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A complexity theory perspective on politico-administrative systems: Insights from a systematic literature review

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ABSTRACT

Complexity theory (CT) refers to a collection of concepts and heuristics that can be used to study the developments emerging from interactions between phenomena, actors, and events. CT has increasingly been utilized in the study of public administration and policy. However, there is no comprehensive analysis of empirical or other research focused on the functioning of political-administrative phenomena applying CT. This article reports the results of a systematic literature review demonstrating how CT has been applied in empirical research in different stages of the policy cycle: policy preparation, implementation, evaluation, and maintenance. The study reveals empirical research utilizing CT offers practical implications that can be categorized into four themes: enabling leadership, leveraging experimentation, the holistic perspective, and the humble approach.

Introduction

Complexity theory (CT) has emerged over the last few decades as a promising theoretical approach to studying structural, organizational, and institutional factors in politico-administrative systems. The generalization of complexity research to politico-administrative issues is often linked to the works of David Byrne (*Complexity and Social Sciences*, 1998) and Paul Cilliers (*Complexity and Postmodernism*, 1998). Both of these works share the basic premise of CT, which suggests that a phenomenon should be considered complex when it encompasses many interconnected elements and where the interactions between those elements produce *emergent* structures that cannot be understood based solely on what is known of their individual parts. Research a decade later applied CT to the study of public management, and public administration systems (e.g., Geyer and Rihani 2010; Rhodes et al. 2011; Teisman et al. 2009). Despite their differences, these works share an intention to utilize CT to explore increasingly wicked policy issues and to understand the dynamics of the policy processes through which such issues are made tractable and produce change. The work cited above particularly associates complexity with the difficulty of interpreting the whole that emerges from interaction and with the unpredictability of development. Research acknowledging Urry (2005) might refer to a *complexity turn*, as dozens of studies applying CT either conceptually or empirically have been published in top academic journals in the twenty-first century. The establishment of journals in 2014, such as the *Journal on Policy* and *Complex Systems and Complexity, Governance and Networks*, as well as special issues on complexity in existing scientific journals like *Public Management Review*, underscore how complexity theory became mainstream, a trend further bolstered by a broad range of public policy and management scholars who presented theories unveiling the governance of complex systems (e.g., Cairney and Weible 2017; Gerrits and Marks 2015; McGee and Jones 2019; Rhodes and Dowling 2018; Tenbensel 2018).

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In this article, public administration and public policy are viewed as interconnected arenas of action. Echoing the perspectives of Waldo (1987) and Wildavsky (1988), the relationship between administration and policy is perceived as complementary rather than dichotomous. This interpretation aligns with that of Verschuere (2009:23), who challenges the prevalent practitioner doctrine of the policy/operations divide that suggests politicians are solely responsible for policy formulation and administrative bodies handle execution. Rather than existing as separate realms, administration, and policy are inextricably linked and dynamically impact each other. The notion of interconnectedness is supported by research showing that bureaucrats are not just implementers of political decisions but active agents applying discretion (Hill and Hupe 2022). For example, civil servants are reported to pursue their own objectives, wield significant political influence, exhibit less compliance than Max Weber originally outlined, and sometimes engage in counterproductive behaviors while working on the front lines of the public sector (Peters 2002).

The term *politico-administrative* refers here to an ensemble comprising the framing of societal problems, the communication of policy ideas, the search for solutions, and their implementation and evaluation. A *politico-administrative system* embodies the relationship between elected officials, who provide political direction and decision-making, and the civil service, which carries out administrative tasks and enforces these decisions. The dynamics of this system are influenced by institutional arrangements, cultural norms, legal frameworks, and historical contexts, ensuring that governance is both responsive to the electorate and efficiently operationalized (e.g., Johanson et al. 2023; Wessels 1998). In the language of complexity, public administration and policy are entangled in a way that transcends the actions or characteristics of individual actors, a notion that underscores the growing insufficiency of studying just one policy subsystem in isolation (McGee and Jones 2019). This complexity framework not only enriches our understanding of public administration but also facilitates a multifaceted approach, whether closely scrutinizing the perceptions of individual actors or observing broader systems and their environments (Cairney and Geyer 2017). Prior research offers various criteria to categorize a system as complex, each with distinct implications for analysis and intervention. This article draws on the previous research which deems a system to be complex if the following conditions are present: its multitude of interconnected parts; the difficulty in tracing cause-and-effect relationships over time, leading to unforeseen outcomes; the inherently unpredictable emergent behavior that arises, even when the behaviors of its subsystems are understood; and its ability to execute a unique function that could not be achieved by its individual components alone (e.g., Eppel 2012; Marks and Gerrits 2013; Meek and Marshall 2018; Teisman and Klijn 2008).

