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Big Questions of Artificial Intelligence (AI) in Public Administration and Policy*

Kamu Yönetimi ve Politikasında Yapay Zekanın (AI) Büyük Soruları

Mehmet Metin Uzun¹ , Mete Yıldız² , Murat Önder³ 

Abstract

Technological advancements have created notable turning points throughout the history of humanity. Influential transformations in the administrative structures are the result of modern technological discoveries. The artificial intelligence (AI) ecosystems and algorithms now affect daily lives, communities, and government structures more than ever. Governments are the main coordinators of technological transition and supervisors of the activities of modern public administration systems. Hence, public administration and policies have crucial responsibilities in integrating, governing, and regulating AI technology. Integrating AI into public administration and the policy-making process allows numerous opportunities. However, AI technology also contains many threats and risks in economic, social, and even political structures in the long term. This article concentrates on the big questions of AI in the public administration and policy literature. The big questions discussion started in 1995 by Robert Behn drawing attention to the big questions as the primary driving force of a public administration research agenda. The fundamental motivation of the big questions approach is shaped by the fact that “questions are as important as answers.” This article aims to identify big questions and discuss potential answers and solutions from an AI governance research agenda perspective.

Keywords

Big Questions, AI, Public Administration, Public Policy, AI Governance, AI Policy

Öz

Teknolojik gelişmeler, insanlık tarihi boyunca dönüm noktaları yaratmıştır. İdari yapıdaki dönüşümler teknolojik keşiflerin sonucudur. Yapay zekâ (YZ) ekosistemi ve algoritmalar günlük yaşantıları, toplulukları ve hükümet yapılarını her geçen gün daha fazla etkilemektedir. Devletler teknolojik geçişin koordinatörleri ve modern kamu yönetimi faaliyetlerinin temel denetçileridir. Bu nedenle, kamu yönetimi ve politikalarına yapay zekâ teknolojisini entegre etme, yönetme ve düzenleme konusunda çeşitli sorumlulukları vardır. Yapay zekâyı kamu yönetimine ve politika oluşturma sürecine entegre etmek çok sayıda fırsata olanak tanımaktadır. Öte yandan, yapay zekâ teknoloji ekosistemi uzun vadede ekonomik, sosyal ve hatta siyasi yapılarda birçok tehdit ve risk potansiyeli barındırmaktadır. Bu makale, kamu yönetimi ve kamu politikası literatüründe yapay zekanın “büyük sorularına” odaklanmaktadır. Robert Behn tarafından 1995 yılında başlatılan büyük sorular tartışması bir kamu yönetimi araştırma gündeminin birincil itici gücü olarak büyük sorulara dikkat çekmektedir. Büyük sorular yaklaşımının temel motivasyonu, “sorular cevaplar kadar önemlidir” yaklaşımıyla şekillenmektedir. Bu araştırma yapay zekâ literatüründeki büyük soruları çerçevelemek ve AI yönetimi araştırma gündemi perspektifinden olası yanıtları ve çözümleri tartışmayı amaçlamaktadır.

Anahtar Kelimeler

Büyük Sorular, Yapay Zekâ, Kamu Yönetimi, Kamu Politikası, Yapay Zekâ Yönetimi, Yapay Zekâ Politikası

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1 **Corresponding Author:** Mehmet Metin Uzun, (PhD Candidate), University of Exeter, Politics, Exeter, United Kingdom. E-mail: mu235@exeter.ac.uk ORCID: 0000-0002-2000-9585

2 Mete Yıldız (Prof. Dr.), United Nations University Operating Unit on Policy-Driven Electronic Governance, Guimaraes, Portugal / Hacettepe University, Faculty of Economics and Administrative Sciences, Department of Political Science and Public Administration, Ankara, Türkiye. E-mail: myildiz@hacettepe.edu.tr ORCID: 0000-0002-5864-6731

3 Murat Önder (Prof. Dr.), Boğaziçi University, Faculty of Economics and Administrative Sciences, İstanbul, Türkiye. E-mail: murat.onder1@boun.edu.tr ORCID: 0000-0001-8300-862X

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Introduction

The digital age has undergone tremendous transformations in various areas, including public administration research. Today, information and communication technologies (ICT) affect organizations' structure, functioning, performance, and shift. With digital adaptations being realized in the public sector, public services have started to be provided with innovative strategies. The digitization steps, launched with the e-government approach in the 1990s, became more widespread in the 2000s, thanks to ICT and mobile applications. Especially after the 2000s, internet technology has become widespread worldwide with the developments in ICT, such as the operating system capacity of computers. Therefore, governments' need to strengthen and develop their technological infrastructures has become more urgent in transforming society. The concepts of data processing and data mining have entered the agenda of governments. Different approaches to understanding e-Government have emerged both in academia and in practice.

The ICTs covered by e-Government 1.0 focused on organizational infrastructures; e-Government 2.0 includes social media, Web 2.0 tools, and open data, whereas e-Government 3.0 focuses on new developments such as data analytics-modelling, simulation, AI, and Internet of Things (IoT). The Fourth Industrial Revolution, defined as Industry 4.0, consists of "AI and big data." Industry 4.0 refers to integrated intelligent systems which work with AI algorithms (Ing et al., 2019; Kolberg & Zühlke, 2015). AI technologies are foreseen to form a shift that will affect not only the future of the industry or the marketplace but also the future of humankind. Karnofsky (2016) indicates that "potential future AI precipitates a transition comparable to the agricultural or Industrial Revolution." The underlying reason is that the process brings about a fundamental transformation for human beings and machines. Artificial Intelligence (AI) technology is one of the essential components of the industry 4.0 approach, which has a structure consisting of many sub-components and techniques, such as machine learning, deep learning, expert systems, and robotics.

The term AI emerged as a sub-branch of computer science, which was first used in the modern sense in the 1950s. Arf (1959) predicted that machines cannot be aesthetically pleasing like human beings, that human beings act on their initiative, and that devices can act on their initiative even if it takes a long time. However, AI today constitutes one of the fields of study of cognitive science, philosophy, psychology, economics, and even law, beyond computer science. Moreover, AI is evolving into an interdisciplinary field of research that has recently gained special attention from society, politics, and the public sector, offering various unique opportunities and posing cataphoric risks. (Önder, 2020; Boyd & Wilson, 2017; Wirtz & Weyerer, 2019). In this context, the public administration discipline has started to bear on studies related to AI since the 2010s. Especially with the COVID-19 outbreak, there has been a proliferation of studies on AI in public administration and policy (Önder & Uzun, 2021).

In line with the rising trends in the field, this article aims to reveal the various AI dimensions by focusing on unearthing the big questions of AI in public administration and policy by reviewing the literature. AI has enormous potential in different government sectors, including infrastructure, finance, health, and the legal and justice systems. Therefore, AI-driven public administration applications are critical for governments to

enhance citizens' quality of life and governance capacity (Cath,2018; Dwivedi et al., 2019a; Sharma et al., 2020).

This article reviews the literature on AI to define and discuss the big questions of AI from the public administration and policy perspective. Behn (1995) emphasized that any field of science is figured out by the big questions it poses. Behn's (1995) approach to big questions draws attention to the fact that an area of research is not driven by data or method but by research questions. Since the mid-1990s, public administration academics have focused on showing the big questions in public administration. One of the main aims of this article is to emphasize how the big questions literature stands for a position in the projection of the public administration in the "AI" context. Not only big questions but also the answers to these questions are valuable. Recently, there has been growing research interest in AI in the public administration literature; however, the current studies are related to primarily specific countries' national AI strategies and policies. Nevertheless, there are some gaps in the literature about AI in the public policy-making process, AI governance, and AI regulations.

To show and examine the pieces of literature relevant for proposing big questions of AI research, electronic academic databases in social sciences were searched for several focus keywords and concepts, such as "Artificial Intelligence," "AI," "public policy," and "public administration," "algorithmic government," "AI governance," "AI regulation," "AI policy," "AI principle." Accordingly, the literature review presents academic research dealing with AI in the public sector, especially those focusing on "AI governance." Overall, this article aims to contribute to the government's AI research agenda by presenting some "big questions" for outlining a future research agenda on AI technology and application context.

