla-León*, 39, 2016, p. 27.

[20] M.V. Forns i Fernández, *Los servicios sociales locales como garantes del Estado del Bienestar en el Estado Español: análisis del régimen jurídico de la atención a la persona en Cataluña*, in *Revista de Direito Econômico e Socioambiental*, 9, 3, 2018, p. 7.

[21] Vid. United Nations Educational, Scientific and Cultural Organization, Culture Urban Future. Global Report on Culture for Sustainable Urban

In Spain, the Spanish Association for Standardization and Certification (AENOR) [22] defines *smart city* as:

> "A fair and equitable city, focused on the citizen, which continuously improves its sustainability and resilience by taking advantage of available knowledge and resources —Especially Information and Communication Technologies (ICT)— to improve the quality of life, the efficiency of urban services, innovation and competitiveness, without compromising future needs in economic, governance, social and environmental aspects".

Many definitions of smart city have been given, and all of them are subject to constant review since "certainly, its precise definition and delimitation still presents uncertainty margins; and significantly, at least twenty different meanings can be counted in the ongoing debate in the United States". [23] For Hollands the problem of the ambiguity of the definition derives from the multiple meanings with which the term *smart* is handled which in most cases is used to refer to the use of technological innovation in the optimization of cities, the implementation of ICTs in public services or the creation of new types of e-governance, learning communities, knowledge economies, creative industries or even technological alternatives for sustainable development. [24] In general terms a smart city can be considered as that umbrella that serves:

> "A variety of strategies focused generically to improve economic competitiveness and urban quality of life, as well as towards a

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Development. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000245999. Retrieved June 27, 2023.

[22] This definition is in the Norm *UNE 178201:2016, Ciudades Inteligentes. Definición, atributos y requisitos*, made by the Normalization Committee C178 of Spanish Association of Normalization and Certification (AENOR).

[23] L. Vandelli, *Prologue*, in F. García Rubio, R. Camp i Batalla and L. Vandelli (coords.), *Las nuevas perspectivas de la ordenación urbanística y del paisaje: smart cities y rehabilitación. Una perspectiva hispano-italiana*, Fundación Democracia y Gobierno Local, Madrid, 2017, p. 13.

[24] R. Hollands, *Will the real smart city please stand up?*, *op. cit.*, p. 308.

> new, more sustainable, resilient urbanism, inclusive and participatory, pivoting around new urban infrastructures and the emerging role of Information and Communication Technologies." [25]

According to García rubio, sustainability is an element associated with smart cities, which refers to safety, efficiency of transport systems and infrastructures, local, national and international accessibility, among other issues. [26] In any case, any definition of *smart city* has as a common element, the use of technology to improve the sustainability and efficiency of public services, and is that:

> "The palette of urban public services is not fundamentally different from the one we find in non-urban territories, and this, despite the significant differences that exist between them. Thus, there is no doubt that certain public services are more widely available in cities, such as those linked to transport. Some of them are even found almost only in cities, is the case of bicycle rental services, cars in free service and municipal wifi. In *smart cities*, all kinds of new services in the form of digital applications are also beginning to emerge. In addition, the major economic players involved in the management of public services are much more willing to operate in cities." [27]

So, *smart cities* through a holistic understanding of the city "include improved quality of life, increased employment opportunities, socially and environmentally sustainable urbanization and increased economic and tourism development". [28] It is a new city model which transform

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[25] M. Fiori and R. Ribera Fumaz, *Smart Cities: Realidades y utopías de un nuevo imaginario urbano*, in *URBS. Revista de Estudios Urbanos y Ciencias Sociales*, 6, 2, 2016, p. 10.

[26] F. García Rubio, *El urbanismo del suelo urbano...*, *op. cit.*, p. 165.

[27] J.-A. Auby, *Droit de la ville*, 2a. ed., Lexis Nexis, París, 2016, p. 10.

[28] J.R. Fuentes i Gasó, *La protección jurídica del patrimonio cultural en la era* smart city, in J.R. Fuentes i Gasó, M.T. Carballeira Rivera and D.L. González Lopo (coords.),

how to live, manage, concert and enjoy the urban space.[29] A model that is not free of criticism or doubts and is that, although smart cities are "a more discursive reality than material is not impediment to have become the new organizing concept of urban development strategies".[30]

2.2. *Elements of change*

It affirms Guerra de los Ríos that perhaps one of the greatest attractions of the idea of the construction and/or development of *smart cities* is its multidimensionality, i.e.; it seeks to improve the quality of life of people in cities through changes in management models in various areas covering infrastructure, environment, energy and mobility, facilitation of economic activity, public services, among other sectors.[31]

According to Cerasoli the areas of intervention specific to the construction of a smart city are the following: 1. Improvement of public transport management and private mobility (infrastructure monitoring systems, traffic, parking, etc.). 2. Possibility to reduce travel (remote working, "horizontal" part-time, etc.) and transformation of mobility models, especially to reduce "unnecessary" mobility. 3. Reduction of pollutants, improvement of the quality of the urban environment, circular economy, among others.[32] 4. Improving the supply and quality of public and private

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Camino de Santiago y patrimonio cultural. Una visión jurídica integradora, Atelier, Barcelona, 2019, p. 234.

[29] H. Villarejo Galende, Smart cities*: una apuesta de la Unión Europea para mejorar los servicios públicos urbanos*, in *Revista de Estudios Europeos*, 66, 2015, p. 30.

[30] H. March Corbella and R. Ribera Fumaz, *Una revisión crítica desde la Ecología Política Urbana del concepto* smart city *en el Estado español*, in *Ecología Política*, 47, 2014, p. 30.

[31] B. Guerra de los Ríos, Bibiana, *Ciudades inteligentes, más que tecnología*, *op. cit.*, p. 60.