The focus of CT on interdependence and the unpredictability of development provides a useful approach for studying phenomena related to public administration and policy. This perspective aligns with the contemporary understanding that theories are products of their time and space, reflecting a circular relationship between science and society characterized by dense feedback loops where societal influences shape the nature of scientific inquiry (Chettiparamb 2019:431). The rise of CT seems to have been significantly influenced by prevailing sociopolitical pressures. However, a significant portion of the research focusing on politico-administrative phenomena *via* CT has been conceptual-theoretical and involves the metaphorical use of concepts associated with complexity (Castelnovo and Sorrentino 2018; Klijn 2008). For example, the perspective of complexity leadership (Uhl-Bien et al. 2007) has rarely been applied in the study of politico-administrative phenomena (exceptions include Murphy et al. 2017; Paananen et al. 2022). The reasons vary, but Haynes (2015) and Walton (2016) suggest that the dominant role of new public management has slowed the proliferation of empirical research applying CT. It has also been argued that the recommendations derived from CT remain too abstract and are, therefore, meaningless or banal for public managers (Cairney 2012:354).

Despite growing interest, there is no comprehensive analysis of empirical research applying CT to the functioning of political-administrative systems. The absence of a comprehensive analysis makes it difficult to ascertain the state of the art in CT and to establish what we know and what we must still investigate (Cairney and Geyer 2017). This systematic literature review

aims to fill that research gap by addressing a two-part research question: *i) What concepts associated with complexity theory have been utilized in describing politico-administrative systems, and in what ways have these concepts been applied,* and *ii) What practical implications derived from complexity theory are presented in studies?*

This article presents two primary contributions to the existing literature. First, it critically examines the extent and manner in which specific complexity concepts have been used to elucidate the dynamic behaviors observed in political-administrative systems. Second, it addresses an evident disconnect, bridging the gap between abstract CTs and the tangible challenges faced by practitioners. Accumulating empirical knowledge necessitates moving beyond the vague adage that the whole is more than the sum of its parts and contextualizing key complexity concepts in a manner that permits meaningful comparison with other studies.

A complexity-informed way of seeing

Political-administrative systems can be characterized as complex systems for five specific reasons. First, the functioning of complex systems cannot be explained by breaking them down into parts, as the interaction between parts produces emergent development containing elements not found in its constituent parts. For instance, local self-organization in a political-administrative system is described not as a process happening without guidance but one that occurs despite it (Cairney 2020:106). As a result of self-organization, the solutions generated are often different than expected (Marks and Gerrits 2013). Second, the developmental path of a complex system can be characterized as a combination of path dependency and unpredictability. Dynamics have been examined, for example, in terms of punctuated equilibrium theory, which addresses the stability of social institutions and their sudden changes (Baumgartner et al. 2018). Punctuated equilibrium has also been described using the concept of attractors (e.g., Bovaird 2008, Geyer and Rihani 2010). Attractors function as rules and logics that impose some degree of order and replicability within a dynamic system (Byrne 1998).

Third, actors in complex systems are in co-evolutionary relationships with their environments. For example, Teisman and Klijn (2008) have described how actors in politics and administration are simultaneously adaptive to their environments and autonomous agents shaping those environments. Due to this entanglement, even powerful individual actors have limited operational options (Bovaird 2008:339). Fourth, complex systems are open, and their boundaries are socially constructed. Policies are implemented in multi-level and multi-disciplinary networks, characterized by alternating permanence and change (Morçöl and Wachhaus 2009). The result is ongoing negotiations over which actors belong to the inner circle (inside) and which are relegated to the periphery (outside) (Eppel 2017). Fifth, complex systems operate in environments that can be described as messy. New phenomena arise, and existing phenomena take new forms in the arenas of politics, economics, technology, and culture and the interfaces between them. It is common for these phenomena to challenge existing knowledge while also producing conflicting interpretations. Sanderson (2009) criticized the assumed benefit of reducing complex issues into manageable questions in evidence-based policymaking. Over-reliance on evidence-based approaches can neglect the multifaceted and dynamic nature of real-world problems, potentially oversimplifying issues that require a fine-grained understanding.

Richardson (2008) points out that CT is not monolithic but comprises multiple schools of thought. The neo-reductionist school focuses on uncovering fundamental laws through mathematical models and simulations, adhering to positivism, which regards scientific knowledge as the only true knowledge derived from empirical observation and logical reasoning. The metaphorical school, conversely, employs complexity concepts as metaphors to enhance understanding and dialogue, rooted in social constructionism, which sees knowledge as a social and cultural construct. The critical pluralistic school bridges these views, recognizing complexity's intrinsic link to life and knowledge, advocating for diverse perspectives and methodologies to facilitate

a comprehensive understanding of complex systems. It is tied to a realistic philosophy of science, acknowledging that while objective reality may exist, our comprehension is inevitably influenced by human limitations.

