

Bureaucracy Ontology in Public Services: A Post Normal Science Approach to Managing Complexity and Uncertainty

¹ Ulfa

¹ Doctoral Student in Public Administration, Universitas Hasanuddin, Indonesia
[email: ulfa@uinpalopo.ac.id](mailto:ulfa@uinpalopo.ac.id)

Received: April 10,2026 | Revised: April 20, 2026| Accepted: 1 May 2026| Published Online: 10 May 2026

Abstract

Weberian bureaucracy, grounded in rational-legal authority, faces a fundamental adaptive crisis in public service environments increasingly characterized by epistemic uncertainty, value conflict, and systemic complexity. The ontology of bureaucracy and the Post Normal Science (PNS) framework have developed as independent streams in global public administration literature, while their systematic integration as a unified conceptual framework within public service delivery remains underexplored a research gap that motivates this study. Using a library research approach with content analysis and source triangulation, the study argues that the contemporary bureaucratic crisis is not merely managerial but constitutes a fundamental epistemic and ontological crisis. Key findings indicate that: bureaucracy, as an institutional social reality, operates through politically constituted mechanisms of legitimation, categorization, and performativity; post normal conditions demand a reorientation from hierarchical technocratic to reflexive-participatory models; and integrating the social ontology of bureaucracy with PNS produces a new analytical framework emphasizing epistemic reflexivity, extended knowledge communities, and adaptive governance. The novelty of this research lies in developing the concept of Reflexive Participatory Bureaucracy as a new theoretical proposition within public administration discourse.

Keywords: Bureaucracy ontology; post normal science; public services; social construction; reflexive bureaucracy

Abstrak

Birokrasi Weberian yang bertumpu pada otoritas rasional-legal menghadapi krisis adaptasi mendasar dalam konteks pelayanan publik yang semakin ditandai oleh ketidakpastian epistemik, konflik nilai, dan kompleksitas sistemik. Kajian ontologi birokrasi dan pendekatan Post Normal Science (PNS) selama ini berkembang secara terpisah dalam literatur administrasi publik global, sementara integrasinya sebagai kerangka konseptual terpadu dalam konteks pelayanan publik belum dikaji secara memadai itulah gap riset yang menjadi landasan penelitian ini. Melalui pendekatan studi kepustakaan dengan analisis konten dan triangulasi sumber, artikel ini mengargumentasikan bahwa krisis birokrasi kontemporer bukan sekadar persoalan manajerial, melainkan merupakan krisis epistemik dan ontologis yang fundamental. Temuan menunjukkan bahwa: birokrasi sebagai realitas sosial institusional beroperasi melalui mekanisme legitimasi, kategorisasi, dan performativitas yang bersifat politis, kondisi post normal menuntut reorientasi birokrasi dari model hirarkis-teknokratis menuju model refleksif partisipatif, dan integrasi ontologi sosial birokrasi dengan PNS menghasilkan suatu kerangka analitik baru yang menekankan reflektivitas epistemik, perluasan komunitas penilai, dan tata kelola adaptif. Novelty penelitian ini terletak pada pengembangan konsep Birokrasi Refleksif Partisipatif (Reflexive Participatory Bureaucracy) sebagai proposisi teoritis baru dalam diskursus administrasi publik

Kata kunci: ontologi birokrasi; post normal science; pelayanan publik; konstruksi sosial; birokrasi refleksif

Introduction

Public service is one of the most critical aspects of governance, encompassing the interaction between the state and society. One of the primary challenges in delivering public services is how bureaucracy, as a social institution, can adapt to increasingly complex and uncertain conditions. In this context, the ontology of bureaucracy becomes highly relevant, as ontology examines the nature and existence of phenomena, including bureaucracy itself. Bureaucracy is often perceived as an efficient and rational system; however, in social reality, it is frequently shaped by social and political constructions that influence the manner in which public services are delivered (Epstein, 2024; Tikson, 2017).

The bureaucratic model popularized by Max Weber, although still relevant in many contexts, faces significant challenges in addressing the uncertainty and complexity arising from rapid social, economic, and technological change. In environments marked by profound uncertainty, the traditional hierarchical and technocratic model of bureaucracy is often ineffective. Consequently, the emergence of Post-Normal Science (PNS) as a new approach offers a more adaptive perspective on uncertainty, value conflict, and complexity in bureaucratic management. PNS emphasizes the need for a more inclusive, participatory, and reflective approach to decision-making, particularly within public service contexts that involve multiple actors and diverse interests (Funtowicz & Ravetz, 1993; Healy, 2011).