[32] Vid. C. Faccioli, *Calidad del aire y ciudad inteligente (smart city)*, Atelier, Barcelona, 2020, and S. Vernier and E. Lucatti, *Future Hall, Le Circular Smart City come driver*

services to citizens and tourists. 5. Urban energy independence (micro/mini power plants, recycling plants, etc.). 6. Improvement of housing quality (recovery/regeneration, energy efficiency, among others). 7. Remote monitoring of buildings and public spaces (hydrological risks, protection against accidental events, etc.). 8. Intelligent governance; participatory management of citizens in public affairs (e-government, smart economy, e-learning, etc.). [33]

In the same sense García Rubio pronounces when he says that we will be before a *smart city* when the following elements are present: 1. An urban space, 2. An infrastructure system, 3. An intelligent platform network complex, 4. A citizenry exercising different degrees of interaction, and; 5. A set of legal and administrative mechanisms that allow the use of these technologies by municipalities effectively and with respect for citizens' rights. [34]

We will briefly touch on two of these elements. The first is that of governance. In the management of smart cities public bodies and entities can have a lot of data that allow you to make more assertive decisions to meet citizens' needs, [35] however, the idea of governance must not be limited to Public Institutions, but —how Guerra de los Ríos affirms— the "nowadays smart city, inter and

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global si uno sviluppo sostenibilie resiliente, in V. Aguado i Cudolà, V. Parisio and O. Casanovas Ibàñez (dirs.), *El derecho a la ciudad: el reto de las* smart cities, Atelier, Barcelona, 2018, pp. 191-207.

[33] M. Cerasoli, *La recuperación de los centros históricos menores, hacia las 'historical small Smart Cities'*, in *ACE: architecture, city and environment*, 33, 2017, p. 176. Vid., also, V. Aguado i Cudolà, V. Parisio and O. Casanovas Ibàñez (dirs.), *El derecho a la ciudad: el reto de las* smart cities, Atelier, Barcelona, 2018.

[34] F. García Rubio, *Las nuevas perspectivas de la ordenación urbanística y del paisaje: smart cities y rehabilitación. Una perspectiva hispano-italiana*, in F. García Rubio, R. Camp i Batalla and L. Vandelli (coords.), *Las nuevas perspectivas de la ordenación urbanística y del paisaje: smart cities y rehabilitación. Una perspectiva hispano-italiana*, Fundación Democracia y Gobierno Local, Madrid, 2017, p. 32.

[35] R. Martínez Gutiérrez, *Gestión inteligente y sostenible de las ciudades: gobernanza, smart cities y turismo*, in M.T. Cantó López, J.A. Ivars Baidal and R. Martínez Gutiérrez (dirs.), *Gestión inteligente y sostenible de las ciudades: Gobernaza, Smart Cities y turismo*, Tirant lo Blanch, Valencia, 2018, p. 24.

hyper connected, requires an open data model that allows citizens be informed in real time with official data and numbers" or in the words of Bouskela et al. "it is not enough to have smart cities, smart citizens are also needed". [36]

Smart cities require citizens that, counting with timely and reliable information, participate in the construction, development and evolution of the city, people who are aware of what happens in their environment and with a sense of belonging to it are involved in the decision-making that affects them.

This brings us to the second element: the human factor. The benefits of implementing smart cities "include improved quality of life, increased employment and opportunities, socially and environmentally sustainable urbanization and increased economic and tourism development". [37] A *smart city* "cannot be created only by deploying sensors, networks and data analytics to improve the efficiency of your services. The growth of cities has allowed generating maintenance policies and improvement covering not only infrastructure but also vulnerable sectors and people". [38] The city model implies a new way of living, managing, arranging, consuming and enjoying the urban space. [39]

From the above we have that not only the "urban" is determinant for the construction of a smart city, but, the "human" becomes the central axis of this digital revolution enveloping and transmuting. [40] It is what has been called smart human city that is:

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[36] M. Bouskela et al., *La ruta hacia las smart cities: Migrando de una gestión tradicional a la ciudad inteligente*, Banco Interamericano de Desarrollo, Washington D. C., 2016, p. 6.

[37] J.R. Fuentes i Gasó, *La protección jurídica del patrimonio cultural...*, *op. cit.*, p. 234.

[38] J. Gifreu i Font, *Las actuaciones sobre el medio urbano como nueva frontera de las políticas públicas al servicio de la sostenibilidad territorial y urbanística*, in F. García Rubio, R. Camp i Batalla and L. Vandelli (coords.), *Las nuevas perspectivas de la ordenación urbanística y del paisaje: smart cities y rehabilitación. Una perspectiva hispano-italiana*, Fundación Democracia y Gobierno Local, Madrid, 2017, p. 63.

[39] H. Villarejo Galende, *Smart cities: una apuesta de la Unión Europea...*, *op. cit.*, p. 30.

[40] J.R. Fuentes i Gasó, *El modelo smart city y el patrimonio cultural...*, *op. cit.*, p. 332.

> "A concept that works from innovation, creating an urban area with adequate infrastructure, networks and intelligent platforms; an environment capable of listening and understanding what is happening in the city and therefore able to make better decisions and channel the delivery of appropriate information and services to its inhabitants, taking into account the needs of all people through the use of advanced analytical techniques and the availability of inclusive interfaces. *Smart human city* proposes a new paradigm of urban strategy considering the city as a complex and dynamic system whose most important objective is the welfare of all its citizens. It is the different components of the system, its perfect harmonious gear and its holistic design focused on the user that will provide citizens with an ecosystem capable of responding to the needs of its inhabitants". [41]

It is a more humane city project than the smart city, which, from a social perspective, takes into account the diversity existing in the city and, depending on it, strategies are developed that involve all persons belonging to a given collective. Attention is paid to the exercise of rights and individuals are regarded as the main recipients. This requires close collaboration between public administration and private companies in the creation of accessible material — for example, for the sector with disabilities—, "working together to create and develop basic services with accessible ICT applications, without having to look for alternatives". [42]

"A city is 'smart' when it is able to improve the quality of life of its citizens by emphasizing the context in which they live". [43]

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[41] M.J. Álvarez Ilzarbe et al., *Smart Human City–Hacia una ciudad inteligente para todas las personas*, April 24, 2015, available at: https://www.esmartcity.es/comunicaciones/smart-human-city-hacia-ciudad-inteligente-todas-personas. Retrieved June 27, 2023.

[42] Ibidem, p. 1.

