Research on the Value Creation, Ethical Challenges and Response Strategies of Robots in Government Administrative Performance Management

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https://doi.org/10.70695/AA1202502A19

Abstract

Although the application of robots in government administrative performance management can significantly improve efficiency and accuracy, the ethical issues it raises, such as data privacy, algorithmic bias, and responsibility attribution, are becoming increasingly prominent. Most current studies focus on technical effectiveness, but ignore the systematic governance of ethical risks. This article analyzes the impact of robot automated decision-making on administrative fairness and the legal dilemma caused by the ambiguity of the subject of responsibility, revealing the loopholes and defects of the existing governance framework. With regard to these issues, the study advocates the establishment of an ethical governance structure with multi-stakeholder collaboration, the optimization of the algorithm audit mechanism, and the improvement of the responsibility traceability system. In order to balance technological innovation and ethical compliance , the study provides a theoretical basis and practical solutions for the standardized development of intelligent administration.

Keywords Robot Governance; Administrative Performance Management; Ethical Risks

1 Introduction

With the rapid development of artificial intelligence technology, the application of robots in government administrative performance management has gradually improved. They have highlighted their value in promoting efficiency, achieving efficient resource allocation, and reducing administrative costs. The large-scale application of robots has also given rise to ethical dilemmas such as data privacy, algorithmic bias, and responsibility definition. It is urgent to conduct systematic research to balance the needs of technological innovation and ethical compliance [1]. When domestic and foreign scholars discuss the application of robots in public management, they often focus on the technical effectiveness. There is still a lack of discussion on this ethical risk and governance strategy. This study focuses on exploring the value creation mechanism of robots in government performance management, exploring its hidden ethical dilemmas, and then formulating key treatment methods to achieve sustainable improvement of intelligent administration [2].

2 Practical Application of Robotics Technology and Its Impact on Transformation Under Administrative Performance Management

2.1 Theoretical Evolution and Technical Adaptability of Administrative Performance Evaluation

The core of government administrative performance management lies in scientifically and effectively evaluating the effectiveness, efficiency, and effect (i.e., "3E": Economy, Efficiency, Effectiveness) and equity of organizations and personnel. Its theoretical development has gone through the process from input control under the traditional bureaucracy to the result orientation, customer orientation, and performance contract emphasized by the New Public Management Movement (NPM), and then to the return and balance of citizen participation, public value, and social equity in theories such as the New Public Service (NPS). Classic performance evaluation models such as the Balanced Scorecard (BSC) were introduced into the public sector, aiming to go beyond a single financial indicator and integrate

multiple dimensions such as finance, customers (citizens), internal processes, and learning and growth; the key performance indicator (KPI) system focuses on identifying and measuring a few core indicators that are critical to the achievement of organizational strategic goals; and benchmarking drives improvement by finding best practices for comparison. These theories and models together constitute the cornerstone of modern government performance management [3].

The introduction of robotics technology provides new possibilities for overcoming many challenges in traditional performance evaluation. First, at the level of data collection and processing, RPA, NLP and computer vision technologies can automatically collect, clean and analyze massive amounts of structured and unstructured data (such as service records, policy texts, and public feedback), greatly improving the breadth, timeliness and objectivity of evaluation data and reducing manual entry errors and subjective screening biases. Second, at the level of indicator measurement and analysis, big data analysis and machine learning algorithms can more accurately identify key factors affecting performance, predict future trends, and discover hidden patterns and anomalies (such as identifying administrative process bottlenecks and predicting peaks in public service demand), making performance evaluation shift from static "ex post evaluation" to dynamic "real-time monitoring" and "forward-looking diagnosis." Third, at the level of complex value integration, intelligent algorithms theoretically have the potential to handle multi-dimensional and even conflicting performance goals (such as efficiency and fairness, cost control and service quality) and optimize trade-offs [4].

2.2 Current Status of Robot Technology Application in Government Performance Management

At present, the application of robots in the field of government performance management focuses on the deep integration of intelligent process automation, data analysis and decision support systems. In terms of administrative process automation, RPA (Robotic Process Automation) technology is widely used in administrative links with a high degree of standardization, such as administrative approval, document processing and public service response, which greatly enhances the efficiency of administrative work [5]. By using big data analysis methods, government departments can implement real-time monitoring of performance indicators, and use machine learning algorithms to find bottlenecks in administrative efficiency. Natural language processing technology is used in intelligent customer service systems and policy document analysis to accelerate the pace of public service response and increase the precision of policy implementation. The use of computer vision technology in areas such as document recognition and security monitoring has further expanded the functional boundaries of robots in the field of administrative management.