Through the PNS lens, bureaucracy is not merely viewed as an efficient administrative machine, but as an entity that must be capable of responding to continuously evolving social dynamics. It is therefore essential to understand how the ontology of bureaucracy can be applied within the Post-Normal Science framework to provide solutions to the growing complexity of public service challenges. This study examines in depth how the relationship between bureaucracy ontology and PNS can offer new perspectives in managing a bureaucracy that is responsive, adaptive, and oriented toward public values (Yang, 2021; Bond et al., 2015).

Methods

This study employs a qualitative approach through library research to analyze the ontology of bureaucracy in public service delivery based on Post-Normal Science (PNS). Data were collected through a systematic review of relevant literature, including books, journal articles, and scientific documents related to bureaucracy ontology, Weberian theory, and PNS. Sources were selected based on their relevance and analytical depth in supporting the understanding of the key concepts addressed in this study (Tikson, 2017; Funtowicz & Ravetz, 1993). This approach aims to examine related theories and construct a conceptual framework addressing the challenges of bureaucracy in the context of uncertainty and complexity (Yang, 2021).

Data analysis was conducted using content analysis to identify major themes within the existing literature, including how bureaucracy is formed, functions, and adapts across different contexts. Data validation was performed through source triangulation, comparing multiple references to ensure the accuracy and consistency of the research findings (Epstein, 2024; Greaves et al., 2025). Furthermore, to minimize bias, the literature screening process was conducted

rigorously to select credible and relevant sources, thereby providing a solid foundation for the study's conclusions (Labolo, 2013).

Results and Discussion

Bureaucracy Ontology: Reality, Existence, and Social Construction

Ontology is a branch of philosophy that examines existence, or what truly exists. It investigates what exists and the nature of that existence. In metaphysical inquiry, there is what is referred to as metaphysical realism the view that the world possesses structure and properties, even if humans may understand them in different ways. Thus, reality is not entirely dependent on how humans perceive or interpret it (Bricker, 2014). However, ontological questions become more complex when they move beyond natural objects such as rocks, trees, or rivers to social phenomena, such as bureaucracy, institutions, offices, or law. The ensuing question is whether such social entities truly exist in the same way as physical objects, or whether their existence depends on agreement, rules, or recognition.

Studies in public administration focus on the relationship between human beings and reality. This raises ontological questions about human existence within the organizational world. Individuals define and interpret situations based on their experiences, drawing on the knowledge they possess. Yet those experiences and that knowledge may themselves be products of social construction (Tikson, 2017). In this context, social ontology serves as an approach for examining the nature of existence in social life entities formed through human interaction, norms, and shared recognition. This approach demonstrates that various social elements, such as politics, law, and gender, are not merely abstract ideas but possess genuine social reality, as they are collectively constructed, legitimized, and enacted (Epstein, 2024). Within the context of bureaucracy, social ontology helps illuminate how social structures, norms, and institutions are formed, function, and interact within bureaucratic organizations. Consequently, the ontology of bureaucracy does not focus on the physical existence of office buildings, but rather on the existence of bureaucracy as a social institution and the form of reality it possesses.

From a Weberian perspective, bureaucracy must be understood within specific cultural, normative, and historical contexts (Lammers, 1979). In his seminal work *The Theory of Social and Economic Organization*, Weber identified three pure types of legitimate authority: those grounded in rationality, tradition, and charisma now commonly referred to as rational-legal authority, traditional authority, and charismatic authority. These types are associated with the transition from traditional to modern societies in Europe and align with the broader process of societal rationalization (Tikson, 2017). Accordingly, bureaucracy may be understood as a large-scale modern organization that is effective and efficient, founded upon formal legal authority.

The ontological study of bureaucracy bridges the gap between objective structures and subjective experience, offering a deeper understanding of its existence and role in governance. This approach encourages critical reflection on how bureaucratic systems are constructed, understood, and adapted across different contexts. Although bureaucracy appears objective, this does not mean that it emerges naturally. Within ontological inquiry, bureaucracy is better understood

as an institutional social reality socially constructed and sustained by positions, authority, norms, and practices.