Research design

Methodological literature recognizes various approaches to conducting an exploratory literature review, but a common feature is that the data are collected and analyzed systematically. Although the authors of the review are ultimately responsible for the interpretation, it is also important for the reader to understand what actions were taken and why at different stages of the process. The present literature review applies the PRISMA framework (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*, see Moher et al. 2009). The PRISMA framework has been used for data search, selection, evaluation, and the presentation of results. This process is illustrated in Figure 1.

The exploratory literature review was carried out in four stages. The first stage was a preliminary study to explore how complexity has been addressed in previous research. This stage was executed by conducting searches in key journals related to public administration and policy studies (e.g., *Public Administration Review, Public Management Review, American Review of Public Administration and Journal of European Public Policy,)*. The outcome of this stage was a general overview of the extent to which complexity is discussed in research on politics and administration.

The preliminary study laid the foundation for the second stage of the literature review, where the target material was restricted to the following databases: *Web of Science, Scopus, ScienceDirect, ABI Inform Complete* (ProQuest), and *Academic Search Elite* (EBSCO). Database searches were performed using a two-part query to deliver a methodologically meaningful sample. The first part targeted complexity perspectives, and the second targeted the public administration and policy context. The following search query was formed using Boolean operator logic: Abstract=(complexity theor* OR complexity thinking OR complexity science* OR complex system*) AND (public administr* OR public manag* OR public organi* OR public leader* OR public polic* OR public govern* OR politic*). The search was supplemented by identifying studies applying CT from leading journals in public administration and policy research. A search conducted in early 2023 identified 1,717 peer-reviewed research articles.

The third stage began with the prescreening of articles based on their titles and publication venues. That stage reduced the sample to 321 articles, and their abstracts were read. A particular focus was on whether complexity theory (or complexity thinking/science) was a central

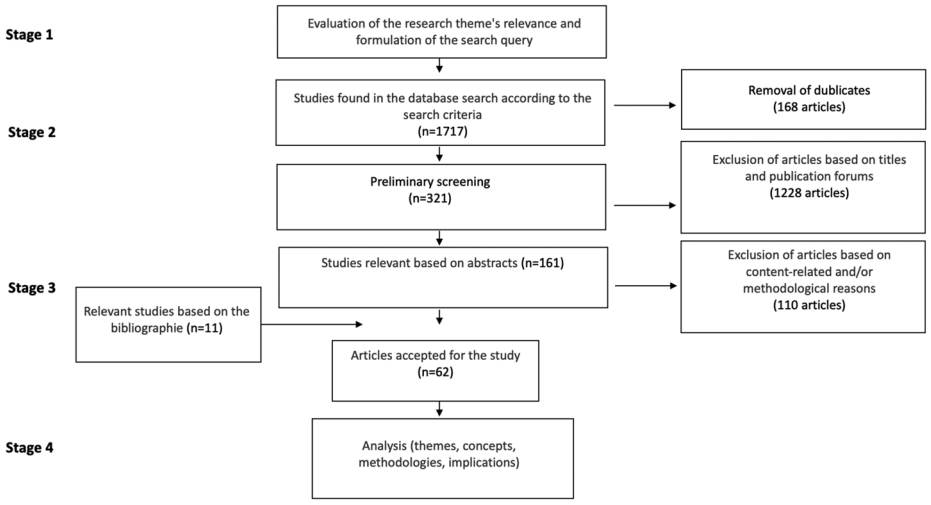

Figure 1. The process of data collection, selection, and analysis.

theoretical framework in the empirical research on public administration and policy. The purpose of the stage was to exclude articles where complexity was just one term among others, so studies that merely employed the term *complexity* to describe administrative or policy processes and environments were discarded. After the third stage, the material consisted of 51 articles. Studies referenced in 11 articles that did not meet the original search criteria were also included to prevent exclusion criteria from being too strict. After a supplementary search in early 2023, the sample size became 62 articles.

All articles were read multiple times in the fourth stage, and notes were taken. With reference to the research question, the content analysis focused on applying CT to various public administration and policy themes, the use of complexity concepts, methodological choices, and practical implications derived from CT. The analytical methodology adopted was multifaceted, encompassing both theory-led (deductive) and data-originated (inductive) methods (Mayring 2014). Within the realm of deductive analysis, the study made strategic use of the policy cycle framework, a conceptual tool that bifurcates policy actions into distinct, sequential phases (preparation, implementation, evaluation, and maintenance). This framework typically adopts a quartet classification system: policy preparation, implementation, evaluation, and maintenance (e.g., Cairney 2020).