2.3 Robotics Technology has Brought About the Impact and Transformation of Traditional Administrative Models

With the introduction of robotics technology, the traditional administrative management operating mechanism and organizational structure are being reconstructed. In terms of organizational structure, in view of the trend of intelligent transformation, each government department has established a dedicated data governance agency to break down the previous administrative barriers. In terms of decision-making mechanism, the traditional decision-making model that relies on experience and intuition is being replaced by algorithm-assisted decision-making, which has also triggered controversy over the compression of administrative discretion. In terms of the specific way of service provision, the 24-hour uninterrupted intelligent service system breaks the time and space constraints of traditional administrative services and changes the interaction mode between civil servants and the public. As real-time data monitoring technology is put into operation, the performance appraisal system shows a higher level of dynamics and accuracy, but it also faces the difficult situation of relying too much on quantitative indicators [6] .

2.4 Application of Robots in Government Performance Management

Many typical cases at home and abroad have demonstrated the actual application results of robots in government performance management. The government service robot project derived from Singapore 's Smart Nation Plan has achieved intelligent upgrades in administrative approval processes by integrating multiple AI technologies, reducing the average processing time by 70%. The "City Brain" project piloted in some Chinese cities relies on big data analysis and machine learning algorithms to optimize the

efficiency of municipal resource allocation. The natural language processing system has been adopted by a state government in the United States to achieve automatic response feedback for policy consulting services, significantly raising the level of public satisfaction. The intelligent monitoring system planned and deployed by the Seoul Metropolitan Government in South Korea relies on data mining technology to discover flawed links in administrative efficiency.

3 Identification and Governance Challenges of Ethical Risks Caused by Intelligent Administrative Systems

3.1 Identification of Ethical Risks in Robot Applications

The widespread use of robots in government performance management has caused multi-dimensional ethical risks. These risks are mainly reflected in the three aspects of algorithmic decision-making, data governance, and responsibility identification. The risks in the algorithm-related category are presented as the black box phenomenon of decision-making. Due to the inherent complexity of machine learning models, the administrative decision-making process is not transparent and explainable, and it is difficult for the public to understand the logic and principles behind algorithmic decision-making. Data governance is caught in the dilemma of privacy protection. During the collection, processing and analysis of massive citizen data, government robots encounter the substantial contradiction between the principle of data minimization and the need for algorithm optimization. In terms of responsibility identification, the subject has a problem of blurred responsibility boundaries. If automated decisions produce deviations or errors, the responsibility boundaries of algorithm developers, system operators and administrative subjects are not easy to clearly divide. The further ethical contradiction dilemma is that algorithm optimization is performance-oriented, which may systematically marginalize specific groups. Algorithms trained with historical data may continue the structural bias of existing administrative practices and cause new social justice errors.

AI refusal incident of US health insurance company. In recent years, many commercial health insurance institutions in the United States have widely used artificial intelligence in the claims approval process, among which the algorithm nH Predict developed by naviHealth under UnitedHealth Group (UHG) is the most controversial. In November 2023, a class action lawsuit filed in the Minnesota federal court pointed out that the algorithm had an error rate of up to 90% when evaluating the extended care needs of elderly patients , resulting in a large number of qualified health insurance applications being "systematically" rejected in advance, forcing patients to pay out of pocket or give up treatment [8]. Subsequently, in January 2025, The Guardian further disclosed that insurance giants such as UnitedHealth , Humana , and Cigna used similar algorithms to reject more than 300,000 claims in just two months, with an average decision time of only 1.2 seconds per case; and less than 0.2% of patients actually filed complaints, resulting in the continuous amplification of erroneous refusal of payment under economic incentives [9]. & nbsp ;& nbsp ;& nbsp ;& nbsp ;This case highlights the "user-side risk" - even if the algorithm performance is insufficient, institutions may continue to deploy and rely on its automated decision-making for cost control reasons, thereby exacerbating health inequality among vulnerable groups. This situation is a warning to the government when introducing robotics technology: it is difficult to avoid ethical misconduct by technology alone . It is necessary to implement the chain of responsibility to specific operators and decision makers through mandatory algorithm audits, transparency disclosure and multi-subject supervision mechanisms to prevent efficiency goals from overriding fairness and justice.