Weber's most celebrated research reflects an interpretive tradition focused on subjective understanding a method for attaining a valid interpretation of the subjective meaning of social action. Interaction may provide insight into the motives or meanings of an actor, yet this alone is insufficient to grasp the subjective meaning behind others' actions. What is required is empathy the capacity to place oneself within another's frame of reference, to view the situation from their perspective. This process corresponds to the concept of role-taking in symbolic interactionism. The concept of rationality becomes central to the objective analysis of subjective meaning, forming the basis for comparing different types of social action. The objective approach concerns itself only with observable phenomena, such as physical or overt behavior, while the subjective approach seeks to attend to phenomena that cannot be directly observed, such as the thoughts, feelings, and motives of individuals (Tikson, 2017).

In this context, the question arises: is reality objective or socially constructed? At the level of natural objects, reality is understood as relatively independent of human perception. However, at the level of social institutions such as bureaucracy, reality is constituted through law, administrative practice, and relations of power. Social ontology reveals that the social order appears natural, even though it has emerged from historical and institutional processes subsequently accepted as given. Bureaucracy may thus appear neutral and natural, even though its form and authority are constructed through social and political processes (Epstein, 2024).

The political dimension of bureaucracy ontology arises from the fact that bureaucracy is not merely an administrative mechanism but a political entity that actively shapes social reality through categorization, the legitimation of authority, and its performative processes. These dimensions highlight its ontological role in constructing and sustaining societal structures, which often privilege certain groups while marginalizing others. Bureaucracy operates on the basis of rational-legal authority, which legitimizes its decisions and actions through formal rules, hierarchical structures, and standard procedures none of which are neutral, as they inherently prioritize certain values and actors over others (Appiah, 2018).

Beyond its social and political dimensions, bureaucracy has also been analyzed through a gender perspective. Gender is understood not merely as a biological matter, but as a social and cultural construction shaped through relations of power. Bureaucracy intersects with gender dynamics, as evidenced by research linking bureaucratic behavior to gender-based representation (Safronov, 2010). Representative bureaucracy theory, as explored by Bishu, examines how the demographic characteristics of bureaucrats — often focusing on race and gender — influence their actions (Bishu, 2019). This suggests that bureaucratic systems are not neutral but reflect broader social constructions, including those of gender.

Ontologically, bureaucracy is not merely a formal administrative apparatus but an emergent social entity composed of authority structures, rules, classification practices, and knowledge regimes that collectively produce administrative reality. As such, bureaucracy not only governs action but also determines what is recognized as fact, problem, and solution within the public domain. Bureaucracy

may be viewed simultaneously as an objective structure and as a construction shaped by social, political, and gendered forces. Although it operates on the basis of rational principles, its implementation and evolution are shaped by cultural, political, and social contexts (Labolo, 2013).

Bureaucratic reality is not entirely objective. It is the product of a complex interplay between social, political, and gender constructions. Bureaucracy reflects social and cultural norms, is shaped by political dynamics, and frequently reinforces or challenges gender inequalities. As part of social reality, bureaucracy is ontologically subjective internalized by individuals and epistemically objective shaping social structures. This duality underscores its constructed and institutional nature, as opposed to being a naturally occurring entity (Glavå, 2025).

Bureaucracy in Public Service Delivery Based on Post-Normal Science

The Weberian bureaucratic model remains effective in ensuring stability, consistency, predictability, impersonality, and procedural compliance. However, it becomes ineffective when the environment shifts from simple to complex, from certain to ambiguous, and from technically driven to value-laden (Yang, 2021). The limitations of the normal bureaucratic model can be elucidated through the framework of post-normal science (PNS).

From a post-normal science perspective, bureaucracy operates in contexts where facts are not fully certain, values are contested, decision stakes are high, and action must be taken urgently (Healy, 2011). As a result, a purely hierarchical and technocratic bureaucratic model becomes inadequate. Bureaucracy must be reconfigured as a reflexive, adaptive institution that is open to a plurality of knowledge and to the participation of actors beyond the formal expert community.

Bureaucracy can be categorized as a post-normal science domain, as conceptualized by Funtowicz and Ravetz (1993), due to its complex and value-laden character, shaped by diverse norms and traditions, and thus amenable to analysis through multiple epistemological and ontological lenses. According to Funtowicz and Ravetz, Kuhnian normal science fails to acknowledge complex reality reality that is saturated with uncertainty and value. However, the post-normal science model does not itself offer a clearly defined research methodology (Tikson, 2017).