Each study in the dataset was coded in the NVivo program according to its primary cycle phase. The inductive analysis began by simplifying the results and conclusions in the dataset for meaningful treatment from the perspective of the second research question. Following this, common features were identified from the simplified data, leading to the clustering of the material into thematic categories. In the final step of the content analysis, the clustered material was abstracted, resulting in the following themes: *enabling leadership*, *leveraging experiments*, *holistic perspective*, and *humble approach*. A research assistant helped with data collection and preliminary classification, but the classification and analysis are the responsibility of the author of this article.

Findings

Descriptive analysis of the studies

The 62 studies selected for the literature review were published in a total of 41 different scientific journals (articles included in the review are marked with an asterisk * in the references). Table 1 compiles the Academic Journal Guide (AJG) classifications of scientific journals, countries, years of publication, and research approaches and datasets. The descriptive analysis of the dataset shows that almost half the studies were published in scientific journals ranked as leading (3) or highest (4) according to the AJG classification. It is noteworthy, however, that a significant portion of the studies selected for analysis were published in scientific journals not ranked by the AJG. That could be because research employing CT does not fare well in the peer-review process of top-tier journals, or perhaps there has not yet been a sufficiently strong academic discourse around research applying CT. There has been a clear growth trend in publication volume in the last decade. Most studies applied qualitative methods, and accordingly, interviews and documentary evidence comprise the bulk of their dataset. Geographically, complexity has been studied most extensively in English-speaking countries, particularly in the United States and the United Kingdom. The overwhelming majority of the studies have been conducted in countries classified as democracies.

Table 2 compiles the policy themes discussed in the studies and places the studies within three different complexity schools (as defined by Richardson 2008). The most frequent policy themes pertain to health and social care, security, and crisis management, which is understandable given many health and social care phenomena are inherently complex; however, security and crisis management naturally encompass unpredictability and interdependencies among events. Among the schools Richardson (2008) identified, the metaphorical school is the most represented in the studies.

Table 1. Summary of AJG Classifications, countries, publication years, research approaches, and datasets.

AJG	Number	Country	Number	Research approach	Number
4	19	United States	12	Qualitative	59
3	6	United Kingdom	12	Quantitative	3
2	6	Australia	9		
1	5	The Netherlands	7	**Data sets**	**Number**
N/A	26	New Zealand	7	Interviews	42
		European Union	2	Documents	42
Year	**Number**	Italy	2	Observations	10
2007	4	India	2	Survey	9
2008	6	Ireland	2	Focus group	5
2009	1	South Korea	1	Registry data	4
2010	1	South Africa	1		
2011	2	Switzerland	1		
2012	2	Sweden	1		
2013	2	Germany	1		
2014	1	China	1		
2015	4	Canada	1		
2016	6	Estonia	1		
2017	1	Israel	1		
2018	6	Mali	1		
2019	5	Congo	1		
2020	6	Angola	1		
2021	6	Namibia	1		
2022	7	Pakistan	1		
2023	2	Ghana	1		
		Solomon Islands	1		

Table 2. Summary of policy themes and complexity schools.

Policy themes	Number	Complexity school	Number
Health and social care	16	Metaphorical	58
Crisis management and security	14	Critical pluralistic	3
Good governance	9	Neo-reductionist	1
Education	8		
Environment, climate, energy	8		
Housing	6		
Urban planning	5		
Business and industry	3		
Digitalization	2		

Byrne (1998) posits that CT fundamentally entails an ontological shift, which subsequently has epistemological and methodological ramifications. However, examining the selected literature reveals difficulty in pinpointing this purported shift. A significant portion of the studies address complexity using traditional methods such as interviews, surveys, and document analyses. This observation aligns with the insights of Pollitt and van Buuren (2009), who contended that CT is not firmly anchored in a clearly defined ontological or epistemological position and contributes little to the development of suitable methodologies. From the perspective of Richardson's (2008) identified schools, the dataset paints a picture where the challenge for CT appears to be the use of concepts to describe real-world phenomena rather than explain them.

What concepts associated with complexity theory have been utilized in describing politico-administrative systems, and in what ways have these concepts been applied

Although emergence and self-organization have been considered anchor concepts of complexity theory (Chiles et al. 2004), a wide range of other concepts have also been associated with CT. Table 3 presents how complexity concepts were manifested in the studies.

