

# Artificial Intelligence in Government

**Carlos E. Jiménez-Gómez**, Consultant

**Jesús Cano-Carrillo**, Ministry of the Interior

Francisco Falcone Lanas, Public University of Navarre



*The repercussions of artificial intelligence (AI) in government are broad and significant. The characteristics of these technologies will have an impact on almost everything in public organizations, from governance or the multidimensional perspective of interoperability, to the organizational or social implications linked to concepts like public value, transparency, or accountability. This special issue seeks to shed light on foundations and key elements to be taken into account for AI adoption by public organizations.*

**G**overnments are the primary enablers of technology and market stimulators and regulators of general activities in our society. Governments have always sought the common good and, therefore, the advancement of public and collective interests. This is key to understanding, as a first step, why the principles of public-sector organizations do not always match those of the private sector. Public and private perspectives are very different, whether they be management, strategy, or policy.

In recent years, public services have improved due to the evolution of IT, making digital citizenry possible. Technology is a tool, and artificial intelligence (AI) enables an array of new applications, which may effectively break with traditional ways to deliver services, provide novel ones, or update others. AI in government opens and expands the borders of the old e-government conceptualization, becoming a kind of repetitively smarter smart governance. However, the social implications of AI in government are significant and far-reaching and include the drivers of democratic rules that shape modern states. Given the current complexities of this technological and social panorama, a breakthrough gap should be filled with research and informed and transparent answers that help political decision

makers, managers, IT directors, engineers, and any other entity interested in or linked to the public sector and AI adoption.

According to the Organisation for Economic Co-operation and Development's (OECD's) definition, an AI system may be conceived as

*machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments. It uses machine and/or human-based inputs to perceive real and/or virtual environments; abstract such perceptions into models (in an automated manner, e.g., with ML or manually); and use model inference to formulate options for information or action. AI systems are designed to operate with varying levels of autonomy.*<sup>1</sup>

The IEEE Position Statement on Artificial Intelligence urges governments to adopt policies on AI, highlighting the role of governments to ensure that AI serves the interests of society;<sup>2</sup> recently, the ACM has urged the suspension of private and governmental use of facial-recognition technologies, publishing a statement on the principles and prerequisites for the development, evaluation, and use of unbiased facial-recognition

technologies.<sup>3</sup> As Misuraca and van Noordt highlight, the governance of AI should be seen by governments as an extension of existing regulatory tools, emphasizing the authors' belief that "ethical and societal implications of AI adoption should be a matter of high concern for regulators."<sup>4</sup>

In recent decades, AI was a topic almost exclusively studied within academia. Nevertheless, the confluency and popularization of different factors, such as the rise of algorithm analysis and more powerful and distributed processing technologies, the big data phenomena as well as new disciplines including data science, have been the "perfect storm" to bring AI to the real world. In these scenarios, AI-based systems and technologies that autonomously enable process optimization based on elements such as machine or deep learning have also been implemented and used by public organizations and governments. AI has also been included in political agendas, raising public debate on its benefits but also on the new challenges associated with the adoption of these technologies.

Public policies have started to consider this topic, but legal regulations and newly required standardization initiatives, such as the IEEE P7000 Standards, are still currently in development. In this scenario, governments face additional challenges related to the



special characteristics of public organizations and the importance of components such as citizens' rights, ethics, transparency, and accountability.

In addition, governments as implementers and users of technology looking for the best method of public services delivery are facing additional challenges in this field because of its very nature. A double key role is given to government when it is the organization that will adopt AI technologies, taking into account the special nature of public administrations on the one hand and on the other hand, especially now, with the perspective of digital government that, according to the OECD, it is referred to as “the use of digital technologies, as an integrated part of governments' modernisation strategies, to create public value.”<sup>5</sup>

The potential of public value increases when data are taken as a core element in those public organizations looking for a data-driven digital government. It happened before with interoperability and is occurring now with AI in a more advanced state. According to Berryhill et al., “Every AI project starts from the same point: data,” underscoring the fact that governments should guarantee that they have access to enough unbiased data quality and quantity before taking advantage of AI techniques.<sup>6</sup> Within data-driven public organizations, now more than ever, multidisciplinary knowledge linking business domains, data, and technology will be crucial. A simple understanding of the training phase of machine learning models helps us understand why data preprocessing phases could have a strategic impact and therefore why occupations such as data scientists will also be a determinant within public organizations.