[43] M. Cerasoli, La recuperación de los centros históricos menores..., *op. cit.*, p. 176.

Consequently, the concept of smart city has evolved in terms of four essential aspects:[44] communication; socialization;[45] environment and political transparency. Thus, "the idea of smart city refers to an impulse towards change, a total change, involving structures, relations, services, governance, using technologies, but not only technologies",[46] in which environmental sustainability and the energy transition are the keys to respond to climate change that transforms the world we know and that gives rise to the circular smart city, "un concetto che introduciamo per indicare un modelo di città che —integrando sviluppo tecnológico e sostenibilità ambientale— risulti capace di invertire davvero il trend in corso".[47]

Thus, for Faccioli:

> "The most resilient cities —able to evolve without deteriorating the environment— over the years will be those that manage to connect with the different realities without forgetting the by and the strength of the human factor, breeding ground for the generation and dissemination of innovative and exportable good practices to other territories. This evolutionary process and the establishment of a paradigm of life non-existent until now, passes through a transition of values and customs, gradually until the consequent birth of a collective consciousness, soul of the emerging smart cities".[48]

2.3. *Experimentation laboratories*

That the city "is the closest to the citizen is not a cliché, but rather the realization of a reality that sometimes exceeds. [...] Immediacy is

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[44] Vid. S. Colado García et al., *Smart City. Hacia la gestión inteligente*, Marcombo, Barcelona, 2014.

[45] Network spaces are created, which aim at cooperative construction: *Blog*, *Wikipedia*, *Facebook*, *LinkedIn*, etc.

[46] L. Vandelli, *Prólogo*, *op. cit.*, p. 13.

[47] S. Vernier and E. Lucatti, *Future Hall, Le Circular Smart City come driver global si uno sviluppo sostenibilie resiliente*, *op. cit.*, p. 196.

[48] C. Faccioli, *Calidad del aire y ciudad inteligente (smart city)*, *op. cit.*, pp. 484-485.

largely the cause of the wealth of local politics",[49] since "the potential of cities and their correlative local governments as transforming elements of the nearest reality".[50]

Some s*mart cities* that, as regards law, "this context of horizontal collaboration and 'bottom-up' dynamics also evolves the concept of regulation, is that the city becomes soft law legislator, writing global agendas and manuals of good local practices, without waiting for the legal support of the central State".[51]

In this sense, they become, at the same time, true schools of democracy, as Tocqueville affirmed: "the municipal institutions for freedom what primary schools for science: put it within the reach of the people, make it enjoy its peaceful use and accustom it to use it",[52] which constitute a perfect environment for experimentation and innovation, as pointed out by Professor Ballbé Mallol, for whom administrative plurality is "one of the keys to dynamism, political and institutional innovation".[53] "The strength of local power comes from the fact that it is the power with the greatest capacity for innovation and search for new solutions. And the method to achieve this is the application of another of the principles little rooted in our legal culture, as is the 'principle of experimentation'".[54]

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[49] J.R. Fuentes i Gasó, *Gobiernos Locales: retos de futuro*, in *Revista Democracia y Gobierno Local*, 29, 2015, pp. 5-6.

[50] J.R. Fuentes i Gasó, *L'administració local: elecció versus selecció, l'essència de la democràcia representativa. La dignificació de l'ofici de polític local*, in *Eines. El municipalisme al segle XXI*, 1, 2007, p. 82.

[51] C. Faccioli, *Calidad del aire y ciudad inteligente (smart city)*, *op. cit.*., p. 29.

[52] A. de Tocqueville, *La democracia en América*, vol. I, Paris, 1835, p. 62.

[53] M. Ballbé Mallol, *El futuro del Derecho Administrativo en la globalización: entre la americanización y la europeización*, in *Revista de Administración Pública*, 174, 2007, p. 245.

[54] M. Ballbé Mallol and J.R. Fuentes i Gasó, *Nous principis i capacitats competencials*, in *II Congrés de Municipis de Catalunya. Una aposta de futur*, Federació de Municipis de Catalunya i l'Associació Catalana de Municipis i Comarques (ed.), Casa Golferichs Barcelona, 2003, p. 408.

2.4. *Development*

In 2010 the European Union adopted the 2020 Strategy, which aims to achieve intelligent, sustainable and inclusive growth in the next decade. According to Franco Escobar the "smart" objective imposes as an obligation on the Member States an important investment in education, research and innovation. [55]

To meet these objectives, the European Parliament is committed to smart cities, by adopting solutions with ICT tools to increase efficiency, reduce costs and improve the quality of life, [56] in order to achieve a "smart growth [on the basis of the] development of an economy based on knowledge and innovation". [57] In this sense, it should be remembered that the European single market was conceived before the advent of the internet, before ICTs became one of the main drivers of growth and before services so dominated the European economy. The emergence of new services —such as content and media, health, smart energy measurement—, holds enormous potential, but Europe will only take advantage if it overcomes the fragmentation that currently blocks online content flow and access to consumers and businesses". [58]

The European 2020 strategy incorporates a commitment to promote the development of smart cities across Europe and to invest in the necessary ICT infrastructure and the development of human and social capital. It seeks intelligent growth, understood as:

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[55] S.E. Franco Escobar, *Luces y sombras de la administración electrónica para las smart cities*, in in F. García Rubio, R. Camp i Batalla and L. Vandelli (coords.), *Las nuevas perspectivas de la ordenación urbanística y del paisaje: smart cities y rehabilitación. Una perspectiva hispano-italiana*, Fundación Democracia y Gobierno Local, Madrid, 2017, p. 262.

[56] H. Villarejo Galende, *Smart cities: una apuesta de la Unión Europea...*, *op. cit.*, p. 32.

[57] European Commission, *Communication [COM(2010) 2020 final] named Europe 2020: A strategy for smart, sustainable and inclusive growth*, available at: https://eur-lex.europa.eu/legal-content/ES/TXT/?uri=celex%3A52010DC2020. Retrieved June 27, 2023.

[58] Ibidem, p. 25.