The concept of *emergence* refers to the holistic properties of a system that cannot be understood simply by analyzing or reducing the system to its constituent parts. In other words, the emergent

Table 3. Complexity concepts identified and their frequencies of occurrence.

Complexity concepts	Number	% of studies
Emergence	59	96,7
Self-organization	45	72,6
Non-linearity	34	54,8
Feedback	26	41,9
Co-evolution	26	41.9
Interdependency	22	35,5
Dissipative structures	13	21,0
Path-dependency	11	17,7
Diversity	7	11,3
Attractor	7	11,3

phenomena exist above and beyond the sum of individual elements. (Kauffman 1995.) *Self-organization* involves a transition from a state where system components are initially separate to a state where these components become integrated in some form (Ashby 1962). In social systems, self-organization manifests as the continuous adaptation of system components to one another through information exchange and action, as opposed to being guided by a centralized authority (Cilliers 1998). *Non-linearity* refers to the unpredictable relationships among system components, where the overall behavior cannot be easily predicted based on constant interrelations (Kiel 1989). Non-linearity involves feedback mechanisms that can generate a nonlinear and cumulative chain of events, leading to unexpected and disproportionate changes in the system's behavior (Holland 1995).

Feedback loops can be described as reflexive patterns of influence that arise from interactions between various components of the system and its external environment (Eppel 2012). Negative feedback is characterized by its ability to induce system stability and incremental changes, whereas positive feedback is associated with driving momentum, triggering bandwagon effects, and surpassing thresholds to initiate cascades (Baumgartner and Jones 1993). *Co-evolution* involves actors who actively engage with their environment, with each shaping the other through interactions and actions (Kauffman 1995). Co-evolution recognizes the external environment as an interactive entity. Adaptations within the system can trigger reciprocal changes in the environment, leading to a mutual cycle of co-evolution and adaptive transformation (Gerrits 2010). *Connectivity* in complex systems involves a multifaceted array of interactions among agents, encompassing various ways and combinations through which these agents can interact (Holland 1995). These agents engage in intertwined, nonlinear, and cyclical dynamics that define the overall behavior and adaptability of the system (Eppel 2017).

Diversity within a self-regulating system is essential for matching the complexity and variety of its external environment, thereby effectively addressing the challenges it encounters (Ashby 1962). The presence of diversity enhances a system's ability to adapt and manage complex challenges, facilitating greater resilience and adaptability (Stacey 1993). *Dissipative structures* refer to new structures formed when systems move from stability to chaos (Prigogine and Stengers 1984). Dissipative structures can result in abrupt and unpredictable shifts in the system's trajectory, which are not proportionally related to the initial stimuli (Kauffman 1995). *Path dependency* articulates how system histories, initial conditions, and feedback loops collectively influence the trajectory of a system, constraining its future evolution (Prigogine and Stengers 1984). Path dependency accounts for the historical context in which both the actors and the system itself have operated, asserting that this history sets the stage for current and future behavior and adaptability (Joosse and Teisman 2021). *An attractor* serves as an underlying order or deep structure in a system, constraining erratic behaviors while not being tied to a fixed point or operating linearly (Murphy 1996). Attractors represent the enduring and unchanging regularities in a system's behavior, ensuring that even in conditions that appear chaotic, there exists a level of inherent predictability (Bovaird 2008).

Following the logic of the policy cycle framework, the application of the above-mentioned complexity concepts was defined in distinct phases of the policy cycle: *policy preparation*,

implementation, *evaluation*, and *maintenance*. The policy cycle permits the examination of actions through interconnected yet distinct phases. Although separating these phases is difficult (Weible 2017:4), the policy cycle nevertheless provides a heuristic tool for examining the application of CT (Bridgman and Davis 2003). Each stage presents unique challenges and dynamics that can benefit from a complexity-informed perspective.

Policy preparation – Policy preparation, which embodies the notion of linear progression, comprises forming an agenda, setting goals, identifying and evaluating alternative solutions, and selecting an alternative. However, gathering convincing empirical evidence in a policy context is often fraught with challenges, including data inconsistencies, biases in research methodologies, and the complex interplay of sociopolitical factors that can obscure objective analysis (Cairney 2020). For instance, Bacchi (2009) cautions against presuming that policy issues must exist and argues that we need "to understand how any dominant way to think of an issue came to be," "Why is the government involved in the first place?" and "How does it describe the nature of the problem?" (Bacchi 2009, ix).