Big Questions Approach in Public Administration Discipline

Public administration is a core component of humankind's plans to develop a better future for humanity (Kirlin, 2001). The big questions address the macro perspective on the theory and practice of the public administration discipline (Zavattaro, 2018, p. 91). Therefore, big questions that connect organizational and institutional output answer contemporary research and practice issues (Callahan, 2001, p. 495). Defining moments in academic disciplines happen when their fundamental unanswered questions are specified (Brooks, 2002). The big questions approach is not classified in a particular hierarchy of priority or importance. The essential vision is to encourage discussion about the study of public administration. Therefore, the big questions are critical to advance the study field and reveal the primary debates in the public administration discipline (Cooper, 2004, p. 396). Finding the big questions in a research area will lead to discussion in the research area; however, it also includes the risks of misidentification and error (Yildiz, 2013). Big questions in the public administration discussion not only involve and motivate practitioners and scholars but also have significance for many citizens (Kirlin, 2001). The big questions methodology is essential for framing the set of questions on the research agenda and for drawing strengths and limitations of current research (Callahan, 2001). Since the mid-1990s, public administration scholars have focused on identifying the big questions in public administration. All research community members do not need

to accept these questions and their alternative answers. However, they are critical to the advancement of the discipline (Yildiz,2013).

The big questions debate in the public administration literature began with Robert Behn's famous article written in the *Public Administration Review*, entitled "The Big Questions of Public Management" (Behn, 1995). For Behn (1995), as public-management scholars strive to transform their profession into scientific research, they also need to focus on 'big questions' like physics science. Behn (1995) emphasized that any field of science is defined by the big questions it poses. Big questions draw attention to the fact that an area of research is not driven by data or method but by research questions. In this context, Behn (1995) outlined the three big research questions (micro-management, motivation, and measurement) with the opportunity to involve public administration as more beneficial to the public administration research area. Behn (1995) explained that the basis of the locus of big questions is to describe the role of public administration in shaping society historically, and its use to develop the community in the future. Behn's questions, trying to ask how public administrators can handle each of the three big questions, place the public manager at the center point of the public administration (Kirlin, 1996, p. 417). Behn's approach concentrated on fundamental managerial and organizational issues addressed within every governance framework (Mingus & Jing, 2017). In addition, the three questions framed by Behn are essential in leading the debate on the 'big question literature.' Other public administration scholars who participated in the big question discussion followed Behn's pathway and used Behn's question patterns.

However, Behn's questions have been criticized in the literature for being too narrow, instrumental, and focused primarily on the organizational level (Kirlin, 1996; Neuman, 1996). Therefore, big questions literature in public administration can be directed in two approaches. One group of scholars (Neuman,1996; Kirlin, 2001; Callahan, 2001) deal with the broad discussions by addressing the big questions from a macro perspective on public administration. In contrast, other political science and public administration scholars focus on the micro perception of big questions, including specific subthemes in public administration, such as education (Denhardt, 2001), democracy (Kirlin, 1996), administrative ethics (Cooper, 2004), public value (Bozeman, 2009), performance management (Moynihan & Pandey, 2010), intergovernmental relations (Kincaid & Stenberg, 2011), and e-Government (Yildiz, 2013). After becoming a global pandemic, COVID-19 has also been added to the subthemes (O'Flynn, 2021). From a macro perspective, Neuman (1996) concentrated on what will be the central research questions that public administration must answer to reach a level of science. Neuman's (1996) big questions approach emphasizes that the primary character, origins, and philosophy of the discipline of public administration should be related to these big questions. Based on this approach, Neuman's big questions concentrate on big questions about the fundamental characteristic and origin of public administration. However, Kirlin (2001) mentioned that big questions should not focus on instrumental issues but on the implications and importance for the the larger society where public administration is incorporated. Additionally, Kirlin's big questions focus on understanding the role of public administration in traditionally affecting social structure and awareness of its use for shaping society in the future. Callahan (2001) emphasized the necessity of framing

the big questions methodology based on the strengths of earlier studies. Examining and answering the big questions is a circular process in which further studies to address the original set of big questions lead to another series of questions. Therefore, the big questions approach has created different focal points or micro strategies in the public administration literature (Yildiz, 2013). In this context, the big questions are addressed from several micro-approach perspectives through time. It is more ‘popular’ to consider big questions from a micro perspective than a macro perspective. Public administration scholars cannot reach a consensus on big questions because it is challenging to build macro questions (French et al., 2005; O’Flynn, 2021). In addition, the big questions are US-oriented and affect the progress of the literature on the axis of micro questions. The micro approaches discussed in the big question literature are handled from various perspectives. Firstly, Kirlin’s (1996) article titled “The Big Question of Public Administration in a Democracy approach” is crucial to obtaining the discipline beyond the boundaries of the big question. Kirlin’s primary focus is on essential public administration issues from a democratic perspective. Denhardt (2001) developed big questions on the “theoretical and practical education dilemma” in the public administration discipline and criticized the generalizing perception of the big questions approach to the public administration discipline. McGuire and Agranoff (2001) focus on seven essential operational questions based on network management. Similarly, Brooks (2002) and Lohmann (2007) focused big questions on the non-profit organization aspects of public administration.

Over the years, the literature on big questions has been evaluated with a narrower focus and new trends under the discipline of public administration. For example, Yildiz (2013) centered on a new reform area in the public administration literature and emphasized that e-government is a “dynamic field of study.” Since 2010, the big questions literature has produced examples of articles about public administration in China (Mingus & Jing, 2017) and South Africa (Van der Walddt, 2012) beyond the US public administration discussions.

The big questions approach has been interpreted differently since Behn’s framework. Likewise, it should be underlined that each scholar contributes significantly to the progress of the literature. Although the big questions approach has lost popularity in the early 2000s, it is still an excellent opportunity for public administration to answer wicked questions. The central emphasis from which big questions develop should be how public administration impacts people. The focus must be on highlighting the importance of public administration in traditionally affecting the organization and recognizing its value for shaping society (Kirlin, 2001, p. 140). Beyond the traditional effects of public administration, theory and practice play a leading role in the governance, regulation, and adaptation of emerging technologies to government. Indeed, public administration has significantly shaped AI-driven application adoption by the government or outlined national AI strategy priorities and motivations.

The fourth industrial revolution, characterized by technological innovations in multiple domains, such as biological, physical, and digital had incredible impacts on public administration. Since the first industrial revolution, each transformation has built on the previous, constructing opportunities with risks and dangers. New forms of automation and advanced robotic systems have radically transformed the means of production and

our society. AI experts and futurists believe that AI technologies will be one of the main drivers of the fourth industrial revolution and have the potential to transform not only the technology industry but also the way we live our lives. Dobbs et al. (2015) estimated that AI's destructive effects could be seen 100 times faster, and the scale will be 300 times higher than the first industrial revolution. Nevertheless, it also raises many big questions about the field in the future. Neumann (1996) argued that the big questions of a field of research should consider the fundamental characteristics and origins of crucial point matters. Therefore, the big questions about AI in public administration are necessary to deal with fundamental debates such as the possible transformation of AI in a public organization, policy-making process, and governance models.

Thus, AI governance and regulations are big questions that are likely to be questioned in the future of public administration. Overall, based on a study of the AI and public administration academic literature, the following section lists questions about the use and application of AI in public administration, AI governance, and AI regulation. It should be noted that there is no 'absolute truth' or 'one right answer' for 'big questions' (Denhardt, 2001, p. 531).

AI research Agenda in Public Administration

AI is transforming not only technological or engineering innovation but also the sociological, political, and administrative environment. Public administration plays a crucial role in developing and adopting AI (Misuraca & Van Noordt, 2020), which is already adapting to various areas of the public sector (Androutsopoulou et al., 2019; Ojo et al., 2019; Sun & Medaglia, 2019). Although this integration process differs from country to country, AI applications are becoming increasingly common in several government functions (Sousa et al., 2019; Uzun, 2020).

Early studies with the reflections of AI on public administration have considered AI technology as a new level of a computing system. Since the end of the 1980s, studies on AI and public administration have begun in the academic literature. The first studies in the literature were shaped around expert systems and a new level of computing systems. In this framework, Hadden (1989) pointed out that expert systems will improve decision-making and increase public administration productivity. Similarly, Shangraw (1987) argued that expert systems are an opportunity to operationalize the public policy-making strategy. Duffy and Tucker (1995) examined the use of AI from a political science perspective and argued that traditions and meanings could be challenging in modelling AI for political problems. However, scholars emphasized that machine learning systems, election simulations, and expert systems can often be used in future policy modelling. Barth and Arnold (1999), having one of the first studies in the context of AI and public administration, addressed the implications of AI on the government and several dilemmas in the field, such as the use of "administrative discretion, responsiveness, judgment and accountability" innovations in governments. In both articles, attention was drawn to the need for trained experts on AI and computer systems in the public sector.

In the last decade, AI has evolved in various forms, such as internet crowd intelligence, human-machine hybrid-augmented intelligence, and autonomous-intelligent systems. Therefore, after the 2010s, scholars studied AI as a "hot topic" in public administration

and public policies research agenda. Research on various subjects such as the adaptation of AI to public administration, the use of AI applications in public service provision, and the inclusion of AI tools in government-citizen interaction, risk, and concerns about the pace of the AI ecosystem rapidly and national AI policies have come to the agenda of the government. One group of scholars argued that AI would make predictions that can advance the performance of the public sector and provide assistance and improve government functions (Kankanhalli et al., 2019; Margetts & Dorobantu, 2019; Sousa et al., 2019; Wirtz & Müller, 2019). On the other hand, another group of scholars focused on specific AI applications are also on the research agenda such as chatbots (Androutsopoulou et al., 2019; Aoki, 2020) government agencies have also started adopting various Artificial Intelligence (AI, automated decision-making robotics, self-service technology (Chen et al., 2020) and machine learning systems (Ackermann et al., 2018; Anastasopoulos & Whitford, 2019). The main effort in adapting AI to the public sector is the existence of strategy documents. While determining the AI strategy of the countries, defining their priorities and focus is a vital element of AI strategies (Allen, 2019). Chen et al. (2020) argued about integrating AI into the public sector in four stages: (a) relieving human resources, (b) assisting in supplying services, (c) enhancing the capacity of decision making, and (d) transforming public organizations.

AI research has received attention for its remarkable progress and increased policy interest in recent years (Wirtz & Müller, 2019). Two factors can be mentioned as the reason for the enhanced interest. First, ICT technology policies and public administration data studies have evolved into AI studies. Secondly, with the global COVID-19 health crisis, AI integration in the public sector has mushroomed. Governments began using AI opportunities and facilities to combat the outbreak and improve healthcare capacity (Önder & Uzun, 2021). While governments enhance their investments and technological infrastructure in AI, they neglect the black box of AI. Since “pacing problems” and “information-skill asymmetries” are rising in the technical scope of AI, there are legal and administrative regulations gaps. Discussions on AI regulation revolve around issues of authority and legitimacy of distinct types of bodies or groups for regulation. Within this framework, multiple regulatory debates emerge, such as licensing, codes, standards, regional incompatibility of national governments and transnational operators, and ethical and legal perceptions (e.g., Black & Murray, 2019; Reed, 2018; Petit, 2017). In addition, the establishment of a specific regulatory agency or ministry for AI is also discussed in the literature (Scherer, 2015).

Thus, the integration and use of AI in the public sector also raise some big questions. Examining the main questions based on the discussions on the research agenda is significant in finding the position of AI technologies. Exploring the central questions based on the discussions on the research agenda is essential for future debate and research agendas for the AI technology set. Neumann (1996) argued that the big questions are not fully answered because of the multifaceted nature of numerous research topics and paradigm shifts in the sciences. Thus, public administration scholars have different answers to big questions about AI. Based on this approach, the big questions based on the review of the AI literature in public administration are listed as follows:

Question 1. How do AI-Driven Ecosystems Transform the Art of the Public Policymaking Process?

AI technology also has the potential to bring transformations in public policy analysis and the public policy cycle. Evidence-based policymaking, primarily data-driven public policymaking, will share an additional expansion with the combination of AI technology which can also obtain transformations in the public policy cycle.

In recent years, “public policy and technology studies” have become even more critical at the intersection of public policy analyses and e-government studies. Analyzing public policy and the increasing use of ICT in raising and solving general problems are linked, and synergy has occurred between these two areas (Ferro et al., 2013; Misuraca & Viscusi, 2015; Yıldız, 2020). With expanded internet access and the widespread use of social media applications, a new era has started in public policymaking. This new era began being studied as “policymaking 2.0” (Ferro et al., 2013; Misuraca et al., 2014) in literature.

Public policy is a concept that appears in meeting citizens’ demands in the execution of services, ensuring public order, and improving all functions of services and order. Due to the dynamic nature of the public policy process, and the multiple varying connections and factors affecting it, scientists could not set clear and precise boundaries regarding the scope of the public policy process in the historical development of the field (Gordon et al., 1993). It can be argued that there is a desire to solve social problems and respond to people’s requests in the background of public policies. On the other hand, public policies vary significantly since social needs are related to different policy fields. Therefore, public policy deals with various areas such as defense, energy, environment, foreign affairs, education, welfare, security, highways, taxes, housing, social security, health, economic opportunities, and urban development (Dye, 1984).

The criteria for effective and efficient governance with New Public Management’s (NPM) trends have fostered outcomes. These trends have provided the potential for an applicable social science which includes program evaluation, quality of implementation, and emerging methods to solve complex issues using new policy systems and techniques that serve the core concept of evidence-based policymaking (Head, 2008). Evidence-based policy analysis stands for a contemporary and analytical approach to public policymaking. Governments can develop reforms and restructuring solutions in line with public policies with an evidence-based practice that initially motivates policymaking (Howlett, 2009). Evidence-based policymaking” techniques in policy processes increased thanks to the ICTs developed after the 1970s (Busch & Henriksen, 2018).

In the 21st century, technological developments have affected and changed both the public policy data relationship and the policymaking process. Understanding evidence-based public policy has turned into data-driven policymaking with the spread of the internet worldwide since the early 2000s. Big data has evolved into a tool that can be used effectively in policymaking processes. With the integration of machine learning, rational public policy decisions not limited to the human mind have been paved (Munne, 2016; Provost & Fawcett, 2013). In this process, the priority is to obtain data on the practices and operations carried out at the stages of public policy.

People generate more than 2.5 million bytes of data daily (Margetts & Dorobantu, 2019). Digital platforms allow customers and citizens to easily express and share their opinions while making it easier to proclaim their everyday demands and take part in management quickly. As a result of technological transformation, decision-making and policymaking processes in traditional centralized power and management structures change from top to bottom. Furthermore, participatory mechanisms are formed (Linkov et al., 2018; Sousa et al., 2019a). Public officials and policymakers should analyze and respond to their citizens’ demands with exact speed and detail (Thierer et al., 2017). Otherwise, the problems cannot be solved quickly, and crises arise. Indeed, the public sector and governments concentrate their abilities and capabilities to analyze and respond to requests transmitted in large volumes of data sets. The multiplication and processing of data sets necessitate a developing governance mechanism and setting up a data-driven decision-making system (Provost & Fawcett, 2013). Similarly, using big data in the public policy cycle has several benefits. Pencheva et al. (2018) mentioned that big data enhances policy analysis, offers better decision-making, and boosts productivity.

Various approaches have been put forward toward policymaking 2.0. Misuraca et al. (2014, p.173) emphasized this phenomenon as “policymaking 2.0” by identifying it as a collection of policymaking technology methods and technical solutions. This term shows the interaction between various technologies and ICT-based modeling used to achieve the participatory, evidence-based government and the associated organizational and social structures. The understanding of policymaking 2.0 has been developed around social media and the feedback from citizens (Ferro et al., 2013). AI can improve various aspects of administration, including operations, citizen engagement, delivery of services, decision-making, implementation, and evaluation of public policy AI-based policymaking involves (Sun & Medaglia, 2019b; Valle-Cruz et al., 2020): obtaining various kinds and volumes of data, improving the frequency of feedback and participation mechanism, and enhancing the ability to reflect publicly informed policy knowledge.

This framework may need change and innovation in the traditional policy cycle in figure 1. Janssen and Helbig (2018) illustrated the traditional public policy cycle shift with ICT and AI technology. The new public policy cycle includes new levels such as conceptualism, data collection, and experimenting.

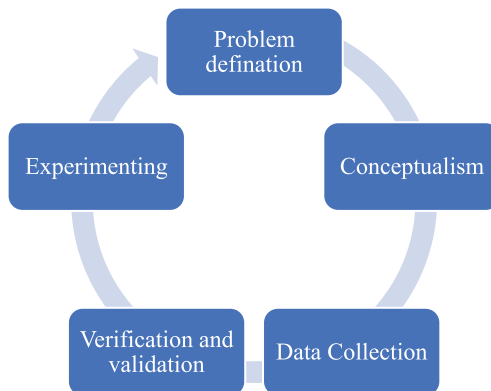


Figure 1. New modelling of public policy definition source.

Similarly, Valle-Cruz et al. (2020) have proposed a new approach to the public policy cycle called the “Dynamic Public Policy Cycle (DPPC).” This approach refers to ongoing changes at different stages of the AI-based policymaking process. The methodology of the public policy cycle covers multiple phases when AI applications may change the operations of government organizations. The use of AI in the public policy cycle encompasses interrelated phases of agenda-setting, policy formulation and decision-making, policy implementation, and policy assessment (Pencheva et al., 2018; Valle-Cruz et al., 2019).

The active use of AI in the public policy cycle can supply a suitable opportunity to understand the complexity of public decision-making processes and the actors involved. Furthermore, AI can exert a data-driven empirical impact on the public policy cycle (Thierer et al., 2017). In addition, using AI can drive e-government instruments to be more practical and functional.

Data-driven policymaking contributes to citizen participation in decision-making processes while increasing public values. The motivation based on new opportunities presented by AI in the public sector stems from the data-oriented nature of AI, which supports the policymaking process. Today’s governments have big datasets of their citizens thanks to their e-government systems. Integrating AI into the public policy process will promote an “automatic” and “dynamic” approach and the potential to adapt “policy-making 3.0”. However, integrating AI into the public policy process is linked to multiple issues, such as safety, mass surveillance, and privacy. Therefore, before integrating AI into the policymaking process, the government considers the AI governance and AI regulation context.

Question 2. How should AI Governance and Regulations be Formed?

Technology and digital governance concepts have been discussed in literature since the 1990s (Zimmerman, 1995). Technology governance is a dynamic area of research that focuses on science and technology studies, policymaking, innovation studies, economics, and political science principles and ideas. Recognition of the mutual shaping and co-creation of technology and society is one of the main aspects of technology governance (Ulnicane et al., 2020).

The understanding of digital governance defines citizens’ direct access to information and services through technological means. According to the understanding of Digital Era Governance, it prioritizes considering citizens as partners in government affairs rather than serving them as customers (Dunleavy et al., 2006). Furthermore, digital governance is a “network governance” that enables inter-network communication. With a horizontal coordination structure, digital governance encourages all interested parties to participate in public administration within network-type organizations and uses local information networks (Linkov et al., 2018; Ojo et al., 2019). Floridi (2018) described digital governance as “establishing and implementing policies, procedures, and standards for the proper development, use, and management of the infosphere.”

AI governance comes to the fore as a multi-disciplinary discussion, including science and technology studies, public policy, computer engineering, philosophy, security studies, sociology, law, and international relations. However, AI technology has also expanded

the meaning of the governance concept. Debate continues about the best strategies for the governance of AI. Therefore, AI governance refers to the actions of governments and transnational/global governance, including norms and regulations from AI tech companies, investors, NGOs, and other relevant actors (Bostrom et al., 2019). In early studies, AI governance research focused on national and subnational aspects. However, recent research focuses on AI governance from a global level perspective.

Dwivedi et al. (2019) emphasized that AI governance means providing the “right value” to AI systems. Similarly, Dafoe (2018) discussed that AI governance is often paired with “AI safety,” and both focus on helping humanity to develop “a beneficial AI.” However, AI governance focuses on institutions and contexts in “how AI is built and used.” Butcher & Beridze (2019) argued that AI governance can be defined as a “range of instruments, solutions, and levers that influence the development and applications of AI.” AI governance is also defined as “tackling the challenges and risk posed by AI” (Wirtz et al., 2020). On the other hand, some scholars express the concept of AI governance as AI regulation (Almeida et al., 2020; Gasser & Almeida, 2017; Thierer et al., 2017; Wang & Siau, 2018). For example, Gasser and Almeida (2017, p. 59) pointed out, “When considering future governance models for AI, it might be helpful and necessary to move beyond such lists and consider some of the larger structural challenges associated with the ‘regulation’ of AI-based technologies.”

AI governance includes long-term processes and focuses on goals rather than rules. Indeed, Almeida et al. (2020) also remarked that showing regulations, standards, and soft law principles are essential for AI governance. To be prepared for AI governance, standards, regulations, and solutions require a multi-dimensional analysis. In addition, global collaborations and interdisciplinary discussions are also a part of AI governance (Cihon, 2019).

AI governance has been studied in various layers and dimensions in the research agenda. These layers deal with the multiple dimensions of governance separately. Gasser & Almeida (2017) discussed AI governance’s heterogeneity, complexity, and degree of technological autonomy. According to Gasser and Almeida’s model (2017), implementing governance structures for AI and algorithmic decision-making systems can occur in multiple layers and include mixed approaches. In this context, “social and legal,” “ethics,” and “technical structure” is proposed as a three-layered model (Gasser & Almeida, 2017, p. 4). Dafoe (2018) specified the AI governance framework with three different research layers: “the technical landscape,” “AI politics,” and “AI ideal governance.” Similarly, Perry & Uuk (2019) considered the policymaking process as a layer of AI governance and emphasized the significance of “AI risk policies.” In this context, “reducing AI risks” is also within the theme of AI governance. Furthermore, Wirtz et al. (2020, p. 6) examined AI governance from a five-layer perspective. These layers are the “AI technology, services, and applications layer,” “AI challenges layer,” “AI regulation process layer,” “AI policy layer,” and “collaborative AI governance layer.”

Regulatory AI governance is often discussed in the literature around AI governance (Almeida et al., 2020; Buiten, 2019; Smuha, 2019; Yeung, 2020). However, there is no consensus on how AI regulation should be or what is the right regulatory policy, instrument, or tools for AI. Clarke (2019) emphasizes that co-regulatory perception is the

most proper approach to the regulatory problem related to AI. Furthermore, studies are highlighting the discussion of AI regulations on a global scale with “transnational legal ordering” or an “international AI regulatory agency” (Erdelyi & Goldsmith, 2018). On the other hand, there is a repeated emphasis on “accountability,” “ethical framework,” and “human rights perspective” in the leading studies on AI regulations (Winfield & Jirotko, 2018; Future Life Institution, 2019; IEEE, 2019).

Several organizations have already developed declarations of the principles or values that should drive the development and implementation of AI in government (Floridi et al., 2018). For example, the EU, UK, and US governments made breakthroughs in AI regulations.

AI governance has shared common themes with digital and technology governance. However, AI governance leads to more complex discussions. Hence, it is necessary to deal with more than one dimension of AI governance, which is a concept discussed on a national scale and comes to the fore on an international scale. Thus, it is not possible to make a single definition of AI nor a single definition of AI governance. Kuziemski and Misuraca (2020) emphasized that “AI governance is a multi-level game characterized by the systemic resistance to steering, due to the sheer volume of actors, the velocity of change, and the perceived inevitability of the very technology at stake.” Overall, AI governance and regulations are necessary to develop the AI ecosystem and prevent technology’s potential harms and risks. Therefore, AI governance will be one of the priority areas on the agenda of policymakers soon because of the government’s current governance effort regarding AI, the principles, standards, and regulatory frameworks vital for future generations.

Questions 3. What are the Potential Opportunities and Threats of AI in the Public Sector?

AI research reveals many findings of the dark side of AI beyond futuristic fiction (Feijóo et al., 2020; Wirtz et al., 2020). While governments improve their investments and technological infrastructure in AI, they neglect the black box of AI. It is too late for us to put AI and ML back into a box (Black & Murray, 2019). AI has massive potential, including education, physical infrastructure, logistics, telecommunications, data monitoring, compliance, financial, sanitary, R&D policies, and lawmaking (Sharma et al., 2020; Sousa et al., 2019b; Valle-Cruz et al., 2019). In addition, AI has promoted productivity in public sector organizations. Automation capabilities assist government agencies in simplifying complex tasks, eliminating redundancies, and improving productivity for increased output. This quality of AI can unlock a range of advantages, such as supply chain management, better decision-making, and waste reduction, resulting in a substantial improvement in total production and economic activity. Mehr (2017) divided AI case studies on citizen services into five categories: “answering questions, filling out and searching information, routing requests, translation, and paper drafting.” These cases primarily focus on governments’ digital information, such as big data sets about citizens, chatbots, and data analytics. With the increased availability of massive datasets and computation power in recent decades, new AI approaches based on data rather than algorithms have been developed (Sousa et al., 2019a). Table 1 below summarizes the use of AI in the public sector and the various dimensions of AI policies in the literature.

Smart cities have seen a tremendous increase in data produced, including real-time and Big Data, with the increased use of digital technology, sensors, and the Internet of Things (IoT). In smart cities, many data such as water, energy consumption, natural disasters, weather and climate, real estate, transportation, and public transportation are essential forms of smart city applications (Perc et al., 2019). Smart cities provide a more effective and efficient use of urban resources, urban planning, urban infrastructure, and traffic (Chang et al., 2019). Furthermore, smart city applications also have substantial advantages in the effective and efficient use of public resources (Janssen & Kuk, 2016).

However, it is frequently discussed in the literature that if AI technology continues to develop at this growth rate, it will cause significant problems in “income distribution” and “unemployment” (Frey & Osborne, 2017). Although governments have initiated AI applications and strategies initiatives, AI still poses several threats, especially to the public sector. While some research has been carried out on AI threats in the public sector, there has been little empirical and systematic research on the AI-driven ecosystem’s negative impact on public administration (Agarwal, 2018; Sun & Medaglia, 2019a;). According to Wirtz et al. (2018), these threats are “threats to be caused by AI applications,” “uncertainties in AI laws and regulations,” “threats related to AI ethics,” and “social problems.” Similarly, Agarwal (2018) argued that AI could cause threats related to employment (job losses), revenue shortfall, privacy, and safety. AI undoubtedly has an impact on the workforce (Brynjolfsson & Mitchell, 2014; Makridakis, 2017; McClure, 2018). The AI revolution will bring about noteworthy shifts in the workplace and the business ecosystem in the next decade (Makridakis, 2017; Su, 2018). Hawksworth & Berriman’s (2018) report estimated that AI technologies can contribute up to 14% to the global GDP by 2030, equivalent to about 15 trillion dollars in today’s values (Hawksworth & Berriman, 2018). However, in the Future of Jobs 2020 Report, the World Economic Forum (2020) estimates that AI will create 97 million new jobs, and 85 million jobs will be displaced by 2025. Economic scholars have discussed how governments will find solutions to technological unemployment since the beginning of the 20th century (Keynes, 1930). Universal Basic Income (UBI) is key to preventing an AI-based job apocalypse, which controls the adverse effects of welfare and unemployment crises caused by automation and robots. (Furman & Robert, 2018; Goolsbee, 2018).

AI-powered biometrics is one of many data analysis technologies under the overarching umbrella of AI. Despite AI-powered biometrics verification and identification benefits, the government’s use of biometric technology without citizens’ consent triggers civil rights and privacy concerns as “algorithmic bias” or “mass surveillance.” China has already adopted the Social Credit System’s AI-powered system, which judges and ranks citizens’ behavior and trustworthiness (Dai, 2018).

AI is conveying a consequential development in the public sector with its opportunities and threats. Nevertheless, research on the public administration agenda still contains hypothetical assumptions about the future of AI improvement. However, more experimental and application-oriented studies are needed to recognize the opportunities and threats of AI.

Table 1
AI Using in Public Services

AI Policy Areas	AI Mechanism	Objective	References
Digital channels of communication between citizens and government	Chatbots Biometric Analytics Text Mining	<ul style="list-style-type: none"> · Improvement of communication between government and citizens. · Answering questions · Enhancement of citizen knowledge. 	(Androutsopoulou et al., 2019; Capgemini Consulting, 2017; Mehr, 2017)
Predictive analytics and data visualization	Deep Learning Computer Vision	<ul style="list-style-type: none"> · Control and performance monitoring in public areas. · Determine risk or emergency issues. 	(Engin & Treleaven, 2019; Jiang et al., 2020; Maciejewski, 2017; Steuer, 2018; Wirtz & Weyerer, 2019)
Enhancing decision-makers' capabilities	Artificial Neural Network (ANN) Deep Learning	<ul style="list-style-type: none"> · AI improves the quality of decisions by enabling governments to make fast and accurate decisions. · Data using AI to reach quick and reliable decisions. 	(Allam & Dhunny, 2019; Ojo et al., 2019)
Improving service delivery	Cognitive Robotics Autonomous systems	<ul style="list-style-type: none"> · AI in government systems and internal functions have the capacity to boost policy decisions and provision of services to citizens. 	(Chen et al., 2020; Van Noordt, 2020; Veale & Brass, 2019)
Health & Safety	Machine Learning	<ul style="list-style-type: none"> · Understand and help prevent workplace injuries and illnesses. · Early diagnostics system 	(Barth & Arnold, 1999; Berk et al., 2016; Kankanhalli et al., 2019; Uzun,2020)

Conclusion

Technological progress has been the cornerstone of humanity since ancient times. AI has the potential to transform the economy, science, and security at a scale comparable to the industrial or agricultural revolutions. AI experts and futurists emphasize that AI will bring about a remarkable economic, social, and even political transformation. However, this transformation also generates some risks and opportunities. With the AI revolution, various big questions emerge: “Could AI help solve complicated, even wicked global problems, such as global warming, poverty, and cancer?” or “Could AI lead to the end of humankind?”. These questions are varied for each discipline and contain many uncertainties. Nevertheless, AI has transformed the future and posed various social, economic, and political threats. With the rapid progress of AI, the “technological singularity,” “transhumanism,” and “humanity 2.0” approaches have started to be discussed frequently in the literature.

The lack of consensus on the essential issues of public administration is why paradigmatic progress in the discipline has been halted in our domain. The field of public administration needs to clearly define some of the “big questions” and then begin to answer them (French, 2009). The big questions approach emerged with this motivation as a great debate in the public administration community in the 1990s. Behn (1995) emphasized that if public administration is accepted as a discipline, it must consider its big questions. Neumann (1995) argued that big questions must address the fundamental nature of a field. The big questions have been handled from the micro and macro perspective on the axis

of public administration. While the first scholars gave direction to big questions focused on macro questions, in the following years, researchers focused on big questions in micro fields (democracy, e-Government, education, public values) in public administration. Indeed, big questions effectively build a research community and set a research agenda. In this context, one of the most prominent issues on the agenda of future governments is undoubtedly AI which, by its nature, contains many questions. This article presents underlying questions that many public administration researchers try to answer, as shown above. The big questions determined by examining the AI literature are as follows:

1. How do AI-driven technologies transform the public policy-making process?
2. How should AI governance and regulations be formed?
3. What are the opportunities and threats of AI in the public sector?

These questions are the focus in the literature on emerging technology that can become more complex and diversified over time in parallel with AI development. Nevertheless, AI research in the public administration literature, which is still in its infancy, will concentrate on more specific and application-oriented questions over the next decade. The questions addressed in this article are around the dimensions of AI adoption, AI-driven policymaking, and AI governance aspects. The dynamic use of AI in the public policy cycle contributes to decision-making processes. The “Public Policy Making 2.0” approach, which is emphasized as creating public policymaking integrated with ICT, evolved into the “Public Policy Making 3.0” approach that uses machine learning in the public policymaking process. AI governance provides solutions and instruments for governments to promote AI advancement and regulation. Indeed, AI governance is conscious of designing, developing, and making beneficial use of AI, including a legal framework, regulations, reasonable, transparent, explainable, human-centered principles, and ethical standards, which determine the boundaries or limits of AI.

The “age of artificial intelligence” has just begun, but it already contained numerous unknowns and concerns. AI has the potential to transform the economy, science, and security at a scale comparable to the industrial or agricultural revolutions. There are likely to be enormous benefits for society, but there are also likely to be catastrophic safety, and privacy risks as Hawking argued that “AI will be ‘either the best or worst thing’ for humanity” (Hern, 2016). AI could be the most vital breakthrough in human history because this discovery can take man beyond the galaxies and destroy humankind. The policymaker and public administrator must be aware of AI risks and promote an AI-driven governance and reform movement. Coping with the challenges and risks posed by AI necessitates a trans-disciplinary and multi-dimensional strategy. This article shows that the public administration discipline is also essential in the discussions on the AI revolution and progress. This research highlights that AI research is a growing interdisciplinary research domain that includes not only computer and engineering science but also political science, public administration, legal and ethical studies which are essential for the performance of a supervisory role in regulating and governing AI. Further research is required to explore specific application-oriented AI research, such as deep neural networks, autonomous vehicles, deep fakes, or chatbots. There are many unanswered questions about AI on the public administration agenda; however, the key to adapting and surviving in the AI age remains in asking questions.

