

DOI: 10.5281/zenodo.18908110

# FROM WEBERIAN BUREAUCRACY TO ALGORITHMIC GOVERNANCE: THE TRANSFORMATION OF THE BUREAUCRATIC SUBJECT IN PUBLIC ADMINISTRATION

Cem Angin<sup>1</sup> and Sevil Zengin Gupta<sup>2</sup>

<sup>1</sup>Associate Professor, Ordu University, Faculty of Economics and Administrative Sciences, Department of Political Science and Public Administration, Mail: [angin52@gmail.com](mailto:angin52@gmail.com), ORCID: 0000-0002-2813-5586.

<sup>2</sup>Assistant Professor, Yozgat Bozok University, Faculty of Economics and Administrative Sciences, Department of Political Science and Public Administration, Mail: [sevil.zengin@yobu.edu.tr](mailto:sevil.zengin@yobu.edu.tr)  
ORCID: <https://orcid.org/0000-0002-8129-8878>.

Received: 14/02/2026  
Accepted: 09/03/2026

Corresponding Author: Cem Angin  
([angin52@gmail.com](mailto:angin52@gmail.com))

## ABSTRACT

*The Weberian bureaucracy that dominated the administrative structure of the modern state for many years, along with this model's institutional logic based on human-centered policy formulation, decision-making, implementation, and monitoring processes, is being reshaped with the emergence of algorithmic governance, a new administrative paradigm based on artificial intelligence. The study questions whether the increasingly widespread use of artificial intelligence in public administration represents merely a process of technical modernization or a structural transformation that alters the nature of administrative power. The aim of the study is to analyze artificial intelligence and algorithmic governance from a public administration perspective in their theoretical, practical, and conceptual dimensions and to reveal the effects of these technologies on public administration. Methodologically, the study adopts a qualitative research approach; in addition to a conceptual and analytical examination based on a literature review, the comparative method has also been employed. In terms of findings, the study demonstrates that human-centered decision-making, implementation, and oversight processes are gradually being replaced by algorithmic systems, and that this situation reshapes the manner in which public power is exercised. The study concludes that artificial intelligence-based algorithmic governance in public administration should be considered not merely as a technical tool but as a structural element that transforms the nature of administrative power; it reveals that this situation necessitates the strengthening of the legal framework of algorithmic systems and the restructuring of transparency and accountability mechanisms.*

**KEYWORDS:** Algorithmic Governance, Public Administration, Artificial Intelligence, Administrative Power, Weberian Bureaucracy.

## 1. INTRODUCTION

The Weberian conception of bureaucracy, which for many years became the fundamental philosophy of public administration (such as hierarchical organization, a centralist approach, adherence to rules, impersonality, and legal-rational authority), has shaped the governing approach of the modern state. However, this conception has undergone changes and transformations in the historical process due to many reasons (social, political, economic, and technological). Especially since the 1980s, rapid developments both in the politico-economic understanding (neoliberalism) and in information and communication technologies have radically transformed, primarily the state in general and as a whole, and more specifically public administration (such as the form of organization, decision-making processes, the understanding of public service and its methods of delivery). In this transformation process, first e-government applications and later innovative technologies such as artificial intelligence have played a leading role.

Artificial intelligence refers to high-level technological systems that can imitate some basic human abilities (Angin, 2025, p. 168). Today, these systems are widely used in many areas of public administration. However, this situation also brings along some fundamental debates. The understanding of algorithmic governance, on which the study will be built, is also one of these controversial topic headings. Algorithmic governance refers to making artificial intelligence effective in the provision of public services and in administrative decision-making processes (Katzenbach & Ulbricht, 2019, p. 4). Therefore, the human-centered policy formulation, decision-making, implementation, and monitoring processes, which are the subject of Weberian bureaucracy, are being replaced, together with algorithmic governance, by an AI-supported administrative understanding. However, this tendency also brings to the agenda fundamental issues such as transparency, impartiality, and legitimacy.

This study questions whether the increasingly growing use of artificial intelligence in public administration is merely a process of technical modernization, or a structural transformation that changes the nature of administrative power. In this framework, the issue of whether algorithmic systems create a new "invisible bureaucracy" in the use of public power is at the center of the study. The aim of the study is to analyze the concepts of artificial intelligence and algorithmic governance theoretically and conceptually from a public administration

perspective. In line with this aim, the study seeks to address, from a holistic perspective, the opportunities that algorithmic governance offers to public administration and the risks it brings along. The scope of the study includes, rather than producing a general inventory of the areas of use of artificial intelligence in public administration, concretely presenting algorithmic governance through examples and focusing on its administrative-normative dimensions. In this context, the study addresses the role of algorithms in the processes of public policy-making, administrative decision-making, and public service delivery; and examines the effects of this role on the principles of the rule of law, transparency, accountability, and participation.

In the study, a qualitative research approach was adopted; alongside a conceptual and analytical examination based on a literature review, the comparative method was also utilized. In this context, academic studies, international reports, and policy documents situated at the intersection of artificial intelligence, algorithmic governance, and public administration were analyzed, and examples of country practices that would concretize algorithmic governance were addressed. In terms of findings, it was determined that artificial intelligence-based algorithmic governance has begun to transform Weberian bureaucracy, which has long been a dominant understanding in public administration. As a result, the study argues that artificial intelligence and algorithmic governance represent a transformation in public administration; however, it is mandatory to make this transformation compatible with the principles of democratic governance. In this context, it is concluded that regulations should be made to increase the transparency of algorithmic systems, hybrid decision-making models based on human oversight should be developed, and the algorithmic literacy of public administrators should be strengthened. It is anticipated that the study will contribute to the literature in terms of presenting a holistic perspective on algorithmic governance, which is a quite new and current paradigm in public administration, and of demonstrating it through concrete examples.

## 2. METHODOLOGY

### 2.1. Method

This study adopts a qualitative research framework, structured around two primary methodological pillars to examine the integration of artificial intelligence and algorithmic systems within public administration.

- **Literature Review and Conceptual Analysis:** The first pillar involves a systematic evaluation of academic literature, international reports, and policy documents situated at the intersection of artificial intelligence, algorithmic governance, and public administration. As noted by Snyder (2019, p. 334), literature reviews range in scope from targeted analyses of specific variable correlations to expansive syntheses of existing evidence, serving as a primary mechanism for evaluating the current state of knowledge and providing a comprehensive overview of a given research problem. This conceptual grounding ensures that the subsequent analysis is rooted in established theoretical debates regarding digital transformation.
- **Comparative Method:** The second pillar utilizes a comparative method to operationalize the abstract concepts of algorithmic governance. This study examines public administration practices across 31 countries, including Türkiye, the USA, China, and various EU member states. To qualify for this classification, a study must analyze at least two cases—whether empirical or counterfactual—while employing a demonstrably comparative methodology, defined either by the author’s explicit methodological claims or by the provision of substantially equal analytical weight to multiple cases (Beck, 2017; p. 537). Consequently, this research integrates conceptual analysis with a comparative examination of 31 national frameworks to scrutinize the practical implementation of AI and algorithmic systems.

By focusing on the proliferation of artificial intelligence within the public sector, this study addresses the following central inquiries: Does the implementation of artificial intelligence and algorithmic systems in public administration represent a simple technical modernization, or does it signify a structural transformation that fundamentally alters the nature of administrative power? Do algorithmic systems facilitate the emergence of a new “invisible bureaucracy” that operates beyond traditional mechanisms of oversight in the exercise of public authority?

Employing this dual-pillar approach allows for a rigorous transition from theoretical abstraction to empirical application. By synthesizing the existing scholarship with a broad-spectrum comparative analysis of 31 distinct jurisdictions, the study moves

beyond mere description to identify systemic patterns in how sovereign powers are being reconfigured. Ultimately, this methodology provides the necessary analytical depth to determine whether the “invisible bureaucracy” identified in the research questions is an incidental byproduct of technical adoption or an inherent feature of modern algorithmic governance.