Funtowicz and Ravetz distinguish among applied science, professional consultancy, and post-normal science based on the degree of systems uncertainty and the stakes involved in decision-making. As both dimensions increase, traditional methodologies become ineffective (Funtowicz & Ravetz, 1993). In the context of public service bureaucracy, approaches that rely solely on technical expertise, procedural standardization, and hierarchical command are no longer sufficient when service-related issues involve incomplete data, significant social impacts, and publicly contested values.

Bureaucracy in public service delivery, when informed by post-normal science, prioritizes sensitivity to uncertainty by: acknowledging complexity and avoiding rigid certainty assumptions (Funtowicz, 2023); adopting adaptive and participatory approaches to decision making (Kovacic, 2024); and fostering collaboration and inclusivity to democratize service delivery and enhance responsiveness (Greaves et al., 2025). This approach aligns with the principles of

PNS and ensures that public services are better equipped to meet the challenges of uncertainty and complexity.

Bureaucracy operates in environments characterized by uncertainty, complexity, and ambiguity conditions that demand adaptive and responsive bureaucratic approaches. Yet traditional bureaucracy tends to emphasize control and procedural certainty, which limits its capacity to promote responsiveness and innovation in unpredictable situations. Accordingly, the effectiveness of bureaucracy in public service delivery cannot rest solely on formal rule compliance; it must also be supported by professional judgment and readiness to navigate uncertainty.

Post normal science critiques the reliance on erroneous normal assumptions in policy formulation specifically, the presumption that science can always provide definitive answers to complex public problems (Funtowicz, 2023). In reality, many policy challenges are characterized by factual uncertainty, divergent values, and the limitations of scientific knowledge. PNS therefore stresses the importance of acknowledging these limitations and building resilience and adaptability into decision-making processes. In this context, bureaucracy should not create a false sense of certainty in public service delivery. Instead, it must develop more open and flexible mechanisms for example, by adopting more participatory, adaptive, and reflective practices through stakeholder engagement, adaptive governance, and policy evaluation (Bond et al., 2015).

Consistent with this view, the OECD affirms that the transformation of public services in addressing complex problems requires a holistic, forward-looking approach centered on public value and involving citizens systematically in decision-making (OECD, 2019). Baty and Mastracci demonstrate that in public administration, a critical element under post-normal conditions is time. This means that bureaucracy frequently operates not in normal situations that permit comprehensive planning, but in conditions that are ambiguous, value-conflicted, and urgently pressing (Baty, 2023). Under such conditions, bureaucracy cannot rely solely on standard operating procedures, chains of command, and technical neutrality; it must instead be capable of integrating rapid judgment, the use of limited knowledge, and engagement with broader knowledge communities.

This is reinforced by Blackstock et al.'s research on the application of Post Normal Science (PNS) to policy actors. They demonstrate that PNS methods demand explicit attention to problem framing, reflexivity, and a more relational mode of science-policy interaction. Accordingly, bureaucracy in post-normal situations cannot function merely as a rule enforcer; it must become an arena for problem framing, negotiation, and mediation between science, politics, and society (Blackstock et al., 2023).

Blackstock et al. further add a dimension particularly relevant to public services: the critical importance of problem framing. In their analysis, PNS requires a process of problem finding before problem solving. They argue that in complex issues, hasty technical solutions may exacerbate systemic problems if the framing of the problem is flawed from the outset. Bureaucracy in post-normal public service contexts must therefore not simply move from instruments to solutions but must

first open deliberative spaces to understand how problems are defined, by whom, and with what consequences.

Post Normal Science redefines the characteristics of bureaucracy in public service delivery by foregrounding the importance of complexity, uncertainty, and stakeholder engagement. It offers a participatory governance model that enhances accountability and transparency while promoting adaptability and responsiveness. By integrating diverse perspectives and forms of knowledge, PNS not only addresses the limitations of traditional bureaucratic structures but also introduces a more inclusive and effective approach to public services. This shift is critical for navigating the complexities of governance and ensuring that public services continue to meet the evolving needs of society.