> "Consolidating knowledge and innovation as drivers of our future growth. This requires improving the quality of our education, consolidating research results, promoting innovation and knowledge transfer across the Union, make the most of ICTs and ensure that innovative ideas can be turned into new products and services that generate growth, quality jobs and to help meet the challenges of social change in Europe and the world. But to succeed, this must be combined with entrepreneurship, funding and priority attention to user needs and market opportunities". [59]

This commitment to the development of smart cities is not a new aspect at European Union level, but is a process that has already begun with the 7th Framework Program (2007-2013), approved by the agreement of the European Council on July 10, 2010. For the analysis of smart cities, Parliament uses a methodology according to which it considers a city to be smart if it has at least one initiative addressing one or more of the following characteristics: *smart economy, smart people, smart mobility, smart environment, smart governance* and *smart living*. [60] The financing tools planned for smart cities are aimed at achieving clear objectives such as: contribute to the sustainability of urban environments, improve the efficiency of urban services, reduce the carbon footprint of cities and stimulate the creation of an innovative environment for technology-based business development.

From the Organization for Economic Cooperation and Development perspective (OECD) thanks to applied technology cities can become "laboratories for a more dynamic and digital

[59] Ibidem, p. 15.

[60] In 2011, based on this definition, 240 of the 468 cities in the European Union with more than 100,000 inhabitants, 51% of the total were classified as smart cities. *Vid.*, European Parliament, available at: https://www.smartcities.at/assets/Publikationen/Weitere-Publikationen-zum-Thema/mappingsmartcities.pdf. Retrieved June 17, 2023.

economy" where innovative measures capable of generating growth and employment can be tested and translated into economic and social benefits for citizens, and "contribute to the "industrial and socio-economic recognition of the European Union". [61] In this sense, The European Strategy 2020:

> "It does not focus exclusively on the achievement of economic objectives; it seeks to combine them with respect for the environment and other social objectives. The above is indicative that it is aware that there is no insurmountable line between such objectives but that, they are all very related and therefore, to get one of them you have to take into account that this can affect the degree of achievement of the rest because, given that resources are limited and that, moreover, the achievement of social objectives implies the mobilization of a large number of resources, to the extent that they are targeted, the allocation of these resources to other objectives must be reduced". [62]

2.5. *Experiences*

There are several initiatives that exist in Spain for the promotion of smart cities and in which the different public administrations participate. The first of these, the National Plan of Smart Cities, approved by the government of Spain in 2015. It is a bet "of the Ministry of Economic Affairs and Digital Transformation to promote in Spain the technology industry of Smart Cities and to help local entities in the transformation processes to become Smart Destinies and Cities". [63] According to Bonete Vizcaino this plan

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[61] OECD, available at: http://www.oecd.org/sti/ieconomy/DigitalEconomy Outlook2015_SP_WEB.pdf Retrieved June 27, 2023.

[62] N. Matía Gallo, *Estrategia 2020. La estrategia europea para un crecimiento int8eligente, sostenible e integrador*, in *Derecho y Cambio Social*, 41, 2015, p. 15.

[63] Ministerio de Asuntos Económicos y Transformación Digital, available at: https://plantl.mineco.gob.es/planes-actuaciones/Paginas/plan-nacional-ciudades-inteligentes.aspx. Retrieved June 27, 2023.

considers, among other things, that Spain in 2014 was the 3rd most visited country in the world "with 65 million international tourists, and the second in volume of tourism revenues worldwide, which reached 48,928 million euros". [64]

We also find that the European Union has co-financed, through its European Regional Development Fund (ERDF), projects of smart cities and islands in Spain, which have allowed to develop projects of smart cities in Alicante, Cáceres, Córdoba, Gijón, Las Palmas de Gran Canaria, Lugo, Murcia, Palencia, Zaragoza, Madrid, A Coruña, Santiago de Compostela, Ponferrada, Santander, Segovia, Valencia, Valladolid, Granada, Huelva, Sevilla, Toledo; Badajoz, the region of Costa del Sol, Alcalá La Real, Lepe, Martos, Valdepeñas, Almendralejo, Villanueva de la Serena, El Hierro, Fuerteventura or Mallorca. [65]

In addition, there is the Spanish Network of Smart Cities which is defined as an "association of local territories whose entities are representative of the territory and lead innovation systems in their own area by fostering their own local network of research and innovation actors" [66] with more than 140 partner municipalities. [67]

According to the Ministry of Economic Affairs and Digital Transformation, Spain is among the countries with the most smart governance projects, along with France, Germany, Sweden and the United Kingdom; and smart mobility initiatives, together with Hungary, Romania and Italy, [68] however, its implementation has not

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[64] F. Bonete Vizcaino, *Smart Cities y patrimonio cultural...*, *op. cit.*, p. 62.

[65] F.J. Durán Ruiz, *Implicaciones jurídicas de la implementación de ciudades inteligentes en la unión europea y en España*, in *Revista internacional CONSINTER de direito*, 6, 11, 2020, p. 118.

[66] Esmartcity.es, available at: https://www.esmartcity.es/2013/09/12/red-espanola-de-ciudades-inteligentes. Retrieved June 27, 2023.

[67] According information posted on their social media (twitter: @RedRECI), Retrieved June 27, 2023.

[68] National Plan of Smart Cities, available at: https://plantl.mineco.gob.es/planes-actuaciones/Bibliotecaciudadesinteligentes/Detalle%20del%20Plan/Plan_Nacional_de_Ciudades_Inteligentes_v2.pdf. Retrieved June 27, 2023.

been exempt from sweeps and challenges, and without wanting to delve into this chapter, we mention that among them are: the protection of personal data, the digital single market, open data, public procurement, the use of artificial intelligence and its impact on decision-making, citizen participation, the concept of accessible cities and the inclusion of people with disabilities or digital administration. [69]

3. *Culture as a configurator element*

Culture and cultural heritage as configurators of smart cities is another challenge facing the implementation of the model. If different theoretical approaches that are made to the idea of smart cities are reviewed —referred to in previous paragraphs— it will be possible to observe that there are few —or none— those that address the cultural dimension of the same. This absence of mention about culture or cultural heritage in the idea of *smart cities* is relevant if we take into account that "the city is the space of satisfaction of material and spiritual needs of its inhabitants". [70]

As Bonete Vizcaino affirms [71] this absence can be observed in the White Paper of the smart cities that although it refers to the government, mobility, sustainability, the population or the economy as elements that can be transformed into a smart city, does not mention the culture or the role of cultural heritage within it. On the other hand, it can be observed that timidly the National Plan of Smart Cities, without expressly emphasizing the importance of

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[69] F.J. Durán Ruiz, *Implicaciones jurídicas de la implementación de ciudades inteligentes...*, *op. cit.*, p. 119.