3.2 Value Creation and Ethical Conflicts in Administrative Performance Management

At the stage when robotics technology creates administrative efficiency and enhances value, it shows a profound conflict with the ethical principles of public administration. Rapid decision-making based on algorithms may compress necessary administrative procedures and reduce the rights and interests of stakeholders to participate and the opportunities for complaints. The contradiction between precise services and the principle of inclusiveness is that personalized service algorithms are likely to provide differentiated services based on citizen data portraits, which is contrary to the basic principle of equal public services. The contradiction between administrative flexibility and performance quantification shows that if administrative personnel rely too much on quantifiable performance indicators, they may leave aside the difficult-to-quantify value of public services and weaken the situational sensitivity in

administrative discretion. The most fundamental contradiction is presented in the form of paradigm differences between technical rationality and administrative ethics. The technical logic of algorithm optimization focuses on standardization and certainty. From the essence of public administration, it is necessary to leave room for ethical judgment when dealing with complex social situations [7].

3.3 Shortcomings and Challenges of the Existing Governance Framework

At present, the governance structure of government robots has obvious problems in terms of lack of institutional supply, and cannot effectively respond to the objective reality of the rapid development of technology applications. From the perspective of legal regulation, the existing traditional administrative law system has not yet formed a responsibility identification rule that fits algorithmic decision-making, and the current data protection legislation does not have special regulations for the use of artificial intelligence in the public sector. Focusing on the scope of standards and specifications, algorithm audits and ethical assessments lack mandatory technical standards. The ethical standards adopted by local governments are scattered and different. In terms of the supervision mechanism, the construction of third-party technical regulatory agencies is extremely backward, and there is no operational means to realize citizens' right to know and right to oppose algorithmic decision-making. In terms of institutional implementation, the scarcity of professional and technical talents has made many governance requirements empty, and it is difficult to achieve the substantive development of systems such as algorithm impact assessment. The deep-seated challenges are attributed to the lag in updating governance concepts. The existing architecture still follows the traditional path of technology neutrality, and there is insufficient understanding of the value-load characteristics of algorithmic systems and their role in reshaping administrative power.

4 Analysis of Structural Contradictions in Data Privacy, Algorithm Fairness and Responsibility Identification

4.1 Analysis of the Contradiction between Data Privacy and Algorithm Transparency

There is a contradiction between data privacy protection and algorithm transparency requirements at a deep structural level. This contradiction presents a special presentation style in the government performance management scenario. From the perspective of technical achievement, enhancing algorithm transparency often requires publicizing model architecture, training data, and decision parameters, which is directly contrary to the data minimization and use restriction requirements in the personal information protection principle. Government data is extremely sensitive. Excessive disclosure of algorithm details may reversely infer citizens' personal privacy information, causing new potential data security risks. From the perspective of institutional design, the existing privacy protection framework focuses on data subject authorization and purpose limitation. If the algorithm system is to achieve continuous optimization, it must use and share a large amount of data multiple times . The two show essential differences in the dimension of data processing norms. According to the perspective of value orientation, the right to privacy in the form of basic rights shows an absolute protection tendency. The algorithm transparency achieved according to the requirements of procedural justice shows the attribute of instrumental rationality. The fuzzy characteristics of value hierarchy put policy making into a dilemma. It is particularly noteworthy that in the context of performance evaluation, the collection and analysis of civil servants' behavior data exacerbates this contradiction. The boundary between organizational management needs and personal privacy protection should be quickly defined.