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References

- Agarwal, P. K. (2018). Public Administration Challenges in the World of AI and Bots. *Public Administration Review*, 78(6), 917–921. <https://doi.org/10.1111/puar.12979>
- Allen, B. G. C. (2019). Understanding China's AI Strategy: Clues to Chinese Strategic Thinking on Artificial Intelligence and National Security. February.
- Almeida, P., Santos, C., & Farias, J. S. (2020). Artificial Intelligence Regulation: A Meta-Framework for Formulation and Governance. Proceedings of the 53rd Hawaii International Conference on System Sciences, 3, 5257–5266. <https://doi.org/10.24251/hicss.2020.647>
- Anastasopoulos, L.J., Whitford, A.B., 2019. Machine Learning for Public Administration Research, With Application to Organizational Reputation. *Journal of Public Administration Research and Theory*, 29, 491–510. doi:10.1093/jopart/muy060
- Androutsopoulou, A., Karacapilidis, N., Loukis, E., & Charalabidis, Y. (2019). Transforming the communication between citizens and government through AI-guided chatbots. *Government Information Quarterly*, 36(2), 358–367. <https://doi.org/10.1016/j.giq.2018.10.001>
- Aoki, N. (2020). An experimental study of public trust in AI chatbots in the public sector. *Government Information Quarterly*, 37(4), 101490. <https://doi.org/10.1016/j.giq.2020.101490>
- Arf, C. (1959). Makineler Düşünebilir mi ve Nasıl Düşünebilir? In Atatürk Üniversitesi 1958- 1959 Öğretim Yılı Halk Konferansları (Issue 1, pp. 91–103).
- Barth, T. J., & Arnold, E. (1999). Artificial Intelligence and Administrative Discretion: Implications for public administration. *American Review of Public Administration*, 29(4), 332–351. <https://doi.org/10.1177/02750749922064463>
- Berk, R. A., Sorenson, S. B., & Barnes, G. (2016). Forecasting Domestic Violence: A Machine Learning Approach to Help Inform Arraignment Decisions. *Journal of Empirical Legal Studies*, 13(1), 94–115. <https://doi.org/10.1111/jels.12098>
- Black, J., & Murray, A.D. (2019). Regulating AI and Machine Learning: Setting the Regulatory Agenda. *Eur. J. Law Technol.*, 10.
- Bostrom, N. (2016). Superintelligence: Paths, Dangers, Strategies, Reprinted.
- Bostrom, N., Dafoe, A., & Flynn, C. (2019). Public Policy and Superintelligent AI: A Vector Field Approach. *Ethics of Artificial Intelligence*, 1(2018), 1–29.
- Boyd, M., & Wilson, N. (2017). Rapid Developments in Artificial Intelligence: how might the New Zealand government respond? *Policy Quarterly*, 13(4), 36–43. <https://doi.org/10.26686/pq.v13i4.4619>
- Bozeman, B. (2009). Public values theory: Three big questions. *International Journal of Public Policy*, 4, 369–337.
- Brooks, A. C. (2002). Can nonprofit management help answer public management's "big questions"? *Public Administration Review*, 62(3), 259–266. <https://doi.org/10.1111/1540-6210.00177>
- Brueckner, R. (2020, March 19). Inside HPC. <https://insidehpc.com/2020/03/alibaba-cloud-offers-ai-cloud-services-to-help-battle-covid-19-globally/> (accessed 18 April 2021)
- Brynjolfsson, E., & Mitchell, T. (2014). What can machine learning do? Workforce implications. *Science*, 358(6370), 1530–1534. <https://doi.org/10.1126/science.aap8062>
- Buiten, M. C. (2019). Towards Intelligent Regulation of Artificial Intelligence. *European Journal of Risk Regulation*, 10(1), 41–59. <https://doi.org/10.1017/err.2019>
- Busch, P. A., & Henriksen, H. Z. (2018). Digital discretion: A systematic literature review of ICT and street-level discretion. *Information Polity*, 23(1), 3–28. <https://doi.org/10.3233/IP-170050>
- Butcher, J., & Beridze, I. (2019). What is the State of Artificial Intelligence Governance Globally? *RUSI Journal*, 164(5–6), 88–96. <https://doi.org/10.1080/03071847.2019.1694260>
- Callahan, R. F. (2001). Challenges of (dis) connectedness in the "big questions" methodologies in public administration. *Public Administration Review*, 61(4), 493–499. <https://doi.org/10.1111/0033-3352.00052>
- Cath, C. (2018). Governing Artificial Intelligence: Ethical, Legal and Technical Opportunities and Challenges. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 376(2133). <https://doi.org/10.1098/rsta.2018.0080>
- Clarke, R. (2019). Regulatory alternatives for AI. *Computer Law & Security Review*, 35(4), 398–409.
- Chen, T., Guo, W., Gao, X., & Liang, Z. (2020). AI-Based Self-Service Technology in Public Service Delivery:

- User Experience and Influencing Factors. *Government Information Quarterly*, May, 101520. <https://doi.org/10.1016/j.giq.2020.101520>
- Chowdhury, G. G. (2003). Natural Language Processing. *Annual Review of Information Science and Technology*, 37, 51–89. <https://doi.org/10.1002/aris.1440370103>
- Cihon, P. (2019). Standards for AI Governance: International Standards to Enable Global Coordination in AI Research & Development. In Future of Humanity Institute, University of Oxford (Issue April). <https://arxiv.org/pdf/1802.07228.pdf>
- Cooper, T. L. (2004). Big questions in administrative ethics: A need for focused, collaborative effort. *Public Administration Review*, 64(4), 395–407. <https://doi.org/10.1111/j.1540-6210.2004.00386.x>
- Copeland, B. (2020, August 11). Artificial intelligence. *Encyclopedia Britannica*. <https://www.britannica.com/technology/artificial-intelligence>
- Dafoe, A. (2018). AI Governance: A Research Agenda. In the Future of Humanity Institute, University of Oxford.
- Dai, X. (2018). Toward a reputation state: The social credit system project of China. Available at SSRN 3193577.
- Denhardt, R. B. (2001). The Big Questions of Public Administration Education. *Public Administration Review*, 61(5), 526–534. <https://doi.org/10.1111/0033-3352.00125>
- Desjardens, J. (2019). How Much Data Is Generated Each Day? Retrieved 15 May 2021, from <https://www.weforum.org/agenda/2019/04/how-much-data-is-generated-each-day-cf4bddf29f/>
- Dobbs, R., Manyika, J., & Woetzel, J. (2015). The Four Global Forces Breaking All the Trends. In McKinsey Global Institute. <https://doi.org/10.18311/sdmimd/2015/2659>
- Duffy, G., & Tucker, S. A. (1995). Political Science: Artificial Intelligence Applications. *Social Science Computer Review*, 13(1), 1–20.
- Dwivedi, Y. K. et al. (2019). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice, and policy. *International Journal of Information Management*, July, 0–1. <https://doi.org/10.1016/j.ijinfomgt.2019.08.002>
- Fatima, S., Desouza, K. C., & Dawson, G. S. (2020). National Strategic Artificial Intelligence Plans: A Multi-Dimensional Analysis. *Economic Analysis and Policy*, 67, 178–194. <https://doi.org/10.1016/j.eap.2020.07.008>
- Dye, Thomas R. (1984). Understanding public policy. Englewood Cliffs, N.J.: Prentice-Hall,
- Dunleavy, P., Margetts, H., Bastow, S., & Tinkler, J. (2006). New public management is dead—long live digital-era governance. *Journal of public administration research and theory*, 16(3), 467–494.
- Engin, Z., & Treleaven, P. (2019). Algorithmic Government: Automating Public Services and Supporting Civil Servants in using Data Science Technologies. *Computer Journal*, 62(3), 448–460. <https://doi.org/10.1093/comjnl/bxy082>
- Erdélyi, O.J., & Goldsmith, J. (2018). Regulating Artificial Intelligence: Proposal for a Global Solution. *Proceedings of the 2018 AAAI/ACM Conference on AI, Ethics, and Society*.
- Fatima, S., Desouza, K. C., & Dawson, G. S. (2020). National Strategic Artificial Intelligence Plans: A Multi-Dimensional Analysis. *Economic Analysis and Policy*, 67, 178–194. <https://doi.org/10.1016/j.eap.2020.07.008>
- Floridi, L. (2018). Soft ethics, the governance of the digital and the General Data Protection Regulation. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 376(2133), 20180081.
- Floridi, L., Cowsls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., ... & Vayena, E. (2018). AI4People—An ethical framework for a good AI society: Opportunities, risks, principles, and recommendations. *Minds and Machines*, 28(4), 689–707.
- French, P. E. (2009). *Effective Leadership in Times of Public Health Crises*. 485–487.
- French, P. E., Spears, R. A., & Stanley, R. E. (2005). The Fifth Paradigm of Public Administration? Public Organizational Theory as a Possible Solution to The Perennial Big Questions of Public Administration. *INTERNATIONAL JOURNAL OF ORGANIZATION THEORY AND BEHAVIOR*, 8(2), 133–154.
- Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change*, 114, 254–280. <https://doi.org/10.1016/j.techfore.2016.08.019>
- G20 Japan: AI Principles - G20 Insights. (2020). Retrieved 11 June 2021, from <https://www.g20-insights>
- G7. (2018). *Common Vision for the Future of Artificial Intelligence*. [Common Vision for the Future of Artificial Intelligence](https://www.g7.int/related-literature/g20-japan-ai-principles/)
- Gasser, U., & Almeida, V. A. F. (2017). A Layered Model for AI Governance. *IEEE Internet Computing*, 21(6), 58–62. <https://doi.org/10.1109/MIC.2017.4180835>
- Gordon, I., Lewis, J., & Young, K. (1993). Perspectives on Policy Analysis. In M. Hill (Ed.), *The Policy Process* (pp. 5–9).
- Hadden, S. G. (1989). The Future of Expert Systems in Government. *Journal of Policy Analysis and Management*, 8(2), 203–208. <https://www.jstor.org/stable/3323379>
- Hawthornth, J., & Berriman, R. (2018). Will Robots Really Steal Our Jobs? An international analysis of the potential long-term impact of automation. In PwC. www.pwc.co.uk/economics
- Head, B. W. (2008). Three Lenses of Evidence-Based Policy. *Australian Journal of Public Administration*,