[70] G. González Martínez, *Los centros históricos, ¿ciudades creativas? Problemáticas y posibles soluciones en torno a la gestión sostenible del patrimonio*, in *Telos: Cuadernos de comunicación e innovación*, 105, 2016-2017, p. 31.

[71] F. Bonete Vizcaino, *Smart Cities y patrimonio cultural...*, *op. cit.*, p. 62.

culture as an element for the integral development of cities, recognizes the great wealth of Spanish heritage and the relevance of smart tourism in the context of smart cities.

Despite this silence regarding culture and cultural heritage as an integral element of smart cities, they are necessary for the full development of the city as a legal institution —*smart* or not— is that the cultural heritage is —among other things— a vivid display of who we are, were and will be; of our identity as a society and its incorporation within the notion smart is, without a doubt, necessary.

The city in the new smart model should not focus only on the use of ICT and the interrelationship between public bodies and entities, private sector and citizens. These links must be accompanied by an effective link with the underlying and common history of their environment and is that, "There is no point in a meaningless intelligence, without a good purpose, without culture".[72] As McLuhan came to affirm:

> "Unlike previous environmental changes, electronic media represent a total and almost instantaneous transformation of culture, values and attitudes. This agitation generates much pain and a loss of identity, which can only be healed if we are aware of its dynamics."[73]

4. *Cultural heritage*

Although culture and cultural heritage are not expressly mentioned in the definitions of smart cities, this does not prevent them from promoting their momentum, promotion and protection inside the new smart era. Spain has a legal regime that facilitates not only the

[72] Ibidem.

[73] M. McLuhan and E. Norden, *La entrevista de Playboy: Marshall McLuhan*, in C. Scolari (coord.), *Ecología de medios: entornos, evoluciones e interpretaciones*, Editores Gedisa, España, 2015, p. 53.

protection of cultural heritage, but its perfect coexistence and interaction with smart cities.

In this regard, we will begin by noting that, according to UNESCO, the term "culture", in a broad sense, can be understood as the set of distinctive features or elements, spiritual and material, intellectual and emotional characteristics of a society or social group.[74] It encompasses, in addition to arts and letters, lifestyles, fundamental human rights, value systems, traditions and beliefs, and that culture gives man the ability to reflect on themselves. It is it who makes us specifically human beings, rational, critical and ethically committed. Through it we discern values and make choices. Through it humankind expresses themselves, becomes aware of themselves, recognizes themselves as an unfinished project, questions their own achievements, tirelessly seeks new meanings, and creates works that transcend them.[75]

Culture has a value in itself, since it is part of the construction of people's own lives, which promotes development through its inclusion and exploitation. Culture can also be considered as a means of promoting specific areas, hence UNESCO highlights that we are witnessing a commodification of new sectors, including cultural. In view of this, UNESCO considers it important to attend to those research and proposals that are working in the field of linking cultural industries and creative industries with development "so that inherent creativity at all heights is harnessed for the development of each community".[76] Inside of it, "cultural heritage" builds itself:

> "As a heterogeneous set of goods and activities extremely diverse, broad and flexible, whose conceptualization is a process in continuous evolution which gives it very particular characteristics

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[74] UNESCO, UNESCO and the world ahead, available at: https://unesdoc.unesco.org/ark:/48223/pf0000074809. Retrieved June 27, 2023.

[75] Ibidem.

[76] UNESCO, *Las Transformaciones de la educación superior de América Latina: identidades en construcción,* available at: https://unesdoc.unesco.org/ark:/48223/pf0000191731. Retrieved June 27, 2023.

> and a very specific common legal system. It is therefore a dynamic and malleable concept that does not depend on the goods themselves, but on the values that society attributes to them at every moment and determining which of these goods deserve to be protected and preserved for posterity". [77]

The notion of cultural heritage encompasses the artistic and historical as central values and typologies, which incorporates other elements that integrate a new expanded notion of culture characterized by an intangible, incorporeal element. Cultural heritage therefore includes traditions or living expressions inherited from our ancestors and transmitted to our descendants, as oral traditions, arts, social uses, rituals, etc. Thus, the concept of cultural heritage responds not only to the material good but also to the intangible good. [78]

From these ideas we understand that smart cities do not escape being "touched" by cultural heritage. In fact, in a world where the physical and the digital come together and connect "heritage destinations have the challenge to adapt to current challenges, where innovation acts as a lever for transformation". [79]

4.1. *Constitutional legal framework*

Rights relating to culture have been positivized in the form of constitutional principles or values, in articles 44.1 and 46 of the Spanish Constitution (CE), Title I, Chapter III, under the heading "Guiding principles of social and economic policy". Accordingly,

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[77] A. Azpeitia Santander, *Patrimonio y cultura. El concepto de patrimonio cultural en la normativa vasca*, in *Revista de la Facultad de Ciencias Sociales y Jurídicas de Elche*, I, 11, 2016, pp. 371-372.

[78] J.L. Alonso Ponga, *La construcción mental del patrimonio inmaterial*, in *Patrimonio Cultural de España*, 0, 2009, p. 45.

[79] J.V. Calle Lamelas et al., *La ciudad histórica como destino turístico inteligente. El caso de Segovia, ciudad patrimonio mundial*, in *Investigaciones Turísticas*, 23, 2023, p. 273.

these provisions must inform positive legislation, judicial practice and the actions of public authorities.