## 2.2. Aim

The main aim of the study is to analyze the concepts of artificial intelligence and algorithmic governance theoretically and conceptually from the perspective of the discipline of public administration. In this direction, the study aims to present, from a holistic perspective, the opportunities (speed, efficiency) that algorithmic governance offers to public administration and the risks (transparency, accountability) it brings along.

## 2.3. Scope

The scope of the study is not limited to producing a technical inventory of the areas of use of artificial intelligence. Instead, by examining the role of algorithms in the processes of public policy-making, administrative decision-making, and service delivery, it focuses on the normative effects of this role on the rule of law and democratic principles.

## 2.4. Findings

The main findings obtained as a result of the analyses are as follows:

- **Paradigm Shift:** It was determined that human-centered decision-making and hierarchical oversight processes are increasingly being replaced by algorithmic systems; that codes have taken the place of hierarchy, and programmability has taken the place of the chain of command.
- **Structural Transformation:** AI-based algorithmic governance has begun to transform the classical principles of Weberian bureaucracy, and vertical organizations have given way to horizontal networks.
- **Transparency Problem:** As seen in country cases such as the Netherlands (SyRI) and the United Kingdom (grading system), it was found that algorithmic systems create a “transparency paradox” and, when left unsupervised, can turn into “inequality machines” that reproduce social inequalities.
- **Efficiency Increase:** Examples such as the ASENSA project in Türkiye or the OAS simulator in Canada were observed to increase

administrative capacity by reducing bureaucratic transaction costs.

Based on these findings, it was concluded that artificial intelligence should be regarded not only as a technical tool in public administration but also as a structural element that changes the nature of administrative power.

### 3. CONCEPTUAL FRAMEWORK: WHAT IS ALGORITHMIC GOVERNANCE?

Since it constitutes the basis of the study, first of all the concept of “algorithmic governance” needs to be clarified. It is possible to present the historical background and development of algorithmic governance in three stages. These stages are as follows: first, revealing its etymological origins; second, associating it with the “Turing Machine,” which is the foundation of modern computer science; and finally, evaluating it within the framework of “algocracy,” a rather new concept in the social sciences. The algorithm, in terms of its origin, is based on the concept of Arithmos (number) in Ancient Greece (etymonline, 2025). However, the concept has undergone transformation over time. The works of Al-Khwarizmi, who made significant contributions to the field of mathematics, were translated into Latin, and this translation took the form of “Algorisme,” that is, algorithm, to be used in the sense of rules for solving numerical problems. Al-Khwarizmi developed logic-based algorithmic concepts and solution techniques to solve mathematical problems, and these techniques were integrated into modern computers and used by computer scientists in the 20th century (worldhistoryedu, 2022). In this respect, Al-Khwarizmi is accepted as the creator of the concept of algorithm.

The concept of algorithmic governance refers to the power of algorithms to make decisions or to influence decisions made; it defines the situation in which human decision-making processes are increasingly replaced by algorithms or these processes are guided by algorithms (Gamito & Ebers, 2021, p. 1). Algorithmic governance is a multidimensional concept that reveals the potential and risks created by algorithms as decision-makers. Algorithmic governance has emerged as a result of the transformation of digitalization and bureaucratic forms of administration. In this respect, algorithmic governance is a hybrid approach that differs from different intellectual approaches in public administration, yet is nourished by them and transforms them. For example, it brings together the rationality logic of Weberian bureaucratic thought;

the efficiency, speed, performance, and measurability of new public management; and the network and data infrastructure of the digital governance approach, but by transforming these through algorithms, it ultimately reveals an AI-supported, code- and data-centered understanding of administration instead of a human-centered understanding of administration. Some basic characteristics of algorithmic governance are as follows (Gamito & Ebers, 2021, p. 2–4):

- Algorithmic governance is data-driven: Within algorithmic governance, data is collected and analyzed in amounts, varieties, and speeds that exceed human capacity. Therefore, in algorithmic governance, administrative processes rely on digitizable data or are subjected to a quantitative transformation (Kalpokas, 2019, p. 13–15).
- Human intervention decreases in algorithmic governance: In algorithmic governance, algorithms, artificial intelligence, and machines make decisions in decision-making processes; therefore, the place of the human factor is gradually decreasing. Accordingly, in algorithmic governance, decision-making authority is transferred to algorithms. For example, in many sectors such as finance, transportation, health, and security, decision-making processes are being transferred from humans to machines.
- There is a transparency paradox in algorithmic governance: The functioning of algorithmic systems is generally not transparent. This situation is characterized in the literature as the “Black-Box” effect (Smith, 2020, p. 3–4). Because, even if there is knowledge about the basic data, there are uncertainties regarding how decisions are formed based on the data. Therefore, while algorithmic governance needs public and open data, the content of the decisions formed on the basis of these data contains uncertainties.

Algorithmic governance consists of some basic components. The first of these is artificial intelligence. Artificial intelligence is the branch of science, technology, and engineering concerned with understanding human intelligence and transferring this intelligence to machines, simulating it (Antonov, 2011, p. 1; Korteling, et. al., 2021, p. 7). In general, artificial intelligence can be defined as the “automation of cognition,” and more specifically it can be defined as a machine’s performing competitive tasks that require cognitive processes (Abbass, 2021, p. 94–95). The term “cognition” here

includes the automation of human-specific mental processes, information and data processing, learning, reasoning, decision-making, and interpretation. Therefore, while the industrial revolution brought about the automation of labor, the AI-driven digital revolution taking place in the period we are in has brought about the automation of cognition.

The second component of algorithmic governance is algorithms. An algorithm is a sequence of paths and methods to be followed in solving problems or meeting needs, and it enables analyses, simulations, calculations, and reporting to be carried out very quickly and reliably (Özgür, 2021, p. 5). The relationship between artificial intelligence and algorithms arises from the fact that artificial intelligence is a technology that uses computational algorithms to imitate human intelligence and solve complex problems (Sivasubramanian, 2022, p. 1).

The third component of algorithmic governance is big data (Big Data). Big data can be defined as massive amounts of information clusters that are too large and complex to be managed by traditional methods and that also require new tools to be analyzed (Pence, 2014, p. 159). In other words, big data refers to the inputs necessary for algorithmic governance to be able to operate and become functional. Artificial intelligence contributes to algorithmic governance by fulfilling functions such as revealing patterns in large data sets, learning based on this, and making inferences.

The fourth component is automated decision-making systems (OKVS). OKVS refers to the use of algorithms or artificial intelligence for the purpose of making decisions or supporting decisions, and thus to situations in which there is no human intervention in decision processes or it is at a minimal level (Karabulut, 2025, p. 152). These systems are software-based or hardware-embedded systems that collect and process data, analyze their environment, and act with a degree of autonomy to achieve certain goals (Monarcha-Matlak, 2021, p. 2079).

As can be seen, algorithmic governance has a structure consisting of different components. Among these components, algorithms reveal the operating logic, artificial intelligence the cognitive capacity, big data the very high amount of input source, and automated decision-making systems reveal the implementation and outputs. Therefore, algorithmic governance points not only to a technical situation but also to a new structural paradigm that transforms fundamental administrative functions such as decision-making, implementation, and oversight. In this transformation, codes and algorithms replace hierarchy in bureaucratic structures,

programmability replaces the chain of command, and horizontal organizations replace vertical organizational forms (Soysal, 2023, p. 71).

### ***3.1. Weberian Bureaucracy and Management Philosophy***

Weberian bureaucracy has been the approach that shaped the administrative philosophy of organizational structures and the modern state for a long period. The theoretical foundations of this approach extend to Max Weber's analyses regarding the sources of authority in modern societies. As a result of these inquiries, Weber developed an understanding of administration based on rational-legal authority and, within the framework of this understanding, conceptualized the bureaucracy model. Weber basically questioned why people obey and consent in organizations and, more generally, in social structures, that is, he questioned the source of legitimacy of authority, and as a result of the observations and research he carried out in this regard, he made a classification of three types of legitimate power (authority). These are traditional authority, charismatic authority, and legal-rational authority (Ok, 2017, p. 46–47).