The importance of delivering public services to citizens with enough

guarantees that are guided by democratic values, rights protection, the rule of law, safety, and security have important implications. Other dimensions—even more important than the technical ones—are key when these services are being delivered electronically or are a part of electronic processes.

Again, the significant elements linked to the governance, legal, organizational, and societal parameters of technological adoption also seem to be the core elements with AI in government,

public organizations, looking for the development of theory and practice in this field. We received 18 submissions to our call for papers and selected six articles for this issue. The topics of the selected articles are linked to the field of management and the organizational dimension of technology adoption, public policy, transparency, security, legal, and ethics. In addition, two articles on specific projects have been included under the category of using machine and deep learning in the field of health care.



## **THE POTENTIAL OF PUBLIC VALUE INCREASES WHEN DATA ARE TAKEN AS A CORE ELEMENT IN THOSE PUBLIC ORGANIZATIONS LOOKING FOR A DATA-DRIVEN DIGITAL GOVERNMENT.**

even more so than the technology itself. The evolution from an exclusively technical perspective to the multidimensional perspective emphasized by Jimenez et al. on interoperability in digital government<sup>7</sup> seems to have been again revisited and amplified with the adoption of AI in public organizations where, additionally, ethical issues could also have important implications. New standards adoption sponsored by the IEEE Computer Society, including *IEEE P7003 Standard for Algorithmic Bias Considerations* and *IEEE P2863 Recommended Practice for Organizational Governance of Artificial Intelligence*, will be important elements to ensure that the right next steps are taken on AI adoption.

### **IN THIS ISSUE**

This theme issue aims to contribute to the advancement of AI adoption by

The first article, “Managing Artificial Intelligence Deployment in the Public Sector,” is one of the very few works published to date based on empirical evidences that goes into depth on the organizational challenges and keys for a successful AI deployment in public organizations. Campion, Hernandez, Mikhaylov, and Esteve highlight the fact that most of the challenges in AI deployment are during the implementation stage and require long-term strategies and short-term actions to address the challenges. Playing important roles in this are elements such as leadership, stakeholder management, data standardization, training, and data-sharing agreements. Derived from their findings, the authors propose a framework to manage AI in the public sector based on a combination of success factors.

### ABOUT THE AUTHORS

**CARLOS E. JIMÉNEZ-GÓMEZ** is an independent consultant in the field of information and technology in government. His research interests include smart government, digital government interoperability, and open and digital justice. Jiménez-Gómez received his M.Sc. in data science from the Open University of Catalonia. He received the IEEE Computer Society Golden Core Award (2020). He is a Senior Member of IEEE. Contact him at [carlosjimenez@computer.org](mailto:carlosjimenez@computer.org).

**JESÚS CANO-CARRILLO** is an IT engineering chief in the Government, Technical Services Command of the Civil Guard, Ministry of the Interior, Spain. His research interests include cybersecurity, smart cities, the Internet of Things, and distributed systems and software architectures. Cano-Carrillo received his Ph.D. in industrial engineering. He is a Senior Member of IEEE and a member of the IEEE Education, Social Implications of Technology, and Computer Societies. Contact him at [jesus.cano@computer.org](mailto:jesus.cano@computer.org).

**FRANCISCO FALCONE LANAS** is an associate professor with the Electrical, Electronic, and Communication Department, Public University of Navarre and the Institute for Smart Cities, Spain. His research interests are in the analysis and implementation of context-aware environments, the Internet of Things, wireless systems, and smart cities. He received his Ph.D. in communication engineering. He is a Senior Member of IEEE. Contact him at [francisco.falcone@unavarra.es](mailto:francisco.falcone@unavarra.es).

