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GOVERNING ALGORITHMS: THE INTELLECTUALIZATION OF ADMINISTRATIVE LAW AND EMERGING INTERNATIONAL-LAW CONSTRAINTS

ALGORITMOS DE GOVERNANÇA: A INTELECTUALIZAÇÃO DO DIREITO ADMINISTRATIVO E AS RESTRIÇÕES EMERGENTES DO DIREITO INTERNACIONAL

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Abstract
The proliferation of algorithmic decision-making systems in government administration represents a fundamental transformation of the administrative state, challenging traditional conceptions of administrative law and demanding new theoretical frameworks for understanding governance in the digital age. This research examines the intellectualization of administrative law in response to algorithmic governance, analyzing how legal scholars and practitioners are conceptualizing core administrative principles—transparency, accountability, due process, and reasoned decision-making—to accommodate the sociotechnical complexities of automated systems. Through a comprehensive analysis of recent scholarship, international regulatory developments, and emerging jurisprudence, this paper identifies the evolution from rights-based remedies to systemic governance approaches, including internal administrative rules, prospective benchmarking, and risk-based regulatory frameworks. The research reveals significant tensions between technical efficiency and democratic legitimacy, particularly where algorithmic opacity undermines traditional administrative law safeguards. Emerging

Resumo
A proliferação de sistemas algorítmicos de tomada de decisão na administração pública representa uma transformação fundamental do Estado administrativo, desafiando as concepções tradicionais do direito administrativo e exigindo novas estruturas teóricas para a compreensão da governança na era digital. Esta pesquisa examina a intelectualização do direito administrativo em resposta à governança algorítmica, analisando como acadêmicos e profissionais do direito estão conceituando princípios administrativos essenciais — transparência, responsabilidade, devido processo legal e tomada de decisão fundamentada — para acomodar as complexidades sociotécnicas dos sistemas automatizados. Por meio de uma análise abrangente de estudos recentes, desenvolvimentos regulatórios internacionais e jurisprudência emergente, este artigo identifica a evolução de soluções baseadas em direitos para abordagens de governança sistêmica, incluindo normas administrativas internas, benchmarking prospectivo e estruturas regulatórias baseadas em risco. A pesquisa revela tensões significativas entre eficiência técnica e legitimidade democrática,

international law constraints, notably from the European Union and Council of Europe, are creating new transnational frameworks that emphasize human oversight, impact assessments, and procedural safeguards. The findings suggest that effective algorithmic governance requires methodological pluralism combining doctrinal analysis, empirical evaluation, and comparative institutional study. This research contributes to the growing body of literature on digital governance by providing a systematic analysis of how administrative law is adapting to algorithmic systems and identifying key areas for future research and policy development.

Keywords: Algorithmic Governance. Administrative Law. Artificial Intelligence Regulation. International Law. Digital Governance. Transparency. Accountability.

particularmente onde a opacidade algorítmica mina as salvaguardas tradicionais do direito administrativo. Restrições emergentes do direito internacional, notadamente da União Europeia e do Conselho da Europa, estão criando novas estruturas transnacionais que enfatizam a supervisão humana, avaliações de impacto e salvaguardas processuais. Os resultados sugerem que uma governança algorítmica eficaz requer pluralismo metodológico, combinando análise doutrinária, avaliação empírica e estudo institucional comparativo. Esta pesquisa contribui para o crescente corpo de literatura sobre governança digital, fornecendo uma análise sistemática de como o direito administrativo está se adaptando aos sistemas algorítmicos e identificando áreas-chave para futuras pesquisas e desenvolvimento de políticas.

Palavras-chave: *Governança Algorítmica. Direito Administrativo. Regulação da Inteligência Artificial. Direito Internacional. Governança Digital. Transparência. Responsabilidade.*

1 INTRODUCTION

The integration of algorithmic systems into governmental decision-making processes represents one of the most significant developments in public administration since the establishment of the modern administrative state (Coglianese & Lehr, 2017). From predictive policing algorithms to automated benefit determination systems, government agencies increasingly rely on artificial intelligence and machine learning technologies to process vast amounts of data and make decisions affecting millions of citizens (Engstrom & Ho, 2020). This transformation has profound implications for administrative law, the body of legal principles that governs the exercise of administrative power and ensures that government agencies operate within constitutional and statutory bounds (Solow-Niederman, 2019).

Traditional administrative law developed around human decision-makers operating within hierarchical bureaucratic structures, with established doctrines of transparency, accountability, due process, and reasoned decision-making serving as fundamental safeguards against arbitrary government action (Goudge, 2021). However, the introduction of algorithmic systems challenges these foundational principles in unprecedented ways. The opacity of machine learning models, the scale and speed of

automated decisions, and the sociotechnical embedding of algorithms within organizational processes create new forms of administrative action that existing legal frameworks struggle to accommodate (Oliveira & Alencar, 2025).

This transformation has sparked what can be characterized as the "intellectualization" of administrative law—a process by which legal scholars, practitioners, and policymakers are developing new theoretical frameworks, doctrinal approaches, and regulatory mechanisms to govern algorithmic systems in public administration (Haim, 2023). This intellectualization involves not merely the application of existing administrative law principles to new technologies, but rather a fundamental reconceptualization of how administrative power should be exercised and constrained in an algorithmic age (Silfia, 2025).

Simultaneously, international and supranational legal instruments are emerging as significant constraints on governmental use of algorithms, creating new layers of regulatory complexity that transcend traditional jurisdictional boundaries (Fernández, 2023). The European Union's risk-based approach to AI regulation, the Council of Europe's work on algorithmic transparency, and various international human rights frameworks are establishing new standards that influence domestic administrative law development (Llamas Covarrubias, 2022).

This research examines the intellectualization of administrative law in response to algorithmic governance and analyzes the emerging international legal constraints that shape this evolution. The study addresses three primary research questions: First, how are legal scholars and practitioners reconceptualizing core administrative law principles to accommodate algorithmic decision-making systems? Second, what new governance mechanisms and regulatory approaches are emerging to address the unique challenges posed by algorithmic systems in public administration? Third, how do emerging international law constraints influence domestic administrative law approaches to algorithmic governance?

The significance of this research extends beyond academic inquiry to practical governance challenges facing democratic societies worldwide. As governments increasingly rely on algorithmic systems to deliver public services, enforce regulations, and allocate resources, the need for effective legal frameworks to ensure accountability, fairness, and legitimacy becomes ever more pressing (Wuttke et al., 2025). Understanding how administrative law is evolving to meet these challenges is essential for policymakers,

legal practitioners, and citizens concerned with maintaining democratic governance in the digital age.

2 LITERATURE REVIEW

2.1 Theoretical foundations of algorithmic governance

The scholarly literature on algorithmic governance has evolved from early techno-optimistic accounts that viewed algorithms as neutral tools for improving administrative efficiency to more nuanced analyses that recognize algorithms as sociotechnical systems embedded within complex organizational and political contexts (Hildebrandt, 2018). Bovens and Zouridis's seminal work on the "discretion-computer" introduced the concept of "system-level bureaucrats" to describe how algorithmic systems can embody policy decisions and exercise a form of automated discretion, though this foundational insight predates the current corpus of literature examined in this study.

Coglianese and Lehr's influential analysis of "regulating by robot" provided one of the first comprehensive examinations of how administrative law should respond to algorithmic decision-making (Coglianese & Lehr, 2017). Their work identified key challenges including the problem of algorithmic opacity, the difficulty of ensuring adequate procedural safeguards, and the need for new forms of oversight and accountability mechanisms. This analysis has been extended by scholars who argue for moving beyond individual rights-based approaches to focus on systemic governance mechanisms that can address the scale and complexity of algorithmic systems (Edwards & Veale, 2018).

The concept of "algorithmic accountability" has emerged as a central organizing principle in the literature, encompassing various approaches to ensuring that algorithmic systems operate in accordance with legal and democratic norms (Engstrom & Ho, 2020). Their comprehensive analysis identifies multiple accountability mechanisms, including transparency requirements, audit procedures, impact assessments, and human oversight provisions. This work demonstrates the need for layered accountability approaches that combine ex-ante design requirements with ongoing monitoring and evaluation.

2.2 Administrative law adaptations

Legal scholars have proposed various approaches to adapting administrative law principles to accommodate algorithmic systems. One significant strand of scholarship focuses on reconceptualizing transparency requirements in light of algorithmic opacity (Coglianese & Lehr, 2019). Edwards and Veale (2018) argue for moving beyond simplistic "right to explanation" approaches toward more sophisticated frameworks that emphasize the "right to better decisions" through systemic improvements in algorithmic design and deployment. This perspective recognizes that technical explanations of algorithmic operations may be less important than ensuring that algorithmic systems produce fair and accurate outcomes.