Article 44 CE advocates the right of all citizens to have access to culture, requiring for its effective realization two fundamental requirements such as the very existence of a cultural heritage and the enhancement of it. For this reason, the right of access to culture acquires a meaning when it is connected with the principle enshrined in Article 46, where the public authorities are assigned the task of ensuring the preservation and to promote the enrichment of the historical, cultural and artistic heritage of the peoples of Spain and of the property comprising it, whatever its legal status and title. Thus, "the integration of the cultural term unquestionably broadens the concept of the protected to accommodate what is now termed as immaterial culture". [80]

Article 149.1.28 CE confers on the State exclusive competence to defend Spain's cultural, artistic and monumental heritage against export and plunder, State-owned museums, libraries and archives, without prejudice to their efforts by the Autonomous Communities (CCAA). However, Article 148 CE confers on the Autonomous Communities competences on museums, libraries and music conservatories of interest to the autonomous community; the monumental heritage of interest to the Autonomous Community, the promotion of culture, research and, where appropriate, the teaching of the language of the Autonomous Community.

Therefore, there is a competition of competences between the State and the Autonomous Communities ordered to the preservation and encouragement of cultural values. The basis of competition is Article 149.2 of the CE, where after recognizing the autonomous competence affirms a state competence shaping

[80] C.M. Ávila Rodríguez and M.d.P. Castro López, *La salvaguardia del patrimonio cultural inmaterial: una aproximación a la reciente Ley 10/2015*, in *Revista sobre Patrimonio cultural: regulación, propiedad intelectual e industrial*, 5-6, 2015, p. 98.

culture as an essential duty and attribution.[81] Thus, as the Constitutional Court affirms, what occurs is a concurrence of competences between the State and the Autonomous Communities "ordered to the preservation and encouragement of cultural values".[82] Moreover, the High Court also states that "a reflection on cultural life leads to the conclusion that culture is something of the own and institutional competence of both the State and the Autonomous Communities".[83]

4.2. *Legal regime*

The Act 16/1985, of June 25, of Spanish Historical Heritage (LPH) in Article 1 states that "they are the object of this Law of protection, enhancement and transmission to the future generals of the Spanish Historical Heritage".[84] In this context, the Artistic Historical Heritage is considered a collective wealth whose use and enjoyment must be guaranteed for citizens. And it is that, according to the prologue of the law:

> "(...) its value is provided by the esteem that, as an element and cultural identity, deserves the sensitivity of citizens, because the assets that comprise it have become patrimonial exclusively due

[81] Some authors refer to this article as the singular formula in matters of culture and derived from the full assumption by the constituent of the polyhedral and complex nature of the concept of culture. Vid. C.M. Ávila Rodríguez and M.d.P. Castro López, *La salvaguardia del patrimonio cultural inmaterial...*, *op. cit.*, p. 100.

[82] Judgment of the Constitutional Court of 17 July 2014, Case No. 5277-2013 (available at: https://www.boe.es/buscar/doc.php?id=BOE-A-2014-8751. Retrieved June 27, 2023).

[83] The social right to culture is enshrined in numerous judgments of the Supreme Court, including: Judgment of the Constitutional Court, 5 April 1984, Case No. 182-1982 (available at: http://hj.tribunalconstitucional.es/ca-ES/Resolucion/Show/302#complete_resolucion. Retrieved June 27, 2023).

[84] On historical heritage legislation, see inter alia, C. Barrero Rodríguez, *La ordenación jurídica del Patrimonio Histórico*, Civitas, Madrid, 1990.

> to the social action that they fulfill, directly derived from the appreciation with which the citizens themselves have been revalued."

It is further stated that the Act seeks:

> "(...) in short, to ensure the protection and to promote the material culture due to the action of man in the broad sense, and conceives it as a set of goods that in themselves are to be appreciated, without limitations arising from ownership, use, age or economic value." [85]

The LPH in article 1.2 provides that they integrate the Spanish historical heritage or the "cultural heritage" —according to the name more in accord with the varied reality of goods that integrate it— properties and movable objects of artistic, historical, paleontological, archaeological, ethnographic, scientific or technical interest, but also include documentary and bibliographical heritage, archaeological and natural sites, gardens and parks, of artistic, historical or anthropological value, and assets that integrate intangible cultural heritage, in accordance with their special legislation.

Hence, the cultural heritage is configured as: material or tangible (buildings, monuments, artifacts, clothing, works of art, books, machines, historical cities, archaeological sites); intangible (representations, knowledge, skills, cultural objects and spaces;

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[85] Similarly, Act 9/1993, of 30 September, on the Catalan Cultural Heritage (LPC), states in the Preamble that "cultural heritage is one of the fundamental testimonies of the history and identity of a national community. The assets that comprise it constitute an irreplaceable heritage, which must be transmitted in the best possible conditions to future generations. Protection, conservation, enhancement, research and dissemination of knowledge of cultural heritage is one of the fundamental obligations of public authorities". Vid. in totum, the excellent work of J. Gifreu i Font, *Régimen jurídico de la protección y fomento del Patrimonio Cultural en Cataluña: estado de la cuestión*, in *Patrimonio cultural y Derecho*, 22, 2018, pp. 237-335.

including oral language and traditions, performing arts, social practices and traditional crafts); and natural (landscapes, flora and fauna). But, in recent times you could add digital, created in digital form (digital art or animation) or digitized to preserve them (including texts, images, video, records). [86]

The Spanish State possesses a cultural richness that goes beyond its monuments and collections of objects, extending to traditions or living expressions, understanding by these, their oral traditions, performing arts, social uses, rituals, festive events, knowledge, practices relating to nature, traditional medicine, knowledge and even techniques linked to traditional crafts. "The cultural heritage of Spain includes not only tangible objects/material goods, but also intangibles". [87]

In this sense, on the intangible cultural heritage, the LPH contemplates such cultural events [88] in Title IV, relative to ethnographic heritage as special heritage. Article 46 LPH includes in the Spanish historical heritage, together with movable and immovable property "the knowledge and activities that are or have

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[86] In the same vein, the first article of the Catalan LPC refers to the two major areas of goods comprising the "cultural heritage", that is, the "material heritage" and the "intangible heritage": "2. The Catalan cultural heritage is integrated by all the movable property, the immovable property related to the history and culture of Catalunya that for its historical, artistic, architectural, archaeological, paleontological, ethnological, documentary, bibliographical, scientific or technical value, merit special protection and defense, so that they can be enjoyed by citizens and can be transmitted in the best conditions to future generations. 3. Also part of the Catalan cultural heritage are intangible assets that are part of popular and traditional culture and linguistic particularities, in accordance with Act 2/1993, 5 March, Promotion and Protection of Popular and Traditional Culture and Cultural Associations".