Consequently, instead of implementing a linear planning paradigm, many reviewed studies call for the ability to navigate in changing situations. Those studies pay particular attention to *feedback* processes. In the realm of policy preparation, the integration of feedback processes—both negative and positive—is paramount. Negative feedback serves as a corrective mechanism during the policy preparation phase, ensuring that the politico-administrative system retains its overarching stability. It may lead to refining agenda items, adjusting goals, or reconsidering selected alternatives to maintain equilibrium. Positive feedback reinforces existing trajectories, which can expedite the adoption of specific alternatives (Eppel 2012). Van Buuren and Gerrits (2008) examined negative and positive feedback in a land planning context. They reported that the implementation of innovative policy proposals could be hindered by resistance from entrenched parties with deep-seated interests. This phenomenon can be attributed to *path dependency*, where decisions and outcomes are heavily influenced by historical choices and events (Angst 2020; Curtis et al. 2018; Grossmann and Haas 2016). Path dependency assumes that once a system embarks on a particular trajectory, it becomes increasingly difficult to deviate from that path due to accumulated investments and established practices, often leading to suboptimal or locked-in outcomes. In contrast, the direction of certain policy initiatives can reinforce new proposals, which suggests actors can devise strategies through issue linkage. For example, in environmental policy, linking climate change mitigation to economic growth can reinforce new green initiatives, suggesting that policymakers can strategically connect issues to gain broader support. That involves using other policy processes to make their proposals more attractive and foster positive feedback. At the same time, some actors may resurrect dormant policies to impede the progress of a particular policy proposal.

The dynamic landscape underscores the need for an integrative and holistic strategy (Castelnovo and Sorrentino 2018; Sanial 2014). Such strategies not only encompass various solution models but also actively involve *diverse* stakeholders in the decision-making process (Poku-Boansi 2021). Embracing diversity means decisions reflect a broad spectrum of perspectives, which enhances legitimacy and diversity and also nurtures creativity by bringing together various approaches and ideas (Wagenaar 2007). The infusion of creative thinking, paired with diverse stakeholder involvement, can generate rich and resilient strategies that transcend traditional paradigms and address the complexities of the current landscape. The reviewed studies also question the once-celebrated notion of purely evidence-based decision-making (Geyer 2012; Rijken et al. 2020; Smith and Joyce 2012). There is a groundswell of research opinion that embracing feedback mechanisms facilitating a grassroots, bottom-up perspective should augment, or perhaps even replace, the dominant top-down modus operandi (Day and Hunt 2022). This approach seeks to create a more inclusive and adaptive policymaking process attuned to real-world complexities.

Policy implementation – Implementation of policy action consists of practices for actioning decisions and allocating the necessary resources. The reviewed studies addressed the *self-organization* of actors implementing the policy. For example, Butler and Allen (2008) argued that the ability

of local-level actors to interpret policy programs and connect them to local resources significantly affects national-level policy implementation. In many studies, self-organization is linked to governance—referring to enabling various interactions rather than controlling them (e.g., Naveed and Azhar 2022; Schillemans and van Twist 2016; Woolcott et al. 2021). According to Meek and Marshall (2018) and Trenholm and Ferlie (2013), self-organization is about the resilience of a system operating at the local level, that is, the ability to survive various crises.

Brunswicker et al. (2019) investigated the concept of self-organization within the context of digitalization and argued that digitalization amplifies administrative transparency. Heightened transparency paves the way for self-organization to occur organically without centralized oversight or control. This idea resonates with numerous studies underscoring the significance of mutual dependencies among actors, emphasizing that interactions between those actors notably influence outcomes (Gear et al. 2018; Goldspink 2007). The work of Grossmann and Haas (2016) illustrates the intertwined nature of policy implementation. They argue that the outcome of a policy is intrinsically linked to its process, and that process is deeply embedded in its context, suggesting a symbiotic relationship between the three. Approaching policy implementation through the lens of CT can be advantageous in that it allows for a nuanced linguistic description of unfolding events (Gear et al. 2018), facilitates advanced modeling techniques to better predict outcomes (Fowler et al. 2019; Long et al. 2018), and provides a foundation for implementing experimental approaches to policy testing and refinement (He et al. 2022).

It is worth noting that self-organization also encompasses the idea that thorough planning does not necessarily guarantee success (Kickert 2010). Policy actions can be imprecise and cause unexpected outcomes, which could be either beneficial or detrimental (Haynes 2007). Such unpredictability can be attributed to the spontaneous processes of self-organization at the local level. Instead of faithfully replicating the design and intent of the overarching policy program, local actors, driven by self-organization, might establish structures and roles that deviate from or even contradict the original policy directives (Castelnovo and Sorrentino 2018). Fundamentally, although strategic planning is vital, the intricate nature and adaptability of politico-administrative structures can bring results that contradict initial anticipations. The essence of non-linearity is feedback loops that can trigger a chain of nonlinear and accumulating events and dissipative structures, resulting in unforeseen and outsized shifts in the system's operations (Kreienkamp and Pegram 2021; Long et al. 2018; Pickering 2019). Consequently, the actors framing and executing policies must be attuned to those dynamics and ready to modify their approaches based on the emergent and often unpredictable paths.