The doctrine of reasoned decision-making, a cornerstone of administrative law, has received particular attention from scholars examining algorithmic governance (Sheehy & Ng, 2023). Traditional requirements for agencies to provide reasoned explanations for their decisions face significant challenges when applied to machine learning systems that may process thousands of variables through complex non-linear relationships. Some scholars propose developing new forms of "algorithmic reasoning" that focus on the justification for using particular algorithmic systems rather than explanations of individual decisions.

Procedural due process requirements present another area of significant scholarly attention (Goudge, 2021). The challenge of providing meaningful opportunities for individuals to contest algorithmic decisions has led to proposals for new procedural frameworks that incorporate both automated and human review processes. These proposals recognize that traditional notice-and-comment procedures may be inadequate for addressing the scale and complexity of algorithmic systems while still preserving essential procedural safeguards.

2.3 Internal administrative law approaches

A growing body of scholarship emphasizes the importance of "internal administrative law" approaches that focus on how agencies develop and implement rules and procedures for governing their own use of algorithmic systems (Haim, 2023). This approach recognizes that external legal constraints alone may be insufficient to ensure

appropriate algorithmic governance and that agencies must develop their own capacity for responsible AI implementation.

The concept of "prospective benchmarking" has emerged as one promising internal governance mechanism (Engstrom & Ho, 2020). This approach involves reserving random samples of cases for human decision-making to provide ongoing validation of algorithmic performance and to detect potential drift or bias over time. Such mechanisms represent attempts to build accountability and quality assurance directly into the design and operation of algorithmic systems rather than relying solely on external oversight.

Administrative procurement and contracting practices have also received scholarly attention as key sites for algorithmic governance (Silfia, 2025). The recognition that many government algorithmic systems are developed by private contractors has led to calls for new procurement standards that incorporate algorithmic accountability requirements. This includes requirements for algorithmic impact assessments, bias testing, documentation standards, and ongoing monitoring and evaluation.

2.4 International and comparative perspectives

The international dimension of algorithmic governance has become increasingly prominent in recent scholarship (Fernández, 2023). The European Union's development of comprehensive AI regulation represents the most ambitious attempt to create binding legal frameworks for algorithmic systems. EU approaches emphasize risk-based regulation that categorizes AI systems according to their potential for harm and imposes corresponding regulatory requirements (Covilla Martínez, 2024).

The Council of Europe's work on algorithmic transparency and human rights provides another significant international perspective. The organization's draft recommendation on algorithmic systems emphasizes the importance of human oversight, transparency, and contestability as fundamental requirements for algorithmic governance (Llamas Covarrubias, 2022). This human rights-based approach differs from the EU's more technocratic risk-based framework and reflects different philosophical approaches to algorithmic governance.

Comparative analysis of different national approaches to algorithmic governance reveals significant variation in regulatory strategies and legal frameworks (Tolentino-

Neto & Costa, 2024). While some jurisdictions have adopted comprehensive legislative approaches, others have relied more heavily on soft law instruments such as guidance documents, ethical frameworks, and voluntary standards (Tiuria, 2022). This variation provides valuable insights into different approaches to balancing innovation with accountability and democratic governance.

2.5 Emerging governance mechanisms

Recent scholarship has identified several categories of emerging governance mechanisms for algorithmic systems in public administration (Mark & Scher, 2025). These mechanisms can be broadly categorized as ex-ante design requirements, ongoing monitoring and evaluation procedures, and ex-post accountability measures. The development of algorithmic impact assessments represents a significant innovation in ex-ante governance approaches (Stetler, 2025).

International readiness frameworks and governance architectures are also emerging as important tools for assessing and improving algorithmic governance capacity (Alalaq, 2025). These frameworks provide benchmarks for evaluating government preparedness for AI deployment and identifying areas for improvement in governance mechanisms.

Healthcare applications of AI governance have received particular attention, with scholars examining how existing regulatory frameworks in healthcare can inform broader approaches to algorithmic governance (Yang & Ricciardi, 2025; Shaw & McCosker, 2025). The healthcare sector's experience with evidence-based regulation and safety oversight provides valuable lessons for other domains of government AI deployment.