[87] J.R. Fuentes i Gasó, *Régimen competencial del patrimonio cultural inmaterial*, in M.T. Carballeira Rivera, M. Taín Guzmán and J.R. Fuentes i Gasó (eds.), *Patrimonio cultural inmaterial: De los Castells al Camino de Santiago*, Tirant lo Blanch, Valencia, 2021, p. 97.

[88] Vid. C.M. Ávila Rodríguez and M.d.P. Castro López, *La salvaguardia del patrimonio cultural inmaterial...*, *op. cit.*, p. 103.

been relevant expression of the traditional culture of the Spanish people in its material, social or spiritual aspects". Article 47 LPH classifies ethnographic heritage into three categories: immovable property of ethnographic nature, movable property of ethnographic nature and intangible assets of an ethnographic nature.[89] On the latter category, the rule determines that they will enjoy administrative protection, obliging the competent administration to take appropriate measures leading to the scientific study and documentation of them when it comes to knowledge or activities which are in foreseeable danger of disappearing.[90]

With this regulation, the LPH stands out by introducing for the first time in the Spanish legal system, the consideration of intangible assets as assets of historical heritage, with the consequent application of all the protection techniques provided.[91] In addition, however, specific protection techniques are provided for ethnographic intangible heritage when establishing an administrative function of documentation or collected in material support, involving the conversion of the "goods activity" into proper goods.[92] However, these cultural assets have also been referred to in environmental legislation, with the aim of interrelating the protection of cultural, historical and artistic heritage with the environment.[93]

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[89] But the LPH does not use this terminology, but defines them as "knowledge or activities that come from traditional models or techniques used by a given community".

[90] Article 47.3 LPHE.

[91] Sánchez Mesa and Bombillar Sáenz consider that the declaration of Good of Cultural Interest, the highest category of protection of the assets belonging to the Historical Heritage provided for in the LPH is extendable to an ethnographic or ethnological good. Vid. L. Sánchez-Mesa Martínez and F.M. Bombillar Sáenz, *El valor cultural y turístico de las prácticas deportivas tradicionales y su fomento desde el derecho deportivo*, in *Revista andaluza de derecho del deporte*, 3, 2007, p. 238.

[92] M. Vaquer Caballería, *La protección jurídica del Patrimonio Cultural Inmaterial*, in *Revista de la Subdirección General de Museos Estatales*, 1, 2005, p. 90.

[93] Act 21/2013, 9 December, Environmental Assessment, establishes in the ordinary procedure of environmental impact assessment of projects and the

However, it is Article 2 of Act 10/2015, of 26 May, for the safeguarding of the Intangible Cultural Heritage (LPCI),[94] which establishes that the uses, representations, expressions, knowledge and techniques that communities will have the status of intangible cultural heritage, groups and in some cases individuals, recognize as an integral part of their cultural heritage, and in particular: a) Oral traditions and expressions, including linguistic modalities and particularities as a vehicle for intangible cultural heritage; as well as traditional toponymy as an instrument for the realization of the geographical designation of the territories; b) performing arts; c) social customs, rituals and festivities; d) knowledge and customs related to nature and the universe; e) traditional craft techniques; f) gastronomy, culinary preparations and food; g) specific uses of natural landscapes; h) forms of collective socialization and organizations; i) sounds, music and traditional dance.

This standard merely outlines a set of parameters on these assets, which do not prevent the Autonomous Communities from approving their own specific regulations on the matter.[95]

5. *Cultural* smart cities

As we have indicated in previous sections, culture is an intrinsic element of the city, of societies and therefore its inclusion should be encouraged in the construction of smart cities. However, in

mandatory character of the report on cultural heritage, which includes all meanings of heritage, including intangible.

[94] Safeguarding intangible cultural heritage has been present in the Spanish legal system prior to Spain's ratification of the 2003 UNESCO Convention. For an analysis of the normative references prior to Act 10/2015. Vid. C.M. Ávila Rodríguez and M.d.P. Castro López, *La salvaguardia del patrimonio cultural inmaterial...*, *op. cit.*, p. 107.

[95] However, it criticizes the excess of competence incurred by the Law in attributing to the State an executive competence such as the declaration of "representative manifestation of the Intangible Cultural Heritage".

order to do so, it is necessary to have a regulatory framework that promotes the protection, promotion and dissemination of cultural values and cultural heritage, it also needs to be included as a mechanism for the promotion of specific areas such as the economy, society, the environment, tourism, among others.

As stated by Bonete Vizcaino [96] in the economic sphere, the creation of applications for cultural purposes could be considered, which would stimulate the creation of new jobs. In the field of tourism "smart tourism" is already spoken of as a way to attract visitors to enjoy the culture of a given city using ICTs, or virtual museums, so necessary during the COVID-19 pandemic. [97] In educational matters it will always be necessary a continuous learning that contributes to give its fair value to the patrimonial assets, claiming the need to respect them and to invest in its restoration and conservation.

Under these premises the idea of smart heritage or "smart heritage has been built", understood as the identity of places through the implementation of smart technologies, knowledge and social inclusion, for the total participation in the promotion of cultural heritage.

The *smart heritage* bets for the transformation of the cultural good of inanimate object into a smart object [98] to the extent that users are no longer mere passive receivers; they become real active agents. In this process ICTs become relevant; but we should not forget about

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[96] F. Bonete Vizcaino, *Smart Cities y patrimonio cultural...*, *op. cit.*, p. 65.