In complex systems, the presence of *attractors* can guide and shape the patterns of self-organization, offering some predictability within inherently chaotic structures (Haynes 2008; Paananen et al. 2022; Roussy et al. 2020). In other words, dissipation in systems is not merely finite but is guided by attractors. That ensures that while changes might appear abrupt and disproportionate to the initial stimuli, there is an underlying level of inherent predictability anchored in the system's enduring behavioral regularities (Haynes 2007). In the health care context, for example, an attractor, such as the unwavering commitment to universal access and quality care, acts as an anchoring principle or a magnetic force (Sturmberg et al. 2012). This commitment transcends transient changes and provides a stabilizing influence across the healthcare policy landscape. Consequently, decisions concerning resource allocation, programmatic interventions, and the forging of partnerships are made with this attractor in mind. The presence of strong attractors cements an unerring focus on core values like universal access and quality care, even in the face of potentially disruptive changes, such as changes to healthcare legislation or leadership. Such attractors are, therefore, the bedrock upon which consistent implementation frameworks are built (e.g., Bovaird 2008; Zivkovic 2015).

Policy evaluation – Evaluation plays a pivotal role in the realm of policy action. Its primary focus is on determining whether a policy has been appropriately implemented and assessing the outcomes of that implementation. At the heart of evaluation is the intent to measure both the direction and magnitude of change occasioned by policy decisions. Drawing from CT, evaluations

have evolved to examine changes by looking at how things are connected. Rather than just looking at direct outcomes, evaluations now seek to understand the *interconnected* nature of factors and the resultant changes (e.g., Walton 2016). Walton (2016:76) provides a checklist to assess if evaluations are complexity-consistent. That involves asking whether the evaluation identifies interactions among system elements, the local rules governing those interactions, the outcomes across system levels resulting from interactions, the types of feedback that either constrain or support change, the initial conditions influencing interactions within the system, the system's controlling parameters, and the interactions between different levels of the system. Although evaluating through a complexity lens has its challenges (Barbrook-Johnson et al. 2020), its merits are evident and confirmed in numerous studies. The method offers nuanced interpretations in scenarios where reductionist methods tend to oversimplify intricate phenomena (Haynes 2008; Meissner and Jacobs 2016). Specifically, the concept of nested systems—emphasizing the dynamic hierarchy and connectivity of subsystems—underlines the value of CT. Complexity-based evaluation offers more than merely theoretical value and has been effectively applied in diverse contexts. For instance, when crafting policies for indigenous populations, understanding the intricate cultural, social, and economic systems at play is essential (Peroff 2007). Similarly, in the vast and convoluted arena of international climate negotiations, a simplified view will not suffice. Pickering (2019) highlights how CT offers detailed insights into such negotiations. He contends that although the study of regimes and regime complexes has illuminated the overarching structures and ties in global environmental policies, there has been less emphasis on systemic analysis of the smaller-scale interactions. These micro-level exchanges, such as conversations among participants within negotiation settings, both influence and are influenced by the wider mechanics of politico-administrative systems.

Complexity theory extends beyond understanding politico-administrative systems dynamics to unveil the nuances of how systems evolve and transform, emphasizing the unpredictable nature of such transformations. A central tenet of this approach is that while change sometimes appears chaotic, it can reveal *emergence* when viewed through the lens of complexity. (Farazmand 2007; Rhodes 2008). These last studies argue that CT is instrumental in shedding light on these recurring patterns that manifest in multifaceted projects. These patterns, while sometimes discernible, cannot simply be attributed to singular actors or isolated events. Instead, they emerge from the intricate interplay of numerous elements within the system. Accordingly, harnessing CT can illuminate the dynamics at play more vividly than a simplistic or reductionist approach. However, it is vital to acknowledge potential pitfalls of the evaluation method, such as the complexity trap: A phenomenon that manifests when policymakers, perhaps to avoid accountability, argue that the intricacies of their actions preclude conventional input-output-impact evaluations (Bächtold 2021). Accordingly, while CT provides richer insights and frameworks, its application must be diligent, transparent, and accountable.