2.6 Gaps and limitations in current literature

Despite the growing body of scholarship on algorithmic governance, several significant gaps remain in the literature. First, there is limited empirical research on the effectiveness of different governance mechanisms in practice (Konnerth et al., 2025). While many proposals for algorithmic accountability have been developed in theory, there is insufficient evidence about how these mechanisms perform when implemented in real-world administrative contexts.

Second, the literature has paid insufficient attention to the distributional effects of algorithmic governance and how different governance approaches may affect different communities and populations. Questions of algorithmic bias and fairness have received attention, but there is less analysis of how governance mechanisms themselves may create or perpetuate inequalities.

Third, there is limited analysis of the relationship between algorithmic governance and broader trends in administrative law and public administration (Wuttke et al., 2025). The literature tends to treat algorithmic governance as a distinct phenomenon rather than examining how it relates to other developments such as performance management, evidence-based policy, and new public management reforms.

3 METHODOLOGY

This research employs a multi-method approach combining doctrinal legal analysis, systematic literature review, and comparative institutional analysis to examine the intellectualization of administrative law in response to algorithmic governance and emerging international law constraints. The methodology is designed to capture both the theoretical development of legal frameworks and their practical implementation across different jurisdictions and institutional contexts.

3.1 Research design

The study utilizes a qualitative research design based on interpretive analysis of legal texts, scholarly literature, and institutional documents (Popovic, 2017). This approach is appropriate for examining the evolution of legal concepts and frameworks, as it allows for detailed analysis of how legal actors construct meaning and develop new approaches to governance challenges. The research design incorporates both synchronic analysis of current approaches and diachronic analysis of how these approaches have evolved over time.

3.2 Data collection

Data collection involved systematic searches of multiple academic databases including SciSpace, Google Scholar, PubMed, and ArXiv to identify relevant scholarly literature on algorithmic governance and administrative law (Conte et al., 2021). Search terms included combinations of "algorithmic governance," "administrative law," "artificial intelligence regulation," "international law," and related concepts. The search strategy was designed to capture both foundational works in the field and recent developments in legal scholarship and practice.

In addition to academic literature, the research incorporates analysis of primary legal sources including statutes, regulations, court decisions, and international legal instruments. Particular attention was paid to emerging regulatory frameworks such as the EU AI Act, Council of Europe recommendations, and national legislation on algorithmic governance. Administrative guidance documents, policy statements, and agency reports were also analyzed to understand how legal frameworks are being implemented in practice.

3.3 Analytical framework

The analytical framework draws on institutional analysis and legal interpretation methods to examine how administrative law is adapting to algorithmic governance (Lobo & Del Ser, 2024). The analysis focuses on three levels: theoretical/conceptual development, institutional/organizational implementation, and international/comparative perspectives.

At the theoretical level, the analysis examines how legal scholars are reconceptualizing core administrative law principles such as transparency, accountability, due process, and reasoned decision-making. This involves close textual analysis of scholarly arguments and identification of emerging conceptual frameworks.

At the institutional level, the analysis examines how government agencies and other organizations are developing new governance mechanisms for algorithmic systems. This includes analysis of internal policies, procurement practices, oversight mechanisms, and implementation strategies.

At the international level, the analysis compares different national and supranational approaches to algorithmic governance, identifying patterns of convergence and divergence. This comparative dimension is essential for understanding how international law constraints are influencing domestic legal development.

3.4 Limitations

Several limitations should be noted regarding this methodology. First, the focus on published scholarly literature and official legal documents may not capture all relevant developments in algorithmic governance, particularly emerging practices that have not yet been documented in academic or legal sources. Second, the emphasis on English-language sources may limit the comprehensiveness of the international comparative analysis.

Third, the lack of extensive empirical data on the implementation and effectiveness of different governance mechanisms limits the ability to assess the practical impact of theoretical developments. Future research would benefit from more extensive empirical investigation of how algorithmic governance mechanisms operate in practice.

4 DISCUSSION

4.1 The intellectualization process

The intellectualization of administrative law in response to algorithmic governance represents a multifaceted process involving the reconceptualization of fundamental legal principles, the development of new governance mechanisms, and the creation of institutional frameworks capable of addressing the unique challenges posed by algorithmic systems (Haim, 2023). This process reflects broader trends in legal scholarship toward interdisciplinary approaches that incorporate insights from computer science, organizational theory, and public policy.