4.2 The Impact of Automated Decision-making on Administrative Fairness

The use of automated decision-making systems to carry out government performance management is re-constructing the practice methods and evaluation standards of administrative fairness. The data used for algorithm model training often contains structural biases of historical decision-making. The machine learning process amplifies and solidifies such biases, causing bias in adapting to new situations. With the help of automated decision-making, the multiple review procedures in traditional administration have been streamlined. In the stage of efficiency improvement, there is a certain possibility of weakening the procedural participation rights of stakeholders and reducing the level of recognition of the results. From the perspective of standard setting, algorithms convert complex administrative value judgments into

quantifiable parameter indicators. Such simplification measures may turn a blind eye to the special conditions of specific groups, resulting in actual unfairness. In the actual situation of resource allocation, algorithm-guided performance evaluation is likely to cause resource allocation to be overly concentrated in the measurable range, and the value of public services that are difficult to quantify is devalued by the system as a whole. The deep-seated impact is that algorithmic decision-making triggers changes in the cognitive framework of fairness. The discretionary space for balancing individual cases in traditional administration has been squeezed out by the standardized logic of technical systems. This paradigm change poses a fundamental challenge to the administrative ethics system. Especially when promoting grassroots governance, the poor level of automated systems in processing local knowledge may make the differences in the quality of urban and rural and regional administrative services more obvious.

4.3 The Legal and Ethical Dilemma of the Blurred Responsibility Subject

After the introduction of robot systems, the identification of responsibilities in government performance management faces unprecedented complex challenges. As machine learning systems present autonomous evolutionary characteristics, tracing the decision-making process becomes difficult. The traditional causal relationship identification model is no longer effective in algorithmic decision-making scenarios. Administrative users, algorithm developers, and system operators build a chain of responsibilities. There are many professional barriers between the subjects , which leads to difficulties in fault identification. The existing legal system does not have an effective way to divide responsibilities. Automated decision-making causes changes in the traditional relationship between power and responsibility. Administrative subjects may shirk their responsibilities in the name of technological neutrality. Technology providers use administrative orders to defend themselves, resulting in a blank area where no one is responsible. Machine decision-making weakens the moral initiative of individual civil servants and assigns ethical responsibilities to technical systems. The dehumanization trend of this object of responsibility has caused an impact on the basic framework of administrative ethics. In the area of damage relief, when algorithms produce errors, the consequences are often systemic. The traditional administrative relief mechanism is stretched to its limits in dealing with this new form of risk. An even more difficult and in-depth dilemma is that the unclear situation of responsibility determination may induce a chilling effect, which in turn curbs technological innovation and hinders the exercise of administrative responsibility. How to achieve a balance between encouraging innovation and ensuring accountability is a core issue that needs to be addressed urgently.

5 Innovative Exploration of Multi-dimensional Collaborative Governance Framework and Intelligent Supervision Mechanism

5.1 Establish an Ethical Governance Framework based on Multiple Stakeholders

We should shape a multi- stakeholder collaborative governance style, break through the closed barriers of traditional administrative management, and form a three-dimensional governance model with the collaborative participation of the government, technology companies, civil society and academic institutions. The core is to plan institutionalized participation channels and consultation models to promote the functions of all stakeholders in the entire stage of algorithm design , deployment and evaluation . The specific path to implementation is to create an ethics review committee with multi-party participation, formulate binding technical ethics regulations, and establish a long-term public opinion collection mechanism. Within the scope of the government's organizational framework, it is necessary to break down the barriers between departments, build a cross-domain intelligent administrative coordination and governance group, and aggregate the professional skills of technical experts, legal advisers, ethicists, etc. The important thing is to create a value-sensitive design path, transform administrative ethical requirements into practical technical specifications , and embed value points such as privacy protection and fairness considerations from the beginning of the system development stage . Whether the governance framework can operate effectively should be examined to see whether three balances can be achieved: the balance between technological innovation and rights protection, the balance between administrative efficiency and procedural justice, and the balance between centralized decision-making and the participation of multiple subjects. This governance model places particular emphasis on process orientation, relying on the establishment of relevant institutional systems such as algorithm

impact assessments and regular ethical reviews to maintain the continuous compliance level of the intelligent administrative system .