- Traditional authority: Acceptance toward persons seen as authority stems from traditions or customs.
- Charismatic authority: Acceptance of the authority person, loyalty and trust felt toward him/her, is based on the personal values of the leader.
- Legal-rational authority: The source of authority is based on laws and procedures.

Weber asserted that from past to present a transformation has been experienced from traditional and charismatic authority toward legal-rational authority. He defined bureaucracy as the organizational counterpart of this form of authority. Therefore, Weber analyzes bureaucracy as a form of organization and as the rational mode of administration of modern societies. In the emergence and shaping of this organizational and administrative form, processes such as the development of capitalism, industrialization, and the institutionalization of the nation-state have significant effects.

The weberian conception of bureaucracy is founded upon a set of fundamental principles that extend beyond the classification of authority types. Hierarchical structure, written rules, division of labor, specialization, and merit are among these principles (Öztürk, 2023, p. 60; Akçakaya, 2016, p. 285). Hierarchy is the principle that envisages the

arrangement of authority and responsibilities in a superior-subordinate manner and also facilitates coordination and supervision. Written rules are the principle that ensures the formation of standards and procedures in administration. The principle of specialization expresses that tasks are carried out by officials specialized in certain fields. Merit, on the other hand, expresses the determination of personnel suitable for the job according to objective criteria and principles. Weber argued that thanks to these principles, bureaucracy would be the most rational form of organization of modern administration. However, Weberian bureaucracy has also brought along many problems such as red tape, sluggishness, excessive rule-boundness, a rigid and inflexible structure, inability to respond quickly to changing social needs, and narrowing the areas of initiative of employees, and for this reason it has been criticized over time (Çevikbaş, 2014, p. 91). Especially in the 1980s, the neoliberal economic policy paradigm that emerged and the administrative approaches such as “new public management” and “governance” that accompanied it deepened the criticisms of the Weberian conception of bureaucracy and drew attention to the need to reconsider it.

Today, the concept of bureaucracy is used in many meanings and functions. In this respect, bureaucracy is used in three basic meanings (Eryılmaz, 2021, p. 244): In the first, bureaucracy is red tape and excessive and unnecessary paperwork that leads to inefficiency. In the second, bureaucracy is civil service. That is, it is the living body of bureaucracy. In the third, bureaucracy (also in accordance with the Weberian conception of bureaucracy) is a form of organization. Within it, there are dominant characteristics such as authority in superior-subordinate relations, hierarchy, and a system of rules.

The Weberian conception of bureaucracy has had effects and contributions in bringing administration, by purifying it from personalism and arbitrariness, to a certain systematics (being based on laws and rules, predictability, division of labor, specialization, etc.). In this respect, the Weberian conception of bureaucracy is one of the important points of reference administratively. However, this conception is undergoing a significant transformation today with the digitalization of public administration and innovative technologies such as artificial intelligence.

#### **4. THE EVOLUTION OF DIGITALIZATION IN PUBLIC ADMINISTRATION: FROM E-GOVERNMENT TO ARTIFICIAL INTELLIGENCE**

Digitalization in public administration, or in other words digital transformation, is, in the most general terms, the integration of information and communication technologies into public administration, public services, decision-making, and administrative processes (Angin, 2021, p. 259–260). Digitalization is not only an administrative modernization but also a multidimensional process that includes the restructuring of the administrative understanding and state-citizen relations (Angin, 2026, p. 110). Digital transformation first manifested itself with e-government and later, together with artificial intelligence and other innovative technologies, has become a multidimensional administrative paradigm today. With e-government, which can be seen as the first step of digitalization, public services were transferred from the physical environment to the virtual environment (Akyazı, 2005, p. 166). This transfer reshaped citizen-state interaction, communication, and the ways and methods of service delivery. While digitalization aimed to facilitate citizens’ access to public services, it also aimed for public administration to attain a less bureaucratic, fast, efficient, and transparent structure.

With the widespread use of the internet, large amounts of data belonging to humanity have been revealed, and this has enabled the spread of a data-based decision-making understanding, which is accepted as a new stage of digital transformation. Big data analytics has made it possible to develop more accurate, faster, and more correct policies, especially in public services, in decision-making processes, and in identifying needs (Gamage, 2016, p. 386). Big data analytics has also brought along an understanding of public administration that is measurable, comparable, and analyzable.

In the third stage of digitalization, artificial intelligence, which has become extremely popular today and is used in many fields, takes place. Artificial intelligence has reached a more widespread usage potential by benefiting from e-government and big data, which are the previous links of digital transformation. Today, artificial intelligence is used in many public services such as social security, disaster management, traffic management, health and education services, and the defense industry, and it effectively performs many functions here, including decision support, risk analysis, oversight, and resource allocation. Therefore, artificial intelligence has ceased to be merely a technical tool and has become an element of the structural transformation of public administration. In the following heading, this transformation is addressed

within the framework of the evolution from the hierarchical, rule-based, and human-centered structure of Weberian bureaucracy to the new understanding of administration of algorithmic governance based on data-driven, automation-based, and decision-support mechanisms.

#### **4.1. Governing with Algorithms: A Structural Transformation in Public Administration**

The bureaucratic organization model defined by Weber has long constituted both the normative and analytical foundation of public administration. Yet, this foundation has undergone a profound transformation, driven particularly by advancements in information and communication technologies. Today, this transformation is characterized by digitalization, marking a process where digital technologies permeate every field. In the context of the citizen-state relationship, this shift redefines access to public services through self-service models—facilitated by easy and accessible data (Lindgren et al., 2019, p. 429). Put differently, digitized public services reposition the citizen from a passive state to a more active role (Agostino, Saliterer, & Steccolini, 2022, p. 162). Accordingly, public administration is re-evaluating its organizational processes, replacing the Weberian bureaucratic apparatus with a digital counterpart. This shift extends the Fourth Industrial Revolution, influencing state decision-making processes. Many nations now employ digital practices across all stages of public policy (Mountasser & Abdellatif, 2023, p. 4). Policymakers, particularly in Northern European countries—predominantly the Nordic states—have envisioned this for a quarter-century, utilizing digital technologies as a strategic opportunity in every sector since the 1990s (Schou & Hjelholt, 2018, p. 4). Thus, the digitalization journey of public administration signals not merely a simple automation process, but a structural paradigm shift shaking the very foundations of traditional Weberian bureaucracy.

While integrating algorithmic systems into decision-making mechanisms optimizes the speed and efficiency of administrative processes, it also necessitates a reinterpretation of ancient public administration principles—such as transparency, merit, and accountability—according to the requirements of the digital age. Governance by algorithms is not simply a technical preference; it is a fundamental reform transforming the quality and legitimacy of the contact between public authority and society. Concretizing this institutional framework and revealing the reflections of

algorithmic transformation across different national experiences constitutes the originality of this study. This structural transformation, discussed at a theoretical level, undoubtedly assumes different appearances based on each country's political culture, legal system, and technological infrastructure. In this context, the practices of countries taking leading roles in digital statehood serve as critical laboratories for both testing the validity of theoretical claims and making sense of future public administration projections.

In the specific case of Türkiye, the position of structural transformation reflects a concrete strategic preparation evolving from an e-government mechanism to an AI-government (a-government) model (Avaner & Fedai, 2019, p. 151). The roadmap drawn by the National Artificial Intelligence Strategy (2021-2025), prepared by the Ministry of Industry and Technology and the Presidency's Digital Transformation Office under the 11th Development Plan, demonstrates that algorithms in Turkish public administration have become an essential element of administrative capacity, rather than merely auxiliary tools. Similarly, the AI-based ASENSA (Analysis System Narcotics Network) project, prepared by the General Directorate of Security, Department of Combating Narcotic Crimes, has gained significant momentum by performing risk analysis regarding criminal elements, illegal activities, and organizations, in addition to being a domestic and national initiative (Presidency Directorate of Communications, 2025, p. 76). Furthermore, the 'Hızır' chatbot, implemented by the Ministry of Foreign Affairs within its digital diplomacy vision, is a significant reflection of this transformation in foreign policy. Likewise, the Ministry of National Education's 'MEB and EBA Assistant' applications, which digitize student-teacher interaction, and the Ministry of Treasury and Finance's "GİB" assistant, offering guidance in tax processes, prove how administrative functioning is becoming personalized. The 'Neyim Var?' (What Do I Have?) system, constructed by the Ministry of Health with algorithmic logic (Karabulut, 2025, p. 161), symbolizes the point automation has reached in diagnosis and referral processes.

When the integration of AI technologies in public administration is examined, the process appears to follow a chronological maturation phase over the last decade, spanning a spectrum from social aid distribution to urban planning, and from judicial processes to border security. As an early example, Costa Rica took a pioneering step in 2013 by launching a centralized algorithm system named

SINIRUBE to identify poor households and determine social benefits (OECD, 2024, p. 27). In a similar early application in Poland, the Ministry of Labor and Social Policy developed an algorithm in 2014 to profile the unemployed; however, this system faced criticism for its rigidity (Niklas et al., 2015, p. 5). India utilized AI as a tool for economic integration by launching the e-NAM project in 2016 to modernize agricultural markets and increase transparency (Nayna & Ashutosh, 2024, p. 7005). This digitalization drive in social policy also found resonance in Canada; the Employment and Social Development administration reconnected thousands of people to aid using NLP and machine learning techniques to identify eligible recipients according to legal changes in 2017 (OECD, 2024: 24).

From 2018 onwards, an increase in security and audit-focused applications is observed. While Spain's national police force developed the VeriPol model, which detects the veracity of robbery reports with over 90% success (Liberatore, Quijano-Sánchez, & Camacho-Collados, 2018, p. 90), France initiated data mining projects such as PILAT and CFVR to analyze tax fraud and financial relationships (Trescher, 2024, p. 9-10). However, the ethical boundaries of algorithmic decision-making were challenged during this period; the algorithm determining student grades in the UK during the pandemic and the SyRI system used for social security fraud in the Netherlands were halted due to bias and human rights violations, respectively, following legal and social backlash (Lantyer, 2018: 2; Lantyer, 2025, p. 2). Despite this, the Netherlands continued data-driven management in public security through crime prediction systems (CAS) and case-matching algorithms in immigration administration (Kinchin, 2024, p. 27).

The years 2021 and 2022 marked a period where urban management and crisis simulations became widespread on a global scale. Under the smart city concept, Singapore and South Korea (Seoul) utilized digital twin technologies to solve urban problems, while Antwerp adopted noise mapping, Helsinki used disaster simulation, and Dublin moved to AI-supported modeling in city planning with landscape simulations (Yang & Kim, 2021: 363-374). In the same

period, the Australian state of Victoria used text analysis in health triage (Wirjo et al., 2022; p. 2); China began utilizing machine learning algorithms across a broad area from foreign policy decisions to road maintenance, and Russia developed systems analyzing veterinary certificates to ensure food safety (Wirjo et al., 2022, p. 4). Additionally, the Philippines and Thailand turned to technologies processing satellite imagery for poverty mapping (Wirjo et al., 2022, p. 3).

Regarding applications in 2024 and beyond, AI is becoming more autonomous in the judiciary, bureaucracy, and complex data analysis. In 2024 and 2025, Brazil deployed an AI named "MarIA" in Supreme Court processes and automated systems in the social security institution for identifying death records (Lantyer, 2025: 1; OECD, 2024, p. 26). While France introduced "Albert," a generative AI model in public services, and LLM-based projects analyzing legislative bills (Trescher, 2024, p. 7-8), Austria, Estonia, and Finland established advanced chatbots and voice recognition systems to manage citizen requests and automate bureaucratic processes (OECD, 2024, p. 22-24). Similarly, Germany actively uses machine learning-supported systems for classifying child benefit documents, as does Canada for immigration applications (ADA) (OECD, 2024, p. 25; Kinchin, 2024, p. 27). Italy's predictive algorithms in tax and judiciary fields (Dorigo & Mercuri, 2024, p. 66) and Sweden's advanced fraud detection systems launched in early 2024 (OECD, 2024, p. 26) demonstrate how the state's financial audit capacity is being strengthened by technology. Finally, Greece's use of Transformer-based models to monitor coastline erosion, referenced for 2026, indicates that the role of AI in public administration will also deepen within the axis of environmental sustainability (Drakopolou et al., 2026, p. 4-6). To systematize these diverse international experiences, Table 1 presents an inventory of algorithmic application practices across the 31 countries examined in this study, including Türkiye. It should be noted, however, that this inventory is non-exhaustive and restricted to accessible data, rather than encompassing every AI or algorithmic model utilized within these jurisdictions.

**Table 1: Country-Specific Details on the Utilization of AI-Based Algorithms and Public Policy Case Studies.**

Country / Region	System / Initiative Name	Policy Area	Description
Australia	Health Risk Detection	Public Health	The Victorian State Government uses text analysis of triage data to detect disease patterns and public health risks (Wirjo et al., 2022, p. 2).
	Real-Time Digital Assistant	Social Welfare	Digital assistants developed by 'Services Australia' are used to assist customers and staff with online claims (OECD, 2024, p. 22).
Austria	OSC Caro (AI-Powered Chatbot)	Social Insurance	The Austrian Social Insurance Institution (SVA) carries out various services for its customers, such as childcare allowances, with an AI chatbot providing