One of the most significant aspects of this intellectualization process is the movement away from individualistic, rights-based approaches toward systemic governance mechanisms that can address the scale and complexity of algorithmic systems (Engstrom & Ho, 2020). Traditional administrative law focused primarily on ensuring

that individual citizens received fair treatment in their interactions with government agencies. While this individual-focused approach remains important, scholars increasingly recognize that algorithmic systems require governance mechanisms that operate at the system level rather than the individual case level.

This shift toward systemic approaches is evident in the development of concepts such as "algorithmic impact assessments," "prospective benchmarking," and "internal administrative law" (Silfia, 2025). These mechanisms focus on ensuring that algorithmic systems are designed, implemented, and monitored in ways that promote accountability and fairness across all cases rather than providing remedies for individual instances of unfair treatment.

The intellectualization process also involves the recognition that algorithmic systems are sociotechnical rather than purely technical artifacts (Hildebrandt, 2018). This understanding has led to greater attention to organizational context, institutional design, and the interaction between technical systems and human decision-makers. Legal scholars increasingly recognize that effective algorithmic governance requires attention to the entire sociotechnical system rather than focusing solely on the technical properties of algorithms themselves.

4.2 Emerging governance mechanisms

The literature reveals several categories of emerging governance mechanisms for algorithmic systems in public administration. These mechanisms can be broadly categorized as ex-ante design requirements, ongoing monitoring and evaluation procedures, and ex-post accountability measures (Mark & Scher, 2025).

Ex-ante design requirements include algorithmic impact assessments, bias testing protocols, documentation standards, and human oversight provisions (Stetler, 2025). These requirements are designed to ensure that algorithmic systems are developed with appropriate consideration for fairness, accuracy, and accountability from the outset. The EU's proposed AI Act exemplifies this approach with its comprehensive requirements for high-risk AI systems including conformity assessments, risk management systems, and quality management procedures.

Ongoing monitoring and evaluation procedures include prospective benchmarking, performance monitoring, drift detection, and regular auditing (Engstrom

& Ho, 2020). These mechanisms recognize that algorithmic systems may change over time due to retraining, environmental changes, or other factors, and that ongoing oversight is necessary to maintain accountability. Some jurisdictions have established specialized oversight bodies with technical expertise to conduct such monitoring.

Ex-post accountability measures include complaint procedures, appeal mechanisms, and judicial review processes adapted for algorithmic decision-making (Goudge, 2021). These mechanisms provide avenues for individuals to challenge algorithmic decisions and seek remedies when appropriate. However, the effectiveness of such mechanisms depends on their design and implementation, and there are ongoing debates about how to make them meaningful in the context of automated decision-making.

4.3 International law constraints and convergence

The emergence of international law constraints on algorithmic governance represents a significant development that is shaping domestic legal frameworks worldwide (Fernández, 2023). The European Union has taken the lead in developing comprehensive regulatory frameworks for AI systems, with the proposed AI Act establishing detailed requirements for high-risk applications including many government uses. This regulatory approach emphasizes risk-based classification, mandatory conformity assessments, and ongoing monitoring requirements (Covilla Martínez, 2024 & Khwaileh, 2025).

The Council of Europe has taken a somewhat different approach, emphasizing human rights principles and democratic governance (Llamas Covarrubias, 2022). The organization's draft recommendation on algorithmic systems focuses on transparency, contestability, and human oversight as fundamental requirements. This approach reflects a more rights-based perspective compared to the EU's technocratic risk-based framework.

These international developments are creating pressures for convergence in domestic approaches to algorithmic governance. Countries seeking to maintain access to international markets and avoid regulatory fragmentation have incentives to align their domestic frameworks with international standards. However, there remain significant differences in national approaches reflecting different legal traditions, institutional structures, and policy priorities (Tiuria, 2022).

The extraterritorial effects of international regulations, particularly the EU AI Act, are creating additional pressures for convergence. Organizations operating across multiple jurisdictions may find it efficient to comply with the most stringent requirements rather than maintaining different systems for different jurisdictions. This "Brussels Effect" may lead to greater harmonization of algorithmic governance approaches even in the absence of formal international agreements.

4.4 Challenges and tensions

Despite these developments, significant challenges and tensions remain in the governance of algorithmic systems. One fundamental tension exists between the desire for transparency and accountability and the practical limitations of algorithmic explainability (Edwards & Veale, 2018). While legal frameworks increasingly emphasize explanation requirements, the technical reality is that many effective machine learning systems operate through complex processes that are difficult to explain in terms that are meaningful to legal decision-makers or affected individuals.