In the second article, “Public Strategies for Artificial Intelligence: Which Value Drivers?” Viscusi, Rusu, and Florin analyze the values that drive AI strategies developed by different governments on a global level and discuss the risks and challenges of AI. The authors identify the misalignments among fundamental values and the AI strategies developed that would be relevant in the AI development.

The third article, authored by Cobbe, Lee, Janssen, and Singh, is “Centering the Law in the Digital State.” It showcases the importance of the rule of law, the legal requirements for public-sector decision making and human rights, and the fundamental principles of good government. The article spotlights the transparency issues linked

to automated decision-making technologies in the public sector; focuses on relevant legal frameworks and their limitations; and explores the way forward, from both regulatory and socio-technical system perspectives.

A different perspective is adopted in “Transparency as Threat at the Intersection of Artificial Intelligence and Cyberbiobioscurity.” The article discusses the conflicts between transparency and secrecy to protect national security. More specifically, this fourth article, authored by Jordan, Fenn, and Shannon, involves the authors’ perspective on the potential risks and threats related to national security based on the cybersecurity issues that would be linked to transparency in the context of AI and biological data and proposes the use of risk assessment tools.

Finally, two articles linked to the field of health care were selected, both on research projects developed in Latin America. In “RIGOR: A New Proposal for Predicting Infant Mortality in Government Health Systems Using Artificial Intelligence in Brazil,” Silva, Rodrigues, and Ishii present research wherein a methodology was developed to predict the mortality rates newborn children based on features such as an APGAR score and gestation weeks, which were extracted from Brazilian government data sets.

The sixth and final article, authored by González-Briceño, Sánchez, Ortega-Cisneros, García-Contreras, Díaz, and Moya-Sánchez, is “Artificial Intelligence-Based Referral System for Patients With Diabetic Retinopathy.” It presents works based on deep learning techniques and addresses screening diabetic retinopathy for the reduction of vision loss and blindness risk in patients. The authors approach this methodology from the perspective of clinical integration and confront the lack of optometrists in the specific region of the project.

With this selected set of thought-provoking articles, a special attempt was made to illustrate the research and practices that are breaking through. AI in government reflects a reality that is booming with great complexities and technological, organizational, legal, and social problems still to be solved. But there is a promising, fruitful line of work for professionals as well as for academics, which might return relevant benefits and innovative, efficient ways of understanding classic governmental relationships. ■

### REFERENCES

1. OECD. *Artificial Intelligence in Society*. Paris, France: OECD Publishing, 2019.

2. "IEEE position statement on artificial intelligence," IEEE, Piscataway, NJ, 2019. [Online]. Available: <https://globalpolicy.ieee.org/wp-content/uploads/2019/06/IEEE18029.pdf>
3. "Statement on principles and prerequisites for the development, evaluation and use of unbiased facial recognition technologies," ACM, New York, 2020. [Online]. Available: <https://www.acm.org/binaries/content/assets/public-policy/ustpc-facial-recognition-tech-statement.pdf>
4. G. Misuraca and C. van Noordt, "Overview of the use and impact of AI in public services in the EU," Publications Office of the European Union, Luxembourg, EUR 30255 EN, 2020. [Online]. Available: [https://publications.jrc.ec.europa.eu/repository/bitstream/JRC120399/jrc120399\\_misuraca-ai-watch\\_public-services\\_30062020\\_def.pdf](https://publications.jrc.ec.europa.eu/repository/bitstream/JRC120399/jrc120399_misuraca-ai-watch_public-services_30062020_def.pdf)
5. "Recommendation of the Council on digital government strategies," OECD, Paris, France, 2014. [Online]. Available: <http://www.oecd.org/gov/digital-government/Recommendation-digital-government-strategies.pdf>
6. J. Berryhill, K. K. Heang, R. Clogher, and K. McBride (2019), "Hello, World: Artificial intelligence and its use in the public sector," OECD Working Papers on Public Governance, No. 36, OECD Publishing, Paris, France.
7. C. E. Jiménez, A. Solanas, and F. Falcone, "E-government interoperability: Linking open and smart government," *Computer*, vol. 47, no. 10, pp. 22–24, Oct. 2014. doi: 10.1109/MC.2014.281.



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