			digital support the institution also uses an AI-powered voice recognition system that automatically routes customer requests to relevant offices based on the identification of specific terms. Similarly, AI is used to automatically route emails to relevant departments (OECD, 2024: 22- 23).
<b>Belgium</b>	Ori	Employment	Developed by the National Employment Office (ONEM) in December 2021, this chatbot is used to answer questions about unemployment and career breaks (OECD, 2024, p.22).
	Stakeholder Analysis	Public Administration	Switched to using Natural Language Processing (NLP) to detect trends by processing high volumes of data from stakeholder engagement platforms (Wirjo et al., 2022, p. 3).
	Noise Simulation	Urban Planning	Noise levels were mapped to assist urban planning specifically in the city of Antwerp (Yang and Kim, 2021, p. 372).
<b>Brazil</b>	MarIA	Justice	MarIA, an AI program used by the Brazilian Supreme Federal Court (STF) for legal drafting, summarizing case files, and checking formal requirements, was announced to the public in 2024 (Lantyer, 2025, p. 1).
	Death Detection System	Social Security	The National Social Security Institute (INSS) of Brazil utilizes AI to accelerate the process of identifying deceased beneficiaries, including using data obtained from digital death certificates issued in real-time. The reason INSS turned to AI is that payments were frequently made erroneously to deceased persons because civil registrars could not transmit death notifications to the institution in a timely manner (OECD, 2024, p. 26).
<b>Bulgaria</b>	Urban Policy Analysis	Urban Planning	Uses an algorithm for the analysis of crowdsourced data to detect behavioral trends and urban problems (Wirjo et al., 2022, p. 3).
<b>Canada</b>	Advanced Data Analytics (ADA)	Immigration	Used by Immigration, Refugees and Citizenship Canada (IRCC) to sort and process temporary visa applications. Acting with the goals of ensuring efficiency in customer service and managing the increasing volume of visa applications, the system utilizes historical data to categorize applications as 'routine', 'non-routine', or 'complex' (Kinchin, 2024, p. 27).
	OAS (Benefits Estimator)	Social Welfare	Canada's Old Age Security (OAS) Benefits Estimator asks questions about age, net income, legal status, residence history, marital status, and spouse or common-law partner (if any) to provide users with estimates regarding the type and level of benefits they are eligible for, such as Old Age Security pension, Guaranteed Income Supplement, and Allowance for the Survivor. A customer satisfaction survey in November 2022 confirmed the value of the implemented estimator an 85% success rate was detected in this system compared to the 35% success rate in existing OAS payment tables (OECD, 2024, p. 23).
	GIS Restart	Social Welfare	Employment and Social Development Canada (ESDC) began scanning case notes with NLP (Natural Language Processing) and ML (Machine Learning) to identify seniors eligible for the restart of the Guaranteed Income Supplement (GIS) according to the 2017 amendment. In this way, benefits were reinstated for 2,000 people affected by the change (OECD, 2024, p. 24).
	Well-being Assessment	Social Policy	In Quebec, switched to using AI in assessing the well-being level of various communities and in decision-making for targeted policy interventions (Wirjo et al., 2022, p. 3).
<b>China</b>	Foreign Policy AI	Foreign Relations	Machine learning algorithms developed by the Chinese Academy of Sciences are used to provide data input and offer recommendations to policymakers on foreign policy issues. The biggest advantage provided by these AI-based assessments is that decisions can be based on current and accurate data (Wirjo et al., 2022, p. 4).
	Road Maintenance	Infrastructure	To improve the maintenance and operation processes of highways and motorways machine learning and data-driven analyses were implemented to increase damage detection capability, create a road defect management system, and classify detected damages (Wirjo et al., 2022, p. 4).
	City Brain/ Monitoring	Urban Management	Specifically in the city of Hangzhou traffic flow simulation, accident and crime prediction, waste management, and a security monitoring system were introduced (Yang and Kim, 2021, p. 370).
<b>Colombia</b>	Sisbén	Social Welfare	Colombia's System for Identifying and Classifying Potential Beneficiaries for Social Programs (Sisbén) has developed machine learning models using survey data on individuals' living conditions (e.g., income level or access to public services) to analyze patterns and relationships between socio-economic factors and 'welfare' scores defined on a scale of 0 to 100. Public institutions apply the assessments derived from these models to new applicants to determine eligibility for social benefits. (OECD, 2024, p. 25).
<b>Costa Rica</b>	SINIRUBE	Social Welfare	A centralized system using algorithms to identify households in poverty and the benefits they are entitled to was developed in 2013 (OECD, 2024, p. 27).

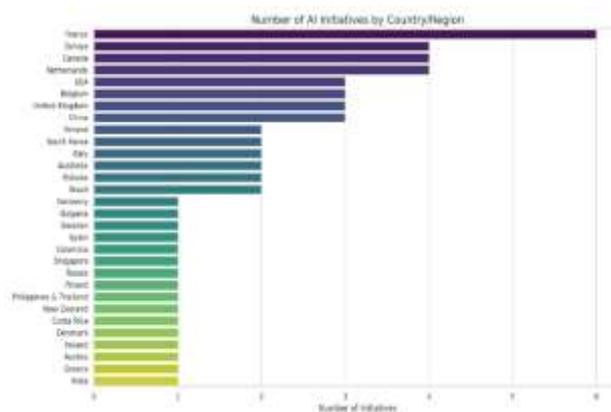
<b>Denmark</b>	Data Mining Unit	Social Fraud	Implemented the use of machine learning and data analytics to detect potential social benefit fraud for human verification (OECD, 2024, p. 28).
<b>Estonia</b>	Bürokratt	Public Services	Established an interoperable network of chatbots (virtual assistants) that enables citizens to access public services via voice or text (Dreyling et al., 2024, p. 2).
	Unemployment Decisions	Social Welfare	The Estonian Unemployment Insurance Fund (Töötukassa) developed an automated decision-making system that verifies data to audit the eligibility of an application in unemployment insurance applications (OECD, 2024, p. 24).
<b>Finland</b>	Kela-Kelpo Virtual Bot	Social Insurance	The Social Insurance Institution of Finland (Kela) created a chatbot that assists customers with social assistance applications and information (OECD, 2024, p. 24).
	Disaster Simulation	Disaster Management	Specifically in the city of Helsinki, a simulation was developed to prepare measures against natural disasters – such as floods and forest fires (Yang and Kim, 2021, p. 371).
<b>France</b>	Albert	Public Administration	Introduced by Prime Minister Attal in 2024, the AI named Albert consists of generative AI models that help public service officials answer citizen questions (Trescher, 2024, p. 7).
	LlaMandements Project	Legislation	Created by the French General Directorate of Public Finance (DGFIP), it began using a Large Language Model (LLM) to synthesize and analyze thousands of parliamentary amendments. It was first used during the examination of the 2024 budget bill. In this process, it allowed the Tax Legislation Directorate to synthesize thousands of motions submitted by senators and deputies (Trescher, 2024, p. 8).
	Weak Signals (Signaux Faibles)	Economy	The Weak Signals Project, which came into effect to detect and prevent company bankruptcies early, is a result of the partnership approach of French institutions and offers an algorithm based on calculating 18-month bankruptcy risk by analyzing data in these institutions (Trescher, 2024, p. 8).
	CFVR & PILAT (GALAXIE Module) Projects	Taxation/ Tax Audit	The data mining program for tax fraud detection (CFVR) and the PILAT (Control Management and Analysis - GALAXIE Module) project initiated simultaneously in 2018 were created to detect fraud and the contextual relationship between individuals' financial and tax situations (Trescher, 2024, p. 9-10).
	Foncier Innovant (Innovative Real Estate)	Taxation	A program foreseeing the use of AI on aerial photos to detect undeclared swimming pools and buildings after being implemented nationwide in 2023, 122,533 taxable swimming pools were detected, providing 43 million Euros in annual tax payments (Trescher, 2024, p. 10-11).
	SupraLegem	Justice	A startup project (later banned) that used machine learning to predict judge bias and partiality in deportation decisions (Kinchin, 2024, p. 28).
<b>Germany</b>	Kindergeld Automation	Social Welfare	The German Federal Employment Agency uses machine learning (ML) to recognize and extract information from student certificates submitted by citizens to prove continued eligibility for child benefits (Kindergeld), which they receive regardless of their employment status (OECD, 2024, p. 25).
<b>Greece</b>	Coastal Segmentation Application	Environment	A model developed for seven coastal classes involving the use of Transformer-based AI models (SegFormer, MaskFormer, and Mask2Former) to map coastal landforms and monitor erosion was put forward (Drakopolou et al., 2026, p. 4-6).
<b>India</b>	e-NAM	Agriculture	In 2016, e-NAM (National Agriculture Market), a digital platform project to unify agricultural markets and increase trade transparency, was implemented. It aimed to modernize the Indian agricultural market and empower farmers with access to a wider market by facilitating better price discovery, real-time information access, and transactions (Nayna and Ashutosh, 2024, p. 7005).
<b>Ireland (Dublin)</b>	Landscape Simulation	Urban Planning	A model was developed allowing the simulation of the impact of new buildings on sunlight and the skyline (Yang and Kim, 2021, p. 370).
<b>Italy</b>	Preventive Settlement Algorithm	Tax Law	It is an analysis method based on settlement that involves using prediction algorithms to propose a taxable income amount to taxpayers for a two-year period. Algorithms play a central role in collecting and processing data to create the offer to be presented to the taxpayer and have the quality to estimate the earnings amount of a specific taxpayer within a two-year period (Dorigo and Mercuri, 2024, p. 66).
	Prodigit Project	Justice	A predictive justice (prediction) and national tax jurisprudence database project containing all anonymized substantive decisions was made available to the public starting in 2024 (Dorigo and Mercuri, 2024, p. 69).
<b>Netherlands</b>	Crime Prediction System (CAS)	Law Enforcement	It is currently widely used nationwide as a prediction system that includes demographic data as well as systematizing law enforcement by detecting where and at what time intervals crime occurs more frequently. The system was developed by the Amsterdam police and is a pioneer in big data policing (Mutsaers and Nuenen, 2023, p. 77).