Another significant challenge involves balancing efficiency and fairness considerations (Wuttke et al., 2025). Algorithmic systems are often adopted by government agencies because they can process large volumes of cases more quickly and consistently than human decision-makers. However, ensuring fairness and accountability may require additional procedures and oversight mechanisms that reduce efficiency gains. Finding appropriate balances between these competing values remains an ongoing challenge.

The problem of algorithmic bias presents another persistent challenge (Oliveira & Alencar, 2025). While there is widespread recognition that algorithmic systems can perpetuate or amplify existing biases, developing effective mechanisms for detecting and addressing bias remains difficult. Different definitions of fairness may conflict with each other, and technical approaches to bias mitigation may have unintended consequences.

Institutional capacity represents another significant challenge (Tolentino-Neto & Costa, 2024). Effective algorithmic governance requires technical expertise that many government agencies currently lack. Building this capacity requires significant investments in training, hiring, and organizational development that may be difficult to

sustain over time. The reliance on private contractors for algorithmic system development further complicates capacity-building efforts.

5 RESULTS

5.1 Conceptual evolution of administrative law

The analysis reveals a significant evolution in how administrative law scholars and practitioners conceptualize the fundamental principles of administrative governance in the algorithmic age. Traditional administrative law principles—transparency, accountability, due process, and reasoned decision-making—are being reconceptualized rather than simply applied to new technological contexts (Hildebrandt, 2018).

Transparency requirements have evolved from simple disclosure obligations to more sophisticated frameworks that recognize the limitations of technical explanations while emphasizing systemic transparency through impact assessments, audit procedures, and public reporting (Coglianese & Lehr, 2019). The concept of "meaningful transparency" has emerged as a key organizing principle that focuses on providing information that is actually useful for accountability purposes rather than technical details that may be incomprehensible to most stakeholders.

Accountability mechanisms have similarly evolved from individual-focused remedies to systemic approaches that emphasize ongoing monitoring, evaluation, and improvement of algorithmic systems (Engstrom & Ho, 2020). The development of "algorithmic accountability" as a distinct field of study reflects this broader reconceptualization of how accountability should operate in the context of automated decision-making.

Due process requirements have been adapted to recognize the unique characteristics of algorithmic decision-making while preserving essential procedural safeguards (Goudge, 2021). This has led to the development of new procedural frameworks that combine automated and human review processes and provide meaningful opportunities for contestation and appeal.

The principle of reasoned decision-making has perhaps undergone the most significant reconceptualization (Sheehy & Ng, 2023). Rather than requiring explanations of individual algorithmic decisions, emerging frameworks emphasize the justification for

using particular algorithmic systems and the ongoing validation of their performance. This shift reflects recognition that traditional forms of reasoning may be inadequate for complex machine learning systems.

5.2 Institutional innovation in governance mechanisms

The research identifies several categories of institutional innovations in algorithmic governance mechanisms. These innovations represent attempts to address the unique challenges posed by algorithmic systems while preserving essential elements of democratic accountability and legal oversight (Silfia, 2025).

Internal administrative law mechanisms have emerged as a particularly important category of innovation (Haim, 2023). These include agency-specific policies and procedures for algorithmic system procurement, deployment, and oversight. Many agencies have developed internal review boards, technical standards, and approval processes for algorithmic systems. These internal mechanisms are often more detailed and specific than external legal requirements and reflect agencies' attempts to manage the risks and benefits of algorithmic systems proactively.

Prospective benchmarking represents another significant innovation (Engstrom & Ho, 2020). This mechanism involves reserving random samples of cases for human decision-making to provide ongoing validation of algorithmic performance. Several agencies have implemented or are piloting such systems as a way to detect performance degradation, bias, or other problems with algorithmic systems over time.

Impact assessment procedures have been widely adopted as a governance mechanism (Stetler, 2025). These assessments require agencies to evaluate the potential effects of algorithmic systems before deployment and to implement monitoring and mitigation measures. The specific requirements and procedures for impact assessments vary significantly across jurisdictions, but they generally include analysis of accuracy, fairness, privacy, and other relevant considerations.

Specialized oversight bodies have been established in several jurisdictions to provide technical expertise and independent monitoring of algorithmic systems (Alalaq, 2025). These bodies typically combine legal and technical expertise and may have powers to investigate complaints, conduct audits, and issue recommendations or orders. The

effectiveness of such bodies depends significantly on their resources, powers, and institutional positioning.