- 67(1), 1–11. <https://doi.org/10.1111/j.1467-8500.2007.00564.x>
- Hern, A. (2016). Stephen Hawking: AI will be 'either best or worst thing' for humanity. Retrieved 10 May 2021, from <https://www.theguardian.com/science/2016/oct/19/stephen-hawking-ai-best-or-worst-thing-for-humanity-Cambridge>
- Ing, T. S., Lee, T. C., Chan, S. W., Alipal, J., & Hamid, N. A. (2019). An overview of the rising challenges in implementing industry 4.0. *International Journal of Supply Chain Management*, 8(6), 1181–1188.
- Janssen, M., & Helbig, N. (2018). Innovating And Changing the Policy-Cycle: Policy-Makers Be Prepared! *Government Information Quarterly*, 35(4), S99–S105. <https://doi.org/10.1016/j.giq.2015.11.009>
- Janssen, M., & Kuk, G. (2016). The Challenges and Limits of Big Data Algorithms in Technocratic Governance. *Government Information Quarterly*, 33(3), 371–377. <https://doi.org/10.1016/j.giq.2016.08.011>
- Jiang, X., Coffee, M., Bari, A., Wang, J., & Jiang, X. (2020). *Towards an Artificial Intelligence Framework for Data-Driven Prediction of Coronavirus Clinical Severity*. 63(1), 537–551. <https://doi.org/10.32604/cmc.2020.010691>
- Kankanhalli, A., Charalabidis, Y., & Mellouli, S. (2019). IoT and AI for Smart Government: A Research Agenda. *Government Information Quarterly*, 36(2), 304–309. <https://doi.org/10.1016/j.giq.2019.02.003>
- Karnofsky, Holden (2016) Some background on our views regarding advanced artificial intelligence, Open Philanthropy, May 6, section 1. C
- Kettl, D. F. (2002). Administrative Dilemmas. In *Public Administration for Twenty-First Century America*. The Johns Hopkins University Press.
- Keynes(1930), J.K,” , *Economic Possibilities for our Grandchildren in Essays in Persuasion* (New York: Harcourt Brace, 1932), 358-373
- Kincaid, J., & Stenberg, C.W. (2011). “Big Questions” about Intergovernmental Relations and Management: Who Will Address Them? *Public Administration Review*, 71, 196-202.
- Kirlin, J. J. (2001). Big Questions for a Significant Public Administration. *Public Administration Review*, 61(2), 140-143.
- Kirlin, J. J. (1996). The Big Question of Public Administration in a Democracy. *Public Administration Review*, 56(5), 416–423.
- Kolberg, D., & Zühlke, D. (2015). Lean Automation Enabled by Industry 4.0 Technologies. *IFAC-PapersOnLine*, 28(3), 1870–1875. <https://doi.org/10.1016/j.ifacol.2015.06.35>
- Kuziemski, M., & Misuraca, G. (2020). AI governance in the public sector: Three tales from the frontiers of automated decision-making in democratic settings. *Telecommunications Policy*, 44(6), 101976. <https://doi.org/10.1016/j.telpol.2020.101976>
- Linkov, I., Trump, B. D., Poinssatte-Jones, K., & Florin, M. V. (2018). Governance strategies for a sustainable digital world. *Sustainability (Switzerland)*, 10(2), 1–8. <https://doi.org/10.3390/su10020440>
- Lohmann, R. A. (2007). What Are the Big Questions of Nonprofit Management Today? *Public Administration Review*, 67(3), 437–444.
- Maciejewski, M. (2017). To-Do More, Better, Faster and More Cheaply: Using Big Data in Public Administration. *International Review of Administrative Sciences*, 83(1_suppl), 120– 135. <https://doi.org/10.1177/0020852316640058>
- Margetts, H., Dorobantu, C., 2019. Rethink government with AI. *Nature* 568, 163–165. doi:10.1038/d41586-019-01099-5
- Makridakis, S. (2017). The Forthcoming Artificial Intelligence (AI) Revolution: Its Impact on Society and Firms. *Futures*, 90, 46–60. <https://doi.org/10.1016/j.futures.2017.03.006>
- McClure, P. K. (2018). “You’re Fired,” says the Robot: The Rise of Automation in the Workplace, Technophobes, and Fears of Unemployment. *Social Science Computer Review*, 36(2), 139–156. <https://doi.org/10.1177/0894439317698637>
- Mehr, H. (2017). Artificial Intelligence for Citizen Services and Government. *Harvard Ash Center Technology & Democracy Fellow*, August 19. https://ash.harvard.edu/files/ash/files/artificial_intelligence_for_citizen_services.pdf
- Microsoft. (2018). *The Future of Artificial Intelligence and its Role in Society*. https://3erlvui9wo30pkxh1v2nh4w-wpengine.netdna-ssl.com/wp-content/uploads/2018/02/The-Future-Computed_2.8.18.pdf
- Mingus, M. S., & Jing, Z. (2017). The Big Questions of Chinese Public Management Research. *Administration and Society*, 49(6), 775–797. <https://doi.org/10.1177/0095399716636926>
- Misuraca, Gianluca; Van Noordt, C. (2020). *Overview of the use and impact of AI in public services in the EU*. <https://doi.org/10.2760/039619>
- Misuraca, G., & Viscusi, G. (2015). Shaping public sector innovation theory: an interpretative framework for ICT-enabled governance innovation. *Electronic Commerce Research*, 15(3), 303–322. <https://doi.org/10.1007/s10660-015-9184-5>
- Misuraca G, Mureddu F, Osimo D. (2014). Policy Making 2.0: Unleashing the power of big data for public governance. In: Mila Gasco-Hernandez, editor. *Open Government: Opportunities and Challenges for Public Governance*. New York / London (USA / UK): Springer / Heidelberg Dordrecht; 171-188. JRC85436
- Moynihan, D. P., & Pandey, S. K. (2010). The Big Question for Performance Management: Why Do Managers