[97] L. Bellas Melgosa, *'Que no pare la fiesta'. Estrategias de gestión del patrimonio inmaterial en Cataluña en tiempos de COVID-19*, in X. Roigé Ventura and A. Canals Ossul (ed. lit.), *Patrimonios confinados: retos del patrimonio inmaterial ante el COVID-19*, Universitat de Barcelona, Barcelona, 2021, p. 93. Vid. in this sense: J.R. Fuentes i Gasó, J. Jaria Manzano, V. Merino Sancho and P. Villavicencio Calzadilla (eds.), *El impacto social de la COVID-19. Una visión desde el derecho*, Tirant lo Blanch, Valencia, 2021.

[98] M. Gaiani and B. Martini, *Processi e temi per una smart cultural city*, in *SCIRES-IT*, 2, 2013, p. 5.

citizenship, since they are, in short, the first to know and the best to promote their own cultural heritage. In the *smart heritage* we can distinguish a double aspect: the *smart heritage management* o *smart heritage building*, focused on the figure of the monument, cultural asset, museum, etc. about its conservation, management and enjoyment and *smart heritage destination* or *smart heritage city* concept related to the fitting of cultural heritage in the development of the city.

Spain already has its first projects in smart heritage, such as Segovia as a smart tourist destination (DTI) [99] or *smartsantiago* which pretends to become Santiago de Compostela in a *smart heritage city*, [100] however, these proposals have not been exempt from problems or difficulties. In its implementation it has been necessary to evaluate and rethink, among others: 1. That public-private cooperation is fundamental to achieving sustainability and that local society should be the maximum beneficiary of the *smart heritage city*, 2. That the end user experience must be improved —inhabitant or tourist— to connect it with the heritage, 3. That ICTs are still a fundamental tool in the development and implementation of the *smart heritage city*. [101]

And it is that, as González Martínez affirms the necessary understanding of the heritage-smart city idea requires, among others: 1. Discover sources of funding for educational, restoration and conservation processes, 2. Promoting understanding and understanding among peoples, 3. Increase social awareness and citizen effort to preserve and maintain heritage, 4. Generate new

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[99] J.V. Calle Lamelas et al., *La ciudad histórica como destino turístico inteligente...*, *op. cit.*, p. 288.

[100] Ayuntamiento de Santiago de Compostela, available at: https://smartiago.santiagodecompostela.gal/es/smartiago/actividades-difusion/el-proyecto-smartiago-analizado-en-tarragona-en-la-jornada-smart. Retrieved June 27, 2023.

[101] J.V. Calle Lamelas et al., *La ciudad histórica como destino turístico inteligente...*, *op. cit.*, p. 287.

spaces of use and enjoyment for the benefit of the visitor and the resident, among others.[102] All this, not only for the preservation of cultural heritage, but also for the enhancement of resources and the economic development of cities.

6. *Epilogue*

In the development and evolution of smart cities, cultural heritage is a determining factor in their formation, since it links the past with the present of the urban community and projects them towards the future, placing the citizenry as the central element of the model to increase their quality of life. Cities are their citizens; but also their history and that is why the construction of a true smart city goes far beyond technological innovation, requires the incorporation of environmental sustainability, fair transition that contributes to mitigate climate change through the evolution towards a true *human circular smart city*, that by incorporating the human dimension, it incorporates the elements that have shaped its evolution and that constitute the cultural heritage to create a fair, sustainable and inclusive society.

A truly intelligent city, with the aim of improving the management of public services and facing the environmental and social challenges, especially for the most disadvantaged groups and at risk of social exclusion, which are posed to it. Just as Aguado i Cudolà affirms:

> "The right to the city built from sciences like sociology allows to serve as contrast or counterpoint to this unstoppable development of technology in urban public spaces and their appropriation from purely privatizing perspectives. It is, however, a right that has been described as emerging and that requires greater recognition from the perspective of the current legal system."[103]

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[102] G. González Martínez, *Los centros históricos, ¿ciudades creativas?*, *op. cit.*, p. 30.

[103] V. Aguado i Cudolà, *Los servicios de interés general en la ciudad inteligente: ¿una*

Thus, a much more evolved concept of smart city, *ville inteligente*, *città inteligente*, *intelligente stadt* or *ciudad inteligente* must consider all dimensions of urban sustainability, protecting the identity and material and intangible wealth of cities, including culture as the axis for achieving an integral development of the human beings that inhabit them. This requires plans for social development and the implementation of innovative services for the enjoyment and promotion of cultural heritage developed jointly by the public Administrations at different levels and, in particular local, for which it is also necessary to work together with "foundations, cultural associations, the third sector and even all voluntary associations who are active in the territory and who can help promote the active participation of all citizens in collaboration with smart city governments" [104].

In order to contribute to the transformation of our cities in *human circular smart city*, the European Commission has promoted the *Intelligent Cities Challenge* (ICC) program as an "initiative supporting European cities towards the green and digital transition of their local economies, through Local Green Deals. ICC helps European cities harness the power of cutting-edge technologies, while improving their economic competitiveness, social resilience and their citizens' quality of life". [105]

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prestación más eficiente a costa de mayores desigualdades sociales?, in V. Aguado i Cudolà, V. Parisio and O. Casanovas Ibàñez (dirs.), *El derecho a la ciudad: el reto de las* smart cities, Atelier, Barcelona, 2018, p. 111.

[104] J.R. Fuentes i Gasó, *Régimen competencial del patrimonio cultural...*, *op. cit.*, p. 113.

[105] European Commission, available at: https://www.intelligentcitieschallenge.eu/. Retrieved June 30, 2023.

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SMART CITIES AND LAW, E-GOVERNANCE AND RIGHTS

The project Smart Cities and Law, E.Governance, and Rights: Contributing to the definition and implementation of a Global Strategy for Smart Cities (with reference NORTE-01-0145-FEDER-000063) is a research project co-financed by the European Regional Development Fund (ERDF), which has been developed since 2021 at the Research Centre for Justice and Governance of the School of Law of the University of Minho.
Its object of study is the place of Law in the process of implementing Portuguese Smart Cities.
In particular, focusing on the study of the protection of fundamental rights in the digital transition process in local public governance, the project includes the study of the rules governing the processing of personal data and those on interoperability, open data, and data reuse, seeking to contribute to the elaboration of a proposal for a "Code of Good Practices for Local Digital Public Governance".

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