5.3 International regulatory convergence and divergence

The analysis reveals both convergence and divergence in international approaches to algorithmic governance. Areas of convergence include widespread recognition of the need for specialized governance mechanisms, emphasis on risk-based approaches, and attention to human oversight requirements (Fernández, 2023).

Risk-based regulation has emerged as a dominant paradigm across multiple jurisdictions (Covilla Martínez, 2024). This approach involves categorizing algorithmic systems according to their potential for harm and imposing corresponding regulatory requirements. The EU AI Act exemplifies this approach with its detailed classification system and tiered requirements. Similar risk-based approaches have been adopted or proposed in other jurisdictions, suggesting significant convergence around this regulatory strategy.

Human oversight requirements represent another area of convergence (Llamas Covarrubias, 2022). Most emerging regulatory frameworks include requirements for human involvement in algorithmic decision-making, though the specific requirements vary. These requirements reflect widespread recognition that fully automated decision-making may be inappropriate for many government applications.

However, significant divergence remains in several areas (Tiuria, 2022). Different jurisdictions have adopted different approaches to transparency requirements, with some emphasizing individual explanation rights and others focusing on systemic transparency. There are also differences in enforcement mechanisms, with some jurisdictions relying primarily on administrative oversight and others providing more extensive judicial review.

The relationship between algorithmic governance and broader data protection and privacy frameworks also varies significantly across jurisdictions (Tolentino-Neto & Costa, 2024). Some countries have integrated algorithmic governance requirements into existing data protection laws, while others have developed separate regulatory frameworks. These differences reflect different legal traditions and institutional structures.

5.4 Effectiveness and implementation challenges

The research reveals significant challenges in implementing algorithmic governance mechanisms effectively. One major challenge involves the technical complexity of algorithmic systems and the limited technical expertise available in many government agencies and oversight bodies (Yang & Ricciardi, 2025). This expertise gap can limit the effectiveness of governance mechanisms and may lead to either overly permissive or overly restrictive approaches.

Resource constraints represent another significant implementation challenge (Shaw & McCosker, 2025). Many proposed governance mechanisms require substantial investments in personnel, technology, and organizational capacity that may be difficult to sustain. Smaller agencies and jurisdictions may face particular challenges in developing adequate governance capacity.

The rapid pace of technological change creates ongoing challenges for regulatory frameworks (Konnerth et al., 2025). Legal and regulatory frameworks typically develop more slowly than technology, creating gaps between regulatory requirements and technological capabilities. This problem is exacerbated by the fact that algorithmic systems may change significantly through retraining or updates even after initial deployment.

Coordination challenges arise both within and between jurisdictions (Wuttke et al., 2025). Within jurisdictions, multiple agencies may have overlapping responsibilities for algorithmic governance, leading to potential gaps or conflicts. Between jurisdictions, different regulatory requirements may create compliance burdens for organizations operating across multiple legal frameworks.

6 CONCLUSION

This research has examined the intellectualization of administrative law in response to algorithmic governance and the emergence of international law constraints that are shaping this evolution. The analysis reveals a fundamental transformation in how legal scholars and practitioners conceptualize administrative governance, moving beyond traditional individual-focused, rights-based approaches toward systemic governance mechanisms that can address the unique characteristics of algorithmic systems.

6.1 Key findings

The research identifies several key findings regarding the evolution of administrative law in the algorithmic age. First, there has been a significant reconceptualization of core administrative law principles, with transparency, accountability, due process, and reasoned decision-making being adapted to address the sociotechnical nature of algorithmic systems (Hildebrandt, 2018). This reconceptualization emphasizes systemic approaches that focus on the design, implementation, and ongoing oversight of algorithmic systems rather than individual case-by-case review.

Second, new governance mechanisms are emerging that combine ex-ante design requirements, ongoing monitoring procedures, and ex-post accountability measures (Mark & Scher, 2025). These mechanisms include algorithmic impact assessments, prospective benchmarking, internal administrative law frameworks, and specialized oversight bodies. While these mechanisms show promise, their effectiveness depends significantly on implementation details and institutional capacity.

Third, international law constraints are playing an increasingly important role in shaping domestic approaches to algorithmic governance (Fernández, 2023). The European Union's comprehensive regulatory approach and the Council of Europe's human rights-based framework are creating pressures for convergence in national approaches. However, significant divergence remains in specific implementation approaches, reflecting different legal traditions and institutional structures.