5.2 Optimizing Algorithm Audit and Data Supervision Mechanisms

To optimize the algorithm audit mechanism, we need to promote optimization in both technical standards and institutional norms . We need to develop algorithm interpretability tools that fit government scenarios, build standardized transparency assessment indicators and regulatory systems, and include functional modules such as model bias detection and decision logic visualization. We must formulate a mandatory algorithm filing and audit system to define the limited scope of audit subject qualifications, specific requirements for audit procedures, and standardized styles for public disclosure of results. Data supervision focuses on building a classified and graded management structure, implementing special protection plans for sensitive data such as personal privacy and public safety, and establishing a mechanism for full-process imprinting and dynamic supervision of data use. Core innovation focuses on developing solutions related to "regulatory technology" (RegTech), using blockchain technology to add traceability attributes to data flow, and adopting privacy computing related technologies such as homomorphic encryption to resolve the contradiction between data utilization and protection needs. In the implementation process, we need to pay special attention to the principle of moderate supervision, prevent excessive supervision from slowing down the pace of technological innovation, and leave room for innovation by creating mechanisms such as "regulatory sandboxes". The use of audit results must be linked to performance evaluation, and the compliance of algorithms must be used as the core basis for evaluating the effectiveness of intelligent administrative systems.

5.3 Improve the Responsibility Tracing and Risk Compensation System

If we want to improve the liability tracing system, we need to reconstruct the legal liability system that adapts to the characteristics of algorithmic decision-making. The main core point is to build a "technical-administrative" dual-track liability identification mechanism, clarify the scope of responsibility and attribution rules of algorithm developers, deployers, and users, and the specific strategy is to introduce relevant systems for mandatory retention of algorithmic decision logs, develop technical tools that can trace the decision-making process, and formulate relevant procedures for expert assistance in determining responsibility. For risk compensation situations, a multi-level relief framework should be created, including the establishment of a government compensation fund for artificial intelligence, the implementation of technical liability insurance with mandatory constraints, and the improvement of the connection system between administrative complaints and judicial relief. The key breakthrough point of system design is to develop new evidence rules and proof standards, break the thorny problems in the proof of algorithmic infringement, and take into account the potential risks of technological innovation and social equity protection. In particular, it is necessary to create a rapid response and repair mechanism for algorithmic errors, implement early warning and intervention operations for systemic risks, deepen institutional innovation, focus on exploring the "algorithm guardian" system, select professional institutions to supervise high-risk automated decision-making systems, and formulate compensation standards that take the particularity of algorithmic decision-making into consideration . It is necessary to distinguish the degree of responsibility for damages caused by different reasons such as technical flaws, data bias, and improper deployment, set accounting specifications for differentiated compensation , and implement the construction of a professional technical support system. This plays a core role in ensuring the effectiveness of this system, and involves the cultivation of algorithm appraisal institutions and the planning of a technical investigator system and other supporting approaches.

6 Conclusion

This study systematically investigates the value creation mechanism and ethical governance challenges of robots in government administrative performance management. Intelligent technology has been used in applications to greatly improve administrative operation efficiency and service accuracy, but it has also induced deep ethical dilemmas such as algorithm black box, data privacy, and responsibility ambiguity. The study shows the structural contradiction between technical rationality and administrative ethics, highlighting the tension between efficiency value and procedural justice, precise service and universal principle, performance quantification and administrative flexibility. In response to such thorny problems,

a framework for multi-stakeholder collaborative governance is formulated, focusing on institutionalized participation mechanisms to integrate ethical requirements into the entire process of technical design. In terms of specific implementation paths, it is proposed to form a standardized system for algorithm auditing and data supervision, establish a responsibility tracing system that conforms to the characteristics of algorithmic decision-making, and then create a multi-level risk compensation system. The research results prove that if intelligent administration is to achieve sustainable development, it is necessary to build a dynamic balance between technological innovation and ethical compliance . This requires a leap in technical solutions, especially innovations in institutional design.

Acknowledgement

This work was supported without any funding.

Conflicts of Interest

The authors declare no conflicts of interest.

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機器人在政府行政績效管理中的價值創造、倫理挑戰與應對策略研究

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摘要：機器人在政府行政績效管理中的應用雖能顯著提升效率與精準性，但其引發的數據隱私、算法偏見及責任歸屬等倫理問題日益凸顯。當前研究多數聚焦在技術效能上，但忽視了針對倫理風險的系統性治理。本文就機器人自動化決策對行政公平性的影響及責任主體模糊化所形成的法律困境進行剖析，揭示出既有治理框架的漏洞缺陷。就這些問題而言，研究主張搭建多利益相關者協同的倫理治理格局，實施對算法審計機製的優化，繼而改進責任追溯製度，為平衡技術創新和倫理上的合規性，研究為智能行政實現規範化發展提供了理論依據與實踐方案。

關鍵詞：機器人治理；行政績效管理；倫理風險

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