The Relationship Between Bureaucracy Ontology and Post Normal Science in Managing a Responsive, Adaptive, and Public Value-Oriented Bureaucracy

Bureaucracy ontology and Post Normal Science (PNS) offer two distinct yet mutually complementary approaches to understanding and managing bureaucracy, particularly within complex and uncertain public service contexts. Bureaucracy ontology examines the nature and existence of bureaucracy as a social entity shaped by norms, authority, and social relations within society. PNS, meanwhile, offers an approach emphasizing adaptivity, inclusivity, and participation in decision-making under conditions of uncertainty and value conflict.

Bureaucracy Ontology: Understanding Bureaucracy as Social Construction

Bureaucracy ontology is grounded in the understanding that bureaucracy is not merely a physical entity or administrative structure built upon formal procedures, but also a social construction produced through interactions among individuals and groups within society. This encompasses how social, political, and cultural norms shape bureaucracy into hierarchical structures and standardized procedures that appear rational yet are frequently constrained by inflexible practices.

For example, bureaucracy premised on rational-legal authority, as proposed by Max Weber, may be highly effective in clear and structured situations. However, when confronted with complex and uncertain problems, such structures often fail to respond to societal needs in a timely and appropriate manner. Bureaucracy ontology provides the perspective that bureaucracy functions not only as an administrative machine but as a social entity influenced by external factors including culture, politics, and evolving social values (Epstein, 2024).

Post Normal Science: Confronting Uncertainty in Public Services

Post-Normal Science (PNS), on the other hand, offers a more dynamic framework for managing uncertainty and complexity within bureaucratic systems. Introduced by Funtowicz and Ravetz (1993), PNS suggests that bureaucracy should not rely solely on rigid technocratic procedures but should instead integrate diverse knowledge perspectives and community engagement to develop more responsive and adaptive policies. PNS emphasizes the importance of public participation and multidisciplinary collaboration in addressing problems that are complex in value and open to interpretation.

PNS also highlights the need for more inclusive decision-making one that involves not only technical experts but also other stakeholders who possess practical experience and knowledge relevant to the issues at hand. This approach creates space for bureaucracy to be more open to uncertainty, to avoid erroneous certainty assumptions, and to introduce continuous evaluation of implemented policies (Funtowicz & Ravetz, 1993).

Integrating Bureaucracy Ontology and PNS in Bureaucratic Management

The integration of bureaucracy ontology and PNS can offer new perspectives for managing a bureaucracy that is more responsive, adaptive, and oriented toward public values. First, bureaucracy ontology reveals that bureaucracy is not a fixed entity detached from social, political, and cultural change. Consequently, bureaucracy must be capable of adapting to the evolving needs of society rather than focusing solely on rigid procedures and hierarchies.

PNS provides the tools for managing uncertainty and accommodating complexity in public services. It enables bureaucracy to respond to change quickly and flexibly by prioritizing the involvement of all parties engaged with public issues. By integrating both approaches, bureaucracy can become more open to change, more attuned to societal needs, and more responsive in confronting unpredictable challenges.

For example, in disaster management situations, the application of PNS within bureaucracy enables collaboration among government, communities, and experts to design solutions that do not rely exclusively on standard procedures but also adapt to local contexts and field dynamics. Community participation and local knowledge become key to developing policies that are more relevant and effective in addressing the challenges encountered (Yang, 2021; Bond et al., 2015).

Contribution to Public Values

Integrating bureaucracy ontology and PNS in public services also makes a significant contribution to enhancing accountability, transparency, and equity in bureaucratic management. PNS encourages bureaucracy to give greater attention to public values in every decision made, prioritizing public participation and professional judgment over sole reliance on traditional bureaucratic norms. In the long run, this approach can foster a bureaucracy more genuinely oriented toward serving society rather than being constrained by norms that impede progress.

Conclusion

This study concludes that the contemporary bureaucratic crisis in public service delivery is not merely a managerial problem but constitutes a fundamental epistemic and ontological crisis. Bureaucracy, as an institutional social reality, operates through mechanisms of legitimation, categorization, and performativity that are political, cultural, and gendered in nature, rendering the Weberian hierarchical-technocratic model structurally inadequate in post-normal conditions characterized by epistemic uncertainty, value conflict, and systemic complexity. The integration of the social ontology of bureaucracy with the Post-Normal Science (PNS) framework produces a new theoretical proposition the Reflexive-

Participatory Bureaucracy emphasizing epistemic reflexivity, the expansion of extended peer communities, and adaptive governance as a conceptual alternative for building a bureaucracy that is responsive, inclusive, and oriented toward public values.

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