	Top600 (Close Monitoring System for Young Offenders)	Public Safety	A model created to closely monitor the list of young offenders to ensure public safety as an inter-agency collaboration (Mutsaers and Nuenen, 2023, p. 84- 85).
	SyRI	Social Assistance	An automation created as a risk indicator system for social assistance fraud (stopped by the Hague Court in 2020 due to human rights violations) (Lantyer, 2025, p. 2).
	Case Matcher	Migration	The Dutch Immigration and Naturalisation Service (IND), "case matcher" It has implemented an unsupervised machine learning (ML) system called. This system relies on a text analysis (or text mining) method where the algorithm searches for data, filters it, and then ranks cases and documents depending on where a term is found in the text or whether multiple search terms are clustered within the text (Kinchin, 2024, p. 27).
<b>New Zealand</b>	Youth Service System	Social Policy	This system uses a risk scoring algorithm aimed at predicting which recent school leavers are at high risk of becoming long-term welfare dependent. As a result of the analysis, young people evaluated as "most at risk" by the algorithm are directly identified by service providers. After this stage, officials contact these young people to intervene before the potential risk materializes and offer them appropriate support services (OECD, 2024, p. 28).
<b>Philippines and Thailand</b>	Poverty Mapping Algorithm	Development	A system used by the Asian Development Bank (ADB) in the Philippines and Thailand using computer vision on satellite imagery to map poverty (Wirjo et al. 2022, p. 3).
<b>Poland</b>	Unemployed Profiling Algorithm	Employment	In 2014, the Polish Ministry of Labour and Social Policy (MLSP) commissioned this system based on data collection and profiling. Profiling created an algorithm that divides the unemployed into three profiles to determine access to assistance (criticized for its rigidity) (Niklas et al., 2015, p. 5).
<b>Russia</b>	Fraud Detection	Consumer Protection	An AI model used to analyze veterinary certificates and detect food fraud was developed by the Russian Federal Service for Veterinary and Phytosanitary Surveillance (Rosselkhoz nadzor). The institution developed and implemented an AI-based technology that detects violations in the production and distribution stages of food products to reduce the rate of counterfeit products in the market and strengthen the food traceability system. This system reveals suspicious fraud patterns by analyzing veterinary certificates and processing massive datasets. This innovation has protected public health by preventing consumers from purchasing potentially dangerous and low-quality products (Wirjo et al., 2022, p. 4).
<b>Singapore</b>	Virtual Singapore	Urban Planning	Within the framework of the smart city concept, as an urban digital twin or digital twin city it is realizing technologies (e.g., solar energy, transportation) to be applied or used in real cities through a simulation beforehand (Yang and Kim, 2021, p. 363).
<b>South Korea</b>	S-Map	Urban Planning	Similar to the Singapore example, it is used in the city of Seoul to solve urban problems (such as wind path simulation, tourism simulation) (Yang and Kim, 2021, p. 363).
	Shared Mobility Simulation	Transportation	In Sejong city, a simulation allowing the simulation of shared bicycle and scooter demand was developed (Yang and Kim, 2021, p. 374).
<b>Spain</b>	VeriPol	Law Enforcement	An AI model developed by the Spanish national police used for the automatic detection of false reports regarding violent robbery (extortion) incidents. Studies have shown that VeriPol's accuracy rate is over 90% (Liberatore, Quijano-Sánchez and Camacho-Collados, 2018, p. 90).
<b>Sweden</b>	Fraud Detection Algorithm	Employment	The Swedish Public Employment Service (Arbetsförmedlingen- PES) developed a large-scale fraud detection system to be commissioned in early 2024. This system combines various techniques such as machine learning, deep learning, social network analysis, and knowledge graphs. The system utilizes a very large data pool covering information on job seekers, employees, and employers (i.e., labor market contract data) as well as the institution's suppliers (partners or service providers) (OECD, 2024, p. 26).
<b>Türkiye</b>	ASENA	Criminal Policy	The AI-powered <b>ASENA</b> (Narcotics Network Analysis System) project, developed by the Counter-Narcotics Department of the General Directorate of Security under the Ministry of Interior, has gained significant momentum. In addition to being a domestic and national initiative, it conducts risk analyses regarding criminal elements, illicit activities, and organizational structures. Thanks to this project, a total of 10,436 seizures were carried out between 2021 and 2023, during which banned substances and contraband cigarettes were confiscated (Cumhurbaşkanlığı İletişim Başkanlığı, 2025, p. 76)
	Hızır Chatbox	Foreign Policy	Launched by the by the Ministry of Foreign Affairs as part of its digital diplomacy vision, is a significant reflection of this transformation in the domain of foreign policy (Karabulut, 2025, p. 161).

	MEB and EBA Assistant & GİBİ	Education Policy	The 'MEB and EBA Assistant' applications by the Ministry of National Education, which digitize student-teacher interactions, and the 'GİBİ' assistant by the Ministry of Treasury and Finance, which provides guidance on tax processes, serve as proof of how administrative operations have become personalized (Karabulut, 2025, p. 161).
	Neyim Var? System	Health Policy	Designed by the Ministry of Health with an algorithmic framework (Karabulut, 2025, p. 161), symbolizes the level reached by automation in diagnosis and referral processes.
<b>United Kingdom</b>	Universal Credit System	Social Welfare	While 98% of households applying for Universal Credit in the UK successfully completed this transaction online a small segment with complex needs or no internet access could not use this online process (criticized for excluding those with low digital skills) (OECD, 2024, p. 35).
	Carbon Pricing Algorithm	Environment	Switched to using machine learning to assess the effectiveness of carbon pricing (Wirjo et al., 2022, p. 5).
	Grading Algorithm	Education	With the cancellation of traditional exams during the COVID-19 pandemic, an algorithm was used to determine students' success grades, but instead of offering a fair alternative, the system disproportionately lowered the grades of students in state schools (public schools) based on schools' past performance data. This situation led to mass protests and legal challenges, ultimately forcing the government to abandon this method (cancelled due to bias) (Lantyer, 2018, p. 2).
<b>USA</b>	Random Forest Algorithm	Justice/Migration	The Random Forest analysis used in US asylum hearings creates algorithmic categories in the form of case information, court and judge information/education, news, and variables to reach a result regarding the rejection or acceptance of the case. This algorithm model has a prediction validation score of 82% (Kinchin, 2024, p. 28).
	Traffic Optimization	Transportation	AI-based traffic lights that adapt to real-time conditions were developed to reduce travel time in the cities of Pittsburgh and Pennsylvania. The technology detects vehicles via radar devices, monitors traffic flow, creates AI models from the obtained data, and produces a real-time signal timing plan. This system allows traffic lights to dynamically adapt to immediate traffic conditions instead of pre-programmed fixed cycles (Wirjo et al., 2022, p. 4).
	EMS Optimization	Health/Safety	In New Orleans and Louisiana, an AI algorithm used to reduce ambulance response times was developed (Wirjo et al., 2022, p. 4).

When examining public administration practices on a global scale, it is evident that algorithmic systems have ceased to be exceptional tools and have instead become structural components of state mechanisms. Across a vast geography extending from China to Canada and from Estonia to Colombia, it is observed that machine learning and AI-based models are being integrated into decision-making mechanisms in critical areas such as tax auditing, social welfare distribution, urban planning, and judicial processes. In particular, examples such as France's legislative synthesis, Spain's law enforcement efficiency, and Singapore's digital twin applications demonstrate that the state is not only gaining operational speed but also reconfiguring data as an instrument of social governance. This trend clearly reveals that public administration is undergoing a radical paradigm shift from traditional bureaucratic rationality toward a data-driven and predictive algorithmic model.

Figure 1: Number of initiatives for each country.



This chart shows the number of initiatives listed for each country. France leads with the highest number of reported projects (6), followed by Canada, the Netherlands, and Türkiye (4 each). From an analytical perspective, the data reveals that government AI adoption is currently driven by bureaucratic functionalism rather than transformative social policy, with a clear prioritization of cost-cutting and control over service expansion. The overwhelming concentration of initiatives in social welfare and security represents the "low-hanging fruit" of automation, where the state is transitioning from human discretion to

algorithmic gatekeeping to process high-volume transactions. While some tools assist citizens, such as chatbots, a significant number focus on fraud detection and fiscal surveillance—seen in the Netherlands and Sweden—indicating a priority on protecting the public purse rather than improving the user experience.

The second major cluster involves the state's coercive power in justice and law enforcement, where initiatives in the USA and Europe show a move toward predictive governance. This sector represents the highest ethical risk, as highlighted by the cancellation of the UK grading algorithm and the Dutch SyRI system due to bias and rights violations. In contrast, the strong presence of urban planning in Asia reflects a safer, technocratic application where governments use 'digital twins' to simulate systems like traffic and waste rather than judging individuals. Ultimately, the chart demonstrates that AI has colonized the administrative and punitive arms of the state but has not yet deeply penetrated complex, qualitative domains like foreign policy or education reform.

## 5. CONCLUSION

This study demonstrates that the use of artificial intelligence and algorithmic systems in public administration is not merely a tool for technical modernization; rather, it constitutes a structural transformation representing a shift from the Weberian understanding of bureaucracy to a new paradigm termed "algorithmic governance." Through conceptual analyses based on a literature review and comparative examinations covering 31 different countries, it has been determined that the nature of the modern state's administrative power has undergone significant change.

The findings indicate that human-centric decision-making, hierarchical control, and rule-based operations—the foundations of Weberian bureaucracy—are increasingly giving way to a management approach that is data-driven, autonomous, and code-based. In this transformation process, algorithms are replacing hierarchy, and programmability is taking the place of the chain of command. The country examples examined, including Türkiye, reveal a dual reality: while algorithmic governance is rapidly expanding administrative capacity, it simultaneously introduces complex challenges regarding oversight. When structured correctly, these technologies become

essential elements that strengthen public service delivery; however, the rapid adoption of unsupervised systems often outpaces the development of necessary checks and balances, creating immediate concerns regarding transparency and accountability.

This integration represents a critical threshold where the legal and social contract between the state and the citizen is being redefined. As demonstrated by applications such as Canada's "OAS" simulator or India's "e-NAM" platform, reducing transaction costs in bureaucratic processes can successfully democratize access to services. However, this wave of digitalization carries the risk of reducing public services to a mere matter of 'technical optimization.' While Brazil's automation of judicial processes via the "MarIA" system or Estonia's "Bürokratt" initiative may enhance efficiency, the delegation of public discretionary power to opaque algorithms paves the way for a legitimacy crisis regarding the principles of open governance.

From an analytical perspective, it is evident that this lack of transparency often reproduces and even deepens entrenched social inequalities under an illusion of 'neutrality.' As experienced with the United Kingdom's grading algorithm during the pandemic or the Netherlands' "SyRI" system, data-driven decision-making processes can frequently transform into "machines of inequality" that penalize socio-economically disadvantaged groups. Similarly, law enforcement applications such as Spain's "VeriPol" or the Netherlands' "Crime Prediction System" (CAS) aim for security-oriented efficiency but, due to inherent biases within the data, can lead to the systematic stigmatization of specific segments of society. Therefore, the role of AI in public policy must be subjected to a radical critique, not merely through criteria of technical success, but within the framework of human rights, social justice, and 'algorithmic fairness.'

In conclusion, algorithmic governance represents a historical turning point in the exercise of public power. However, the legitimacy of this process depends not only on technical success but also on its alignment with democratic values. Consequently, two steps are imperative: legal frameworks must be strengthened to safeguard the transparency of algorithmic systems, and hybrid decision-making models grounded in human oversight must be developed to ensure that administrative discretion is not entirely surrendered to machines.

**Author's Contributions Statement:** C. ANGIN, contributed to the: Introduction, Conceptual Framework: What is Algorithmic Governance?, Weberian Bureaucracy and Management Philosophy, The Evolution of

Digitalization in Public Administration: From E-Government to Artificial Intelligence S. ZENGİN GUPTA, contributed to the: *Governing with Algorithms: a structural transformation in public administration* C. ANGIN - S. ZENGİN GUPTA, these are the sections to which the authors contributed jointly: Methodology, Conclusion

**Conflict Of Interest:** The authors declare no conflict of interest.

**Funding:** There is no financial support for this study.

**Ethical Statement:** This article contains no studies regarding humans or animals.

**Availability Of Data and Material:** We declare that the submitted manuscript is our work. Which has not been published before and is not currently being considered for publication elsewhere

**Notification:** This article is an expanded and revised version of the paper titled 'From Weberian Bureaucracy to Algorithmic Governance: The Transformation of the Bureaucratic Subject in Public Administration', which was presented as an oral/abstract presentation at the 5th International Writetec Congress on Social Sciences and Health Sciences in the Age of Artificial Intelligence (17-22 January 2026), but whose full text was not published.

## REFERENCES

- Abbass, H. (2021). What is artificial intelligence? *IEEE Transactions on Artificial Intelligence*, 2, pp. 94-95.
- Agostino, D., Saliterer, I. & Steccolini, I. (2022). Digitalization, accounting and accountability: A literature review and reflections on future research in public services. *Financial Acc & Man*, 38, pp. 152- 176. <https://doi.org/10.1111/faam.12301>
- Akçakaya, M. (2016). Weber'in bürokrasi kuramının bugünü ve geleceği. *Gazi Üniversitesi Sosyal Bilimler Dergisi*, 3(8), pp. 275 - 295.
- Akyazı, E. (2005). E-devlet ve Türkiye. *İletişim Fakültesi Dergisi*, 22, pp. 165-169.
- Angın, C. (2021). E-Devletin üç kutbu: Gözetim-denetim, katılım-demokrasi ve ekonomik çevrim. A. Saylam (Ed.), *Kamu Yönetiminde Elektronik Vatandaş Katılımı* (pp. 257-283). Ankara: Gazi Kitabevi.
- Angın, C. (2025). Artificial intelligence and innovative technology applications in public administration. *İnsan ve Toplum Bilimleri Araştırmaları Dergisi*. 14(4), pp. 161-183. <https://doi.org/10.15869/itobiad.1718443>
- Angın, C. (2026). Transforming citizen services with AI. D. Leblebici, & D. Çelik içinde, *Artificial Intelligence in Public Administration: Opportunities and Challenges* (pp. 109-124). NewYork: Nova Science Publishers.
- Antonov, A. (2011). From artificial intelligence to human superIntelligence. *International Journal of Computer Information Systems*, 2(6), pp. 1-5.
- Avaner T., & Fedai R. (2019). Türk kamu yönetiminde ofis sistemi: E-devlet uygulamalarından dijital dönüşüm ofisine. *Amme İdaresi Dergisi*, 52 (2), pp. 149-172. DOI: 172. 10.20296/tsadergisi.1036446
- Beck, C. (2017). The comparative method in practice: Case selection and the social science of revolution. *Social Science History*, 41, pp. 533-554.
- Çevikbaş, R. (2014). Bürokrasi kuramı ve yönetsel işlevi. *Ekonomi ve Yönetim Araştırmaları Dergisi*, 3(2), pp. 75 - 102.
- Cumhurbaşkanlığı İletişim Başkanlığı. (2025). 21. yüzyılda Türkiye'nin bağımlılıklarla mücadele seferberliği. Cumhurbaşkanlığı İletişim Başkanlığı Yayınları: Ankara. ISBN: 978-625-6281-54-7
- Dorigo S., & Mercuri G. (2024). AI e amministrazione finanziaria in Italia: Analisi del rischio fiscale, attuazione del rapporto tributario e profili organizzativi. *Comparative Studies- Studi Tributari Europei*, 14, pp. 57-83. ISSN: 2036-3583
- Drakopoulou, P., Tzouveli, P., Karditsa, A., & Poulos, S. (2026). Integrating AI for in-depth segmentation of coastal environments in remote sensing imagery. *Remote Sensing*, 18 (2), pp. 1- 22. <https://doi.org/10.3390/rs18020325>
- Dreyling, R., Tammet, T., Pappel, I., & McBride, K. (2024). Navigating the AI maze: Lessons from Estonia's bürokratt on public sector AI digital transformation. *Telematics and Informatics*, pp. 1- 14. Available at SSRN: <https://ssrn.com/abstract=4850696> <http://dx.doi.org/10.2139/ssrn.4850696>
- Eryılmaz, B. (2021). Kamu yönetimi: Düşünceler, yapılar, fonksiyonlar, politikalar. Kocaeli: Umuttepe Yayınları.
- Etymonline. (2025). algorithm. [www.etymonline.com](http://www.etymonline.com): <https://www.etymonline.com/search?q=algorithm>