- Use Performance Information? *Journal of Public Administration Research and Theory*, 849–866. <https://doi.org/10.1093/jopart/muq004>
- Munne, R. (2016). Big Data in the Public Sector. In *New Horizons for a Data-Driven Economy: A Roadmap for Usage and Exploitation of Big Data in Europe* (pp. 195–208). <https://doi.org/10.1007/978-3-319-21569-3>
- Francis X. Neumann, Jr. (1996). What Makes Public Administration a Science? Or Are Its “Big Questions” Really Big? *Public Administration Review*, 56(5), 409–415. <https://www.jstor.org/stable/977039>
- OECD. (2018). Open Government Data Report: Enhancing Policy Maturity for Sustainable Impact. In OECD Digital Government Studies. <https://doi.org/10.1787/9789264305847-e>
- O’Flynn, Janine (2021). Confronting the big challenges of our time: making a difference during and after COVID-19, *Public Management Review*, 23:7, 961-980, DOI:10.1080/14719037.2020.182027
- Onder, Murat, “Yapay Zekâ: Kavramsal Çerçeve”, Demir, İbrahim(ed.), Disiplinlerarası Politika Vizyonu ve Stratejiler 2020, Iksad Publishing House, 2020, ss. 91-102.
- Onder, M., & Uzun, M. M. (2021). Roles of Artificial Intelligence (AI) on COVID-19 Pandemic Crisis Management Policies. *International Journal of Public Administration in the Digital Age (IJPADA)*, 8(2), 1-13.
- Ojo, A., Zeleti, F. A., & Mellouli, S. (2019). A realist perspective on AI-Era public management. *ACM International Conference Proceeding Series*, 159–170. <https://doi.org/10.1145/3325112.3325261>
- Pencheva, I., Esteve, M., & Mikhaylov, S. J. (2018). Big Data and AI – A Transformational Shift for Government: So, What Next for Research? *Public Policy and Administration*. <https://doi.org/10.1177/0952076718780537>
- Perc, M., Ozer, M., & Hojnik, J. (2019). Social And Juristic Challenges of Artificial Intelligence. *Palgrave Communications*, 5(1), 1–7. <https://doi.org/10.1057/s41599-019-0278-x>
- Perry, B., & Uuk, R. (2019). AI Governance and the Policymaking Process: Key Considerations for Reducing AI Risk. *Big Data and Cognitive Computing*, 3(2), 1–17. <https://doi.org/10.3390/bdcc3020026>
- Provost, F., & Fawcett, T. (2013). Data Science and its Relationship to Big Data and Data-Driven Decision Making. *Big Data*, 1(1), 51–59. <https://doi.org/10.1089/big.2013.1508>
- Shangraw, R. F. (1987). Knowledge Acquisition, Expert Systems, and. *Social Science Microcomputer Review*, 5(3), 163–173. [https://doi.org/10.1016/0377-2217\(87\)90281-5](https://doi.org/10.1016/0377-2217(87)90281-5)
- Sharma, R., Bhattarai, S., & Rupakheti, M. (2020). Lockdown caused by the COVID-19 pandemic reduces air pollution in cities worldwide. April. <https://doi.org/10.31223/osf.io/edt4j>
- Smuha, N. A. (2019). From a “Race to AI” to a “Race to AI Regulation” - Regulatory Competition for Artificial Intelligence. *SSRN Electronic Journal*, 1, 1–27. <https://doi.org/10.2139/ssrn.3501410>
- Sousa, W. G. de, Melo, E. R. P. de, Bermejo, P. H. D. S., Farias, R. A. S., & Gomes, A. O. (2019). How and where is artificial intelligence in the public sector going? A literature review and research agenda. *Government Information Quarterly*, 36(4), 1–14. <https://doi.org/10.1016/j.giq.2019.07.004>
- Steuer, F. (2018). *Machine Learning for Public Policy Making How to Use Data-Driven Predictive Modeling for the Social Good* (Issue July).
- Su, G. (2018). Unemployment in the AI age. *AI Matters*, 3(4), 35–43. <https://doi.org/10.1145/3175502.3175511>
- Sun, T. Q., & Medaglia, R. (2019). Mapping the challenges of Artificial Intelligence in the public sector: Evidence from public healthcare. *Government Information Quarterly*, 36(2), 368– 383. <https://doi.org/10.1016/j.giq.2018.09.008>
- Thierer, A. D., Castillo, A., & Russell, R. (2017). Artificial Intelligence and Public Policy. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3021135>
- Thompson, S. E., & Parthasarathy, S. (2006). Moore’s Law: The Future of Si Microelectronics. *Materials Today*, 9(6), 20–25. [https://doi.org/10.1016/S1369-7021\(06\)71539-5](https://doi.org/10.1016/S1369-7021(06)71539-5)
- Totschnig, W. (2019). The Problem of Superintelligence: Political, Not Technological. *AI and Society*, 34(4), 907–920. <https://doi.org/10.1007/s00146-017-0753-0>
- Turner, J. (2019). Robot Rules Regulating Artificial Intelligence. In Jacop Turner (Ed.), *Springer*. <https://doi.org/10.1126/science.343.6172.707-e>
- Valle-Cruz, D., Sandoval-Almazan, R., Ruvalcaba-Gomez, E. A., & Ignacio Criado, J. (2019). A Review of Artificial Intelligence in Government and Its Potential from A Public Policy Perspective. *ACM International Conference Proceeding Series*, 91–99. <https://doi.org/10.1145/3325112.3325242>
- Valle-Cruz, J. Ramon Gil-Garcia, and Vanessa Fernandez-Cortez. (2020). Towards Smarter Public Budgeting? Understanding the Potential of Artificial Intelligence Techniques to Support Decision Making in Government. In The 21st Annual International Conference on Digital Government Research (dg. o ‘20). Association for Computing Machinery, New York, NY, USA, 232–242. <https://doi.org/10.1145/3396956.3396995>
- Uzun, M. M. “Yapay Zekâ: Fırsat Ve Tehditler”, Demir, İbrahim(ed.), Disiplinlerarası Politika Vizyonu ve Stratejiler 2020, Iksad Publishing House, 2020, ss.137-153.
- Uzun, M. M. 2020. “Covid-19 İle Mücadelede Yapay Zekâ Uygulamaları” /“Artificial Intelligence Applications in Combating Covid-19”. *ULİSA / Journal of International Studies*, 2: 45–55
- Wang, W., & Siau, K. (2018). Artificial Intelligence: A Study on Governance, Policies, and Regulations. *Proceedings of the Thirteenth Midwest Association for Information Systems Conference, September 40*. <http://aisel.aisnet.org/mwais2018/40>

- Waldt, G.V. (2012). Contemplating the Big Five Questions in Public Administration and Management Curriculation.
- Winfield, A. F. T., & Jirotko, M... (2018). Ethical governance is essential to building trust in robotics and artificial intelligence systems. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 376(2133), 20180085. <https://doi.org/10.1098/rsta.2018.0085>
- Wirtz, B. W., & Müller, W. M. (2019). An Integrated Artificial Intelligence Framework for Public Management. *Public Management Review*, 21(7), 1076–1100. <https://doi.org/10.1080/14719037.2018.1549268>
- Wirtz, B. W., Weyerer, J. C., & Geyer, C. (2018). Artificial Intelligence and the Public Sector— Applications and Challenges. *International Journal of Public Administration*, 42(7), 596– 615. <https://doi.org/10.1080/01900692.2018.1498103>
- Wirtz, B. W., Weyerer, J. C., & Sturm, B. J. (2020). The Dark Sides of Artificial Intelligence: An Integrated AI Governance Framework for Public Administration. *International Journal of Public Administration*, 43(9), 818–829. <https://doi.org/10.1080/01900692.2020.1749851>
- World Economic Forum. (2020). The Future of Jobs Report 2020 | World Economic Forum. *The Future of Jobs Report, October 2020*, 1163. <https://www.weforum.org/reports/the-future-of-jobs-report-2018%0Ah>
- Yeung, K., Howes, A., Pogrebna, G., Yeung, K., Howes, A., & Pogrebna, G. (2020). AI Governance by Human Rights-Centered Design, Deliberation, and Oversight. In *The Oxford Handbook of Ethics of AI*. <https://doi.org/10.1093/oxfordhb/9780190067397.013.5>
- Yıldız, M. (2020). Yeni Teknoloji ve İş Yapış Biçimlerinin Kamu Politikalarına Etkisi: Genel Bir Çerçeve. In M. Yıldız & C. Babaoğlu (Eds.), *Teknoloji ve Kamu Politikaları* (pp. 1–8). Gazi Kitabevi.
- Yıldız, M. (2007). E-government research: Reviewing the literature, limitations, and ways forward. *Government Information Quarterly*, 24(3), 646–665. <https://doi.org/10.1016/j.giq.2007.01.002>
- Yıldız, M. (2013). Big questions of e-government research. *Information Polity*, 17(February), 343–355. <https://doi.org/10.1145/2479724>.
- Zavattaro, S. M. (2018). What's in a symbol? Big questions for place branding in public administration. *Public Administration Quarterly*, 42(1), 90-119.
- Zimmerman, A. D. (1995). Toward a More Democratic Ethic of Technological Governance. *Science, Technology, & Human Values*, 20(1), 86-107. <https://doi.org/10.1177/016224399502000105>