Fourth, significant challenges remain in implementing effective algorithmic governance (Wuttke et al., 2025). These challenges include technical complexity, resource constraints, rapid technological change, and coordination difficulties. Addressing these challenges will require sustained investment in institutional capacity, technical expertise, and organizational learning.

6.2 Theoretical contributions

This research makes several theoretical contributions to the literature on algorithmic governance and administrative law. The analysis of the "intellectualization" process provides a framework for understanding how legal concepts and institutions adapt

to technological change (Haim, 2023). This framework emphasizes the active role of legal actors in constructing new approaches rather than simply applying existing frameworks to new contexts.

The identification of systemic governance mechanisms as a distinct category of legal innovation contributes to understanding how administrative law is evolving beyond traditional individual-focused approaches (Engstrom & Ho, 2020). This systemic perspective recognizes that algorithmic systems require governance mechanisms that operate at the system level rather than the individual case level.

The analysis of international law constraints and their influence on domestic legal development contributes to understanding how legal globalization operates in the context of emerging technologies (Covilla Martínez, 2024). The research reveals how international regulatory frameworks create both convergence pressures and opportunities for regulatory innovation.

6.3 Policy implications

The research has several important implications for policy development. First, policymakers should recognize that effective algorithmic governance requires more than simply applying existing administrative law principles to new technologies (Silfia, 2025). Instead, it requires developing new governance mechanisms that can address the unique characteristics of algorithmic systems while preserving essential elements of democratic accountability.

Second, policymakers should invest in building institutional capacity for algorithmic governance (Stetler, 2025). This includes developing technical expertise within government agencies, establishing specialized oversight bodies, and creating mechanisms for ongoing learning and adaptation. Without adequate institutional capacity, even well-designed governance mechanisms are unlikely to be effective.

Third, policymakers should consider the international dimensions of algorithmic governance when developing domestic frameworks (Llamas Covarrubias, 2022). The extraterritorial effects of international regulations and the global nature of technology markets create incentives for coordination and harmonization. However, policymakers should also recognize that different approaches may be appropriate for different jurisdictions based on their legal traditions and institutional structures.

Fourth, policymakers should adopt adaptive approaches that can evolve with technological change (Lobo & Del Ser, 2024). Rigid regulatory frameworks may quickly become obsolete in the face of rapid technological development. Instead, governance frameworks should emphasize principles and processes that can be adapted to new circumstances while maintaining essential accountability requirements.

6.4 Future research directions

This research identifies several important directions for future investigation. First, there is a need for more empirical research on the effectiveness of different governance mechanisms in practice (Konnerth et al., 2025). While many governance mechanisms have been proposed in theory, there is limited evidence about how they perform when implemented in real-world contexts.

Second, future research should examine the distributional effects of algorithmic governance and how different governance approaches may affect different communities and populations (Yang & Ricciardi, 2025). Questions of equity and justice in algorithmic governance require more systematic attention.

Third, research is needed on the relationship between algorithmic governance and broader trends in public administration and governance (Shaw & McCosker, 2025). Algorithmic governance should be understood in the context of other developments such as performance management, evidence-based policy, and digital government initiatives.

Fourth, comparative research on different national and international approaches to algorithmic governance would provide valuable insights into effective governance strategies (Tolentino-Neto & Costa, 2024). Such research should examine not only formal legal frameworks but also implementation practices and outcomes.

Finally, interdisciplinary research that combines legal analysis with insights from computer science, organizational theory, and public policy is essential for developing effective approaches to algorithmic governance (Conte et al., 2021). The sociotechnical nature of algorithmic systems requires governance approaches that draw on multiple disciplinary perspectives.

6.5 Concluding observations

The governance of algorithmic systems in public administration represents one of the most significant challenges facing democratic societies in the digital age. The intellectualization of administrative law in response to this challenge demonstrates the adaptive capacity of legal institutions while also revealing the limitations of traditional governance approaches. As governments increasingly rely on algorithmic systems to deliver public services and exercise administrative power, the development of effective governance mechanisms becomes ever more critical for maintaining democratic accountability and legitimacy.

The emergence of international law constraints adds an additional layer of complexity to this challenge while also creating opportunities for learning and coordination across jurisdictions. The ongoing evolution of these governance frameworks will require continued attention from scholars, policymakers, and practitioners committed to ensuring that technological progress serves democratic values and the public interest.

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Both authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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