Policy maintenance – maintenance refers to the dissemination and integration of changes into the operation of politico-administrative systems. Studies examining the maintenance of change emphasize the importance of *co-evolution*. Scholars, including Jarvie and Stewart (2011) and Rigby et al. (2022), underscore that actors are in a perpetual state of adaptation, concurrently influencing and being influenced by their environment. This dynamic is not a straightforward progression; evolution is delineated not as a linear trajectory but as an ongoing oscillation between structured coherence and chaotic disruption (e.g., Alfoqahaa and Jones 2020; Curth-Bibb 2019). Similarly, van Buuren and Gerrits (2008:397) underscored that "policy processes are composed of multiple, interacting elements that are not autonomous but influence each other in a nonpredictable way." Introducing changes into politico-administrative systems is not a simple matter of insertion or modification but involves navigating a complex web of interdependent elements, each with the potential to influence and be influenced in unpredictable ways.

As stakeholders navigate this complexity, *adaptability* becomes crucial in handling uncertainty (Scott et al. 2018). This emphasis on adaptability underscores the importance of being receptive to evolving scenarios and adjusting strategies accordingly. It is paramount to accept emergent

variations, even when outcomes remain unpredictable. For instance, Woolcott et al. (2021) investigated higher education partnerships and discovered that taking a broad, macroscopic perspective on emerging variations when scaling and sustaining collaborative partnerships can be more productive than micromanagement. A system that allows adaptive flexibility can exhibit "resilience and a capacity to operate away from equilibrium, fostering adaptive capabilities as well as creating opportunities" (Woolcott et al. 2021:103). Adopting an adaptable approach, complemented by the innovative use of control mechanisms (Tenbensel 2018), offers a greater likelihood of sustainability and success in a complex and unpredictable environment. It is also significant how the self-organization of civil society takes shape. It concerns a force that energizes local communities (Castelnovo and Sorrentino 2018), while self-organization can also manifest as a political evasion of responsibility (Uitermark 2015).

What practical implications derived from complexity theory are presented in studies?

Content analysis revealed four salient practical implications, elucidating the fundamental drivers behind effective strategy and decision-making. Those are *enabling leadership*, which underscores the importance of proactive and empowering leadership styles; *leveraging experimentation*, highlighting the need for iterative testing and learning to adapt to emerging challenges; the *holistic perspective*, advocating for a comprehensive understanding and consideration of all facets of the issue; and the *humble approach*, emphasizing the significance of transparency and acknowledging the potential for error.

Enabling leadership – The majority of the studies selected align with the idea presented by Chettiparamb (2016), Naveed and Azhar (2022), and Ruijer et al. (2023), suggesting that although complex politico-administrative systems cannot be controlled, their operation can be influenced by leadership that utilizes emergent properties arising from interaction. The primary task of enabling leadership is seen as creating useful conditions for self-organization. Enabling leadership requires trust in the interaction of the relevant actors, but they cannot be given carte blanche. Bovaird (2008), Haynes (2008), and Alfoqahaa and Jones (2020) propose that the self-organization of actors should be guided using attractors. An example of an attractor that limits self-organization is a commonly shared system of meaning or rules or a value base that defines action. Leading through attractors can be justified because excessive control can weaken the actors' ability to sense and react to changes (Goldspink 2007).

The concept of a *possibility space*, introduced by Butler and Allen (2008), is a compelling paradigm. It represents the vast canvas actors utilize, either adapting to the present milieu or pioneering new directions (i.e., dissipative structures). Skillfully navigating this expansive arena demands a leadership style that can harmonize grand strategic visions with the granular, fluid realities on the ground. Similarly, de Waard et al. (2021) underscored the importance of bridging the gap between overarching strategic objectives and ground-level operational needs. Additionally, studies by Alfoqahaa and Jones (2020), Murphy et al. (2017), Meek and Marshall (2018), Curtis et al. (2018), and Kickert (2010) illuminate the nuances of enabling leadership in varied contexts, from recognizing the value of local-level actor diversity to harnessing the power of change agents. Paananen et al. (2022) examined enabling leadership in the context of peacekeeping and found enabling leadership creates an *adaptive space* where creative initiative combines effectively with operational activity. Murphy et al. (2017) tied tensions to different leadership contexts. In situations of low complexity, they suggest leadership is about problem-solving, while high-complexity situations require acute situational awareness. Leadership in high-complexity situations is not easy, and Scott et al. (2018) call for the ability to accept uncomfortable uncontrollability, while Totry-Fakhoury and Alfasi (2017) advocate for planning without planning.

Leveraging experimentation – Several studies selected proposed development through experiments. Within this context, experiments are often characterized as key tools for navigating the murky waters of unpredictability and inherent complexity in management. Contrary to the

traditional notions of top-down decision-making (Bovaird 2008), experiments signal a more organic, grassroots approach. Their intrinsic value lies not just in successful outcomes but also in the rich empