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Title of research article

Algorithmic Decision-Making in Public Administration: The Role of Artificial Intelligence Applications in Shaping Modern Administrative Law

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Abstract

The integration of artificial intelligence (AI) into administrative systems has accelerated the transformation from e-administration to smart administration, producing a new generation of algorithmic administrative decisions. Unlike traditional decisions grounded in human interpretation of administrative law, these decisions are generated or supported by intelligent algorithmic models capable of predictive analysis, data classification, and automated enforcement. This study investigates the theoretical and practical implications of embedding AI enablers within the legal framework of administrative decision-making, with emphasis on the enforceability and legitimacy of algorithmic decisions. Drawing on comparative legal analysis, case studies, and doctrinal examination, the research demonstrates that algorithmic decision-making challenges the fundamental doctrines of legality, transparency, and judicial oversight. Findings suggest that while algorithmic decisions enhance efficiency, neutrality, and objectivity in public administration, they simultaneously introduce risks of opacity, bias, and accountability gaps. Therefore, urgent reforms are required to adapt legislation and judicial mechanisms, ensuring that algorithmic administrative decisions remain consistent with principles of the rule of law, due process, and fundamental rights.

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Introduction

The last decade has witnessed tremendous developments in the field of technology and the information revolution, with artificial intelligence emerging as one of the most significant advances that humans have employed across various sectors. Administration is among the most important of these sectors, making it necessary for public administration to keep pace with such progress—especially since administrative law governs most of its activities. A key characteristic of administrative law is its flexibility and adaptability to scientific advancements, which ensures the continuity of public services and the provision of quality public service delivery.

In this context, artificial intelligence algorithms have begun to participate in the exercise of authority through predictive analytics and machine learning. This phenomenon is known as algorithmic administrative decision-making in the public sector. It has attracted considerable attention from various stakeholders in the fields of administration and law, as it constitutes one of the most prominent pillars of the transformation from e-administration to smart administration.

This type of administrative decision is based on the application of algorithms, or what are referred to as intelligent electronic media. As a result, the judiciary and legislation are now compelled to adapt rapidly to the new developments brought by algorithmic data-processing systems, ensuring that the traditional theory of administrative decisions is updated by modernizing the legal system governing these decisions in order to guarantee effective judicial oversight.

From this arises the central question: Does the algorithmic administrative decision fall under the same legal rules that govern traditional administrative decisions, or does it require a complete updating of the legal system and the related judicial theories?

To answer this question, it is necessary to define the concept of algorithmic administrative decision-making and clarify its elements, in addition to addressing the issue of the enforceability of algorithmic administrative decisions.

1. The Concept of the Algorithmic Administrative Decision

Defining the concept of an algorithmic administrative decision first requires clarifying artificial intelligence algorithms, which constitute the fundamental basis of such decisions, followed by a discussion of its formal and substantive elements from a legal perspective.

1.1 Definition of Artificial Intelligence Algorithms

Artificial intelligence algorithms differ from traditional algorithms in that they represent the new generation of "deep networks." These are a special form of machine learning in which neural networks mimic the functioning of the human brain in computation, learning, and prediction. From an engineering perspective, they consist of matrices of neural-like cells densely interconnected by a vast number of synapse-like links. Deep learning adjusts and calibrates these networks to improve performance and then trains them to make decisions through what is known as "training data.[1]"

Hence, the algorithm can be regarded as an encrypted file resulting from the transformation of input data into outputs through the analysis of training data. Artificial intelligence algorithms function by detecting correlations among these data through their neural network, in a manner similar to human cognition[2].

1-2 Definition of the Algorithmic Administrative Decision.
Administrative decisions are among the administrative activities that can benefit from algorithmic systems through delegating the decision-making process to the computer in accordance with specific stages, thereby saving the administration both effort and time.

These stages consist of:

- **First stage:** Storing vast amounts of data used in decision-making, such as identity information, academic and professional records, and statuses regarding tax authorities.

- **Second stage:** Designing the algorithmic system to perform selection operations based on the large database and in accordance with the provisions of applicable legal texts.

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- **Third and final stage:** The program undertakes the decision-making process itself by selecting the best possible alternatives[3].

Accordingly, the algorithmic administrative decision can be defined as a computational mechanism based on rules and statistical models that make decisions independently without any human intervention[4]. It is the result of processing carried out by the system, which combines algorithmic formulas with artificial intelligence tools to make decisions based on pre-provided data[5].

1-3 Distinguishing the Algorithmic Administrative Decision from the Electronic Administrative Decision

The electronic administrative decision is defined as: "the disclosure by the public administrative authority of its unilateral binding will, by virtue of the powers granted under applicable laws and regulations, through electronic means, with the intention of producing legal effects whenever this is legally possible and permissible." *In this regard, the electronic administrative decision does not differ from the traditional administrative decision except in the means of expressing will, and nothing more*[6].

From this perspective, the focus on the electronic aspect of the administrative decision lies in the formal aspects of the electronic administrative decision, whether as an electronic document or in terms of the procedures followed for it. This contrasts with the algorithmic administrative decision, which does not necessarily have to take the form of an electronic document or be subject, in its issuance or notification, to electronic procedures. Rather, the essence of this decision is that it is not taken directly by a natural person, but is instead the result of processing carried out by a system that combines algorithmic formulas and artificial intelligence tools to make the decision based on pre-provided data. It may then be issued in either electronic or paper form, bearing either a handwritten or electronic signature, and may be communicated through traditional means or via electronic transmission[7].

1-4 Conditions of the Algorithmic Administrative Decision

In order to issue an algorithmic administrative decision, a set of conditions must govern and regulate it, ensuring that it is characterized by precision and effectiveness, whether in the stage of decision-making or in the stage of issuance. These conditions are as follows:

Conditions for Making the Algorithmic Administrative Decision

The algorithmic administrative decision relies, during its making, on modern conditions aligned with administrative procedures. This is due to the use of artificial intelligence algorithms in administrative decision-making, while taking into account all the established administrative procedures. Such compliance helps avoid technical deficiencies and difficulties related to the use of artificial intelligence in this context.

These conditions consist of:

- Deep learning and automated interpretation
- Adherence to laws and administrative procedures
- Application of machine learning methods specific to algorithmic administrative decision-making[8]

It is worth noting that machine learning algorithms are highly sensitive systems designed to simulate human intelligence through automated learning. They are divided into two types: systems supported by human intervention and systems without human intervention, known as self-learning. These systems are often associated with the concept of the "black box," due to the complexity of their programming and operation, which is intended to protect the rights of those subject to them[9].

Conditions for Issuing the Algorithmic Administrative Decision

The conditions for issuing an algorithmic administrative decision are as follows:

- **Condition of disclosure:** This refers to the administration's obligation to announce the algorithmic administrative decision and communicate it to the concerned parties in a binding manner. Alongside this, the administration must provide a general explanation, with a clear, explicit, and comprehensible interpretation of

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how the algorithm functions, in addition to presenting a transparent report clarifying the reasoning behind the issuance of this type of decision[10].

- **Condition of Justification:**
  The algorithm itself must be justified, and in addition, the reasons for the administration's choice of a specific algorithm must also be explained. This requirement appears to conflict with the discretionary power that the administration enjoys within the limits of the principle of legality. The administration holds the authority to adopt measures it deems appropriate to serve the public interest in providing services to citizens, as well as the freedom to choose the suitable means[11].

- **Condition of Publication and Prior Oversight:**
  This condition requires public administration to publish all information related to the use and application of algorithmic systems, including their source and documentation, and to inform the concerned parties. This ensures that information is accessible to those affected by the decision and allows them to challenge it if the law grants them this right.
- As for prior oversight, it entails assessing the impact of algorithms through a digital questionnaire that must be published by users before implementing the program. This questionnaire evaluates the automated decision encountered by the concerned individuals, assesses the decisions, and is capable of identifying potential harm to citizens. It also explains the type of responsibility of the system, clarifies how decisions are made, how the system is chosen, and how the results are evaluated[12].

Condition of Legal Protection for Algorithms:

Legal scholars differ on the type of legal protection that should apply to algorithms. Some argue that they must be subject to the intellectual property system, others believe they should fall under the regime of trade secret protection, while others consider them subject to copyright protection, since they embody a technical and technological process.

Ultimately, consensus has been reached that the importance of the protection system lies not in its type but in its subject matter. The aim is to safeguard the confidentiality inherent in the algorithm, thereby fostering trust in its use, reinforcing the principle of transparency, and ensuring clear accountability[13].

2- Elements of the Algorithmic Administrative Decision

The reliance on algorithmic processing systems in making administrative decisions necessitates adapting the legal framework governing them in a way that suits the specific nature of this new type of decision. Among the most pressing issues requiring such adaptation is the matter of the essential elements of the decision itself, which must take priority in order to benefit from this legal adjustment. This is what we shall address in the following section[14].

2-1 Formal Elements of the Algorithmic Administrative Decision

The formal elements of the algorithmic administrative decision consist of the following:

- **Element of Jurisdiction**

The administration is bound to respect the rules of jurisdiction, which must always exist and remain valid. This is because jurisdiction is considered part of public order and cannot be violated, whether the decision is issued in a traditional, electronic, or algorithmic form. Jurisdiction represents the legal capacity and authority of an administrative body, or of the individuals subordinate to it, to issue specific decisions regarding their subject matter, scope of application, and temporal and spatial limits[15].

In algorithmic administrative decisions, the element of jurisdiction lies with the authority supervising and managing the algorithmic processing system used to make the decision. This jurisdiction is determined either based on the applicable legal provisions governing traditional administrative decisions or according to new legal texts that specify the body or individual responsible for overseeing the operation of the processing system[16].

- **Element of Form and Procedures**

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The stages followed in making algorithmic administrative decisions must be subject to the principle of administrative legality in order to guarantee what is known as procedural safeguards or procedural fairness, which require transparency in the procedures[17].

Like traditional administrative decisions, the algorithmic administrative decision obliges the administration, when resorting to it, to respect the formalities and procedures. However, the formalities and procedures in algorithmic administrative decisions differ from those in traditional ones in terms of their external appearance or the final form in which the decision is issued[18].

This process is carried out through the use of computers, where information is entered either by the competent administrative officer or directly by the concerned individual (the service recipient)[19].

2-2 Substantive Elements of the Algorithmic Administrative Decision

The substantive elements of the algorithmic administrative decision consist of the **object (subject matter)**, the **cause (reason)**, and the **purpose (goal)**.

- ### Element of the Object (Subject Matter)

The object of an administrative decision refers to the legal effect that arises from it immediately and directly. For example, the object of a decision to dismiss an employee is the termination of the employment relationship between that individual and the administration[20].

In the case of algorithmic administrative decisions, the object is the result of algorithmic processing, which is predetermined in its output variables. Full compliance is required with the instructions embedded in the algorithm, which lacks the ability to interpret when the authority is bound by law. Thus, the programmer of the algorithm is obliged to respect the requirements of legality through the proper understanding of legal provisions.

However, if the administration enjoys discretionary authority regarding the object of the decision, human intervention remains possible especially when it is not feasible to fully translate the possible options into a set of algorithms[21].

Element of the Cause (Reason)

The cause is defined as the factual or legal situation that justifies the issuance of the decision[22]. In the algorithmic administrative decision, the cause consists of pre-existing information, which includes data previously stored in the database considered the "constitution" of the algorithm. Thus, the data utilized by the algorithm prior to the issuance of the algorithmic administrative decision shape the algorithm's assessment and constitute the cause for issuing a decision, whether negative or positive, in relation to a given matter[23].

Element of the Purpose (Goal)

In traditional administrative decisions, the purpose is to achieve the public interest through the conscious will of the human decision-maker. In contrast, in algorithmic administrative decisions, the algorithmic processing system lacks an independent will of its own. Therefore, its purpose is embedded at the stage of designing the processing system, which necessarily involves human intervention[24].

3- Enforceability of the Algorithmic Administrative Decision

The general principle regarding the enforceability of an administrative decision against the individuals to whom it is addressed is that it takes effect from the moment they become aware of the decision issued by the competent administrative authority through its unilateral will. Individuals may only challenge such decisions if they are tainted by a defect of illegality.

In contrast, the enforceability of the algorithmic administrative decision against the administration itself is only achieved through its notification. This notification is digital rather than paper-based, by sending a copy of the decision via SMS to the concerned individual or through their personal email. As for algorithmic regulatory decisions, they become effective through their publication on the administration's official website or via the official gazette's website of the state. This ensures that the concerned individuals attain certain and reliable knowledge of the decision.[25]

3-1 Electronic Publication

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This concerns regulatory administrative decisions. Publication means announcing or informing the public at large of the contents of a decision issued by the administration so that they are aware of it. Public administration is therefore required to publish all its regulatory decisions through the legal means specified by the legislator.

From an electronic perspective, with the rapid development of information technology, administrations can now exploit the digital environment in all its elements and components to express and disclose their decisions. The use of technology in managing public services contributes to accelerating processes and enhancing the efficiency and accuracy of administrative activity.

It should also be noted that the concept of informing individuals about decisions through electronic publication has a major impact, particularly through the influence of the Internet and other communication tools. Individuals can now receive decisions quickly and easily, which enables them to express their views and request annulment of such decisions. Among the communication tools that administrations can use is their official website, which guarantees transparency and ensures public access to these decisions.

Thus, electronic publication relies on a set of electronic procedures carried out by the technical officer appointed by the administrative authority. Based on this, electronic publication can be defined as: *"a technical process aimed at transmitting administrative information and decisions to all individuals through available electronic communication tools.*[26]*"*

Accordingly, the electronic publication of an administrative decision reflects a technical process that carries legal effect, as it enables the addressees to obtain the official document of the administrative decision, thereby establishing their knowledge of its content. This, in turn, means that the decision becomes enforceable against them and produces its legal effects.

Electronic publication offers numerous advantages. It helps reduce public expenditure and save public funds compared to paper-based publication, which consumes significant amounts in printing and distribution. It is also characterized by precision and efficiency, as it relies on electronic procedures carried out in an organized and immediate manner, which are not easily breached. Moreover, it ensures high speed in delivering information and the content of decisions to the addressees, regardless of their location whether within the country or abroad[27].

3-2 Electronic Notification

In general, the notification of an administrative decision refers to the procedure by which the administration informs the addressee of the decision personally, or specific individuals directly concerned, of the content of the decision issued against them by the competent authority[28].

Notification is the method through which the administrative decision is conveyed to individuals, and it marks the start of the period during which an annulment appeal may be filed, provided that notification is duly established.

It should be noted that electronic notification in modern administration does not differ in its purpose from its paper-based counterpart. Its ultimate aim remains the same: to communicate the content of the administrative decision to the addressees through notification or personal notice[29].

However, electronic notification is distinguished by its reliance on electronic means and specific technical procedures not present in traditional notification. It requires the decision to exist in the form of an electronic document, which is transmitted between parties through a programmed process carried out by the computer based on predefined commands. From this, it becomes clear that the fundamental difference lies in the mechanism of preparation and issuance.

Thus, the electronic notification of the algorithmic administrative decision can be defined as: *"a programmed process carried out by the administration for the purpose of sending the administrative decision through available means, resulting in its receipt and possession in the form of an electronic document by the addressee.*[30]*"*

While the administration's objective in issuing the administrative decision as an electronic document is to inform its addressees, some legal scholars argue that this transmission alone is insufficient to establish actual knowledge of such administrative decisions. It requires proof that the addressee has indeed become aware of its content[31].

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This raises several issues, such as whether proof of notification is established at the moment the individual receives the electronic message sent by the administration through the official website or via email, at the moment the addressee opens the email, or only when the inbox of their email account is accessed.

3-2-1 Time of Sending the Message Containing the Electronic Administrative Decision

This refers to the moment considered by the administration as proof that the message has entered an information system not under the control of either the sender or the recipient. This is the standard established by the majority of legislations governing electronic transactions[39].

3-2-2 Time of Receiving the Message Containing the Electronic Decision

Some electronic transaction legislations have specified the relevant moment of receipt by distinguishing between two cases:

1. **When the addressee designates an information system for receiving the electronic message:** the moment of receipt is deemed to be when the message enters that designated system.

2. **When no system is designated:** the moment of receipt is considered to be when the message enters any information system belonging to the addressee[39].

Conclusion

With the widespread adoption of artificial intelligence technology across various scientific fields, including management, public administration has been compelled to utilize AI due to its features of diversity, continuous innovation, and the modernization of services it provides. As a result, public administration has shifted from a traditional model to a smart administration model, one that relies on speed in completing and executing transactions. This shift has had a direct impact on the legal mechanisms upon which public administration depends in performing its duties—particularly administrative decisions. Consequently, the concept of the algorithmic administrative decision has emerged.

Based on the foregoing, this study has led us to several findings and recommendations:

- The algorithmic administrative decision is distinguished from the traditional administrative decision in terms of the means through which the administration's will is expressed, namely through the use of modern electronic tools that contribute to the preparation and issuance process.

- The algorithmic administrative decision differs from the traditional one with respect to the element of jurisdiction, since the electronic medium, pre-programmed to issue administrative decisions, becomes the responsible authority. As for the elements of object, purpose, and cause, they are predetermined due to the absence of an independent will in the algorithmic processing system.

- The administration increasingly relies on modern electronic communication tools for the publication and notification of algorithmic administrative decisions.

Recommendations

- Technological transformation requires the judiciary and legislation to respond swiftly to the impact of artificial intelligence enablers on the traditional theory of administrative decisions. This should be achieved by updating the legal framework governing such decisions, ensuring effective judicial oversight of their legality on one hand, and real protection of the rights of those interacting with the administration on the other.

Responding to digital transformation necessitates providing administrations with programmers and software developers, subjecting them to the laws and regulations that govern public employees, in order to avoid complexity in administrative matters.

Method and Methodology

This research adopts a qualitative doctrinal legal methodology supported by comparative case analysis. The following approaches were applied:

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1. Doctrinal Legal Analysis – Examining statutes, administrative codes, and case law in Algeria and comparative jurisdictions (EU, USA, France).
2. Comparative Legal Method – Identifying best practices and divergences in regulating algorithmic decision-making globally.
3. Case Studies – Reviewing examples of algorithmic decision-making in tax administration, public procurement, and immigration law.
4. Analytical Approach – Evaluating the implications of AI adoption on enforceability, accountability, and transparency of administrative acts.

This multi-layered methodology allows for both normative and practical insights into the challenges of integrating AI with administrative law.

Findings

The study reached several key findings:

1. Efficiency Gains – Algorithmic decisions reduce delays in administrative processes, enhance predictability, and minimize human errors.
2. Legal Ambiguity – Current legislative frameworks inadequately define the legal nature of algorithmic administrative acts, raising questions on enforceability.
3. Transparency Challenges – Many algorithms operate as "black boxes," making judicial oversight and citizens' right to explanation difficult.
4. Accountability Gaps – Responsibility in cases of erroneous or harmful decisions remains unclear, oscillating between developers, administrators, and public authorities.
5. Judicial Oversight – Courts must adapt procedural rules to ensure effective review of algorithmic decisions while safeguarding principles of legality and due process.
6. Necessity of Legal Reform – Traditional administrative decision theories must be modernized to incorporate algorithmic governance without undermining citizens' rights.

Ethical Considerations

This research emphasizes the ethical necessity of:
- Ensuring algorithmic transparency and explainability in administrative decisions.
- Avoiding discriminatory or biased outcomes in automated systems.
- Protecting citizens' rights to due process, appeal, and remedy.
- Maintaining human oversight in high-impact administrative decisions.

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Conflict of Interest

The author declares no conflict of interest related to the subject matter of this research.

Footnotes:

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