- (Accessed: 27.12.2025)
- Gamage, P. (2016). New development: Leveraging 'Big Data' analytics in the public sector. *Public Money & Management*, 36(5), pp. 385-390.
- Gamito, M., & Ebers, M. (2021). Algorithmic governance and governance of algorithms: Legal and ethical challenges. Cham: Springer.
- Kalpokas, I. (2019). Algorithmic governance: Politics and law in the post-human era. Cham: Palgrave Macmillan.
- Karabulut N. (2025). Kamu yönetiminde yapay zekâ destekli otomatik karar verme sistemleri: Türkiye bağlamında bir değerlendirme. *Necmettin Erbakan Üniversitesi Siyasal Bilgiler Fakültesi Dergisi*, 7 (1), pp. 151- 183. ISSN: 2667-8063
- Katzenbach, C., & Ulbricht, L. (2019). Algorithmic governance. *Internet Policy Review*, 8(4), pp. 1-18.
- Kinchin N. (2024). The Human in the feedback loop: Predictive analytics in refugee status determination. *Law Technology and Humans*, 6 (3), pp. 23- 45. <https://doi.org/10.5204/lthj.3635>
- Korteling, J., Boer-Visschedijk, G., Blankendaal, R., Boonekamp, R., & Eikelboom, A. (2021). Human- versus artificial intelligence. *Frontiers in Artificial Intelligence*, (4), pp. 1-13.
- Lantyer, H. V. (2025). MarIA: Artificial intelligence (AI) at Brazil's supreme court. *Transparency and Innovation in Digital Justice*, pp. 1-7. <https://dx.doi.org/10.2139/ssrn.5146151>
- Liberatore, F., Quijano-Sánchez, L., & Camacho-Collados, M. (2018). Applications of data science in policing: VeriPol as an investigation support tool. *European Law Enforcement Research Bulletin - Innovations in Law Enforcement*, pp. 89- 96. Corpus ID: 117152339
- Lindgren, I., Madsen, C., Hofmann, S., & Melin, U.(2019). Close encounters of the digital kind: A research agenda for the digitalization of public services. *Government Information Quarterly*, 36, pp. 427- 436. <https://doi.org/10.1016/j.giq.2019.03.002>
- Monarcha-Matlak, A. (2021). Automated decision-making in public administration. *Procedia Computer Science*, 192, pp. 2077-2084.
- Mountasser, T., & Abdellatif, M. (2023). Digital transformation in public administration: A systematic literature review. *International Journal of Professional Review*, 8 (10), pp. 1- 27. <https://doi.org/10.26668/businessreview/2023.v8i10.2372>
- Mutsaers, P., & Nuenen, T. (2023). Predictively policed: The Duch CAS case and its forerunners. Part of Book (Beek, J.; Bierschenk, T.; Kolloch, A. (ed.), *Policing race, ethnicity and culture: ethnographic perspectives from Europe*, pp. 72-94. <https://hdl.handle.net/2066/289967>
- Nayna, R., & Ashutosh, P. (2024). Digital transforation in agricultural marketing: An empirical study of trade trends on India's e-NAM platform. *Educational Administration: Theory and Practice*, 30 (1), pp. 7005-7010. ISSN: 2148-2403
- Niklas, J., Sztandar-Sztanderska, K., & Szymielewicz, K. (2015). Profiling the unemployed in Poland: Social and political implications of algorithmic decision making. Poland: Fundacja Panoptykon.
- OECD. (2024). Using AI to manage minimum income benefits and unemployment assistance: Opportunities, risks and possible policy directions. *OECD Artificial Intelligence Paper*, 2, pp. 1- 54. [https://www.oecd.org/en/publications/using-ai-to-manage-minimum-income-benefits-and-unemployment-assistance\\_718c93a1-en.html](https://www.oecd.org/en/publications/using-ai-to-manage-minimum-income-benefits-and-unemployment-assistance_718c93a1-en.html)
- Ok, A. (2017). Max Weber'de otorite ve meşruiyet tipolojisi. *Avrasya Sosyal ve Ekonomi Araştırmaları Dergisi*, 4(8), pp. 42 - 54.
- Özgür, S. B. (2021). Algoritmalar, yapay zekâ, makine öğrenmesi, derin öğrenme ve uygulamaları: Beşerî fayda üretiminin yazılımlar tarafından karşılanması. *Ekonomi ve Yönetim Araştırmaları Dergisi*, 10(1), pp. 1-29.
- Öztürk, C. (2023). Yönetim bilimi ve kamu yönetimi. Bursa: Ekin Yayınevi.
- Pence, H. (2014). What is big data and why is it important? *Journal of Educational Technology Systems*, 42(2), pp. 159-171.
- Schou, J., & Hjelholt, M. (2018). Digitalization and public sector transformations. Switzerland: Palgrave Macmillan. ISBN: 978-3319762906
- Sivasubramanian, M. (2022). Artificial intelligence's impact on our everyday lives. In: J. Karthikeyan, S.-H. Ting, & Y.-J. Ng, *Learning Outcomes of Classroom Research* (pp. 1-11). Madurai: L Ordine Nuovo Publication.
- Smith, G. (2020). The Politics of algorithmic governance in the black box city. *Big Data & Society*, 7(2), pp. 1-9.

- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, pp. 333-339.
- Soysal, T. (2023). Can the right to explanation in GDPR be a remedy for algorithmic discrimination? In: M. Kılıç, & S. Bozkuş Kahyaoğlu, *Algorithmic Discrimination and Ethical Perspective of Artificial Intelligence* (pp. 69-89). Singapore: Springer.
- Trescher, B. (2024). France's approach to artificial intelligence by the French tax system. *Comparative Studies*, 14, pp. 1- 11. <https://doi.org/10.6092/issn.2036-3583/21289>
- Wirjo, A., Calizo, S. C., Vasquez, G. N., & San Andres, E. (2022). Artificial intelligence in economic policymaking. *APEC Policy Support Unit, Policy Brief*, 52, 2022, pp. 1- 11. [https://www.researchgate.net/publication/365945079\\_Artificial\\_Intelligence\\_in\\_Economic\\_Policymaking](https://www.researchgate.net/publication/365945079_Artificial_Intelligence_in_Economic_Policymaking)
- Worldhistoryedu. (2022). Al-Khwārizmī: Biography, notable achievements & facts. worldhistoryedu.com: <https://worldhistoryedu.com/al-khwarizmi-biography-notable-achievements-facts/> (Accessed: 22.11.2025)
- Yang, S., & Kim, H. (2021). Urban digital twin applications as a virtual platform of smart city. *International Journal of Sustainable Building Technology and Urban Development*, 12(4), pp. 363- 379. <https://doi.org/10.22712/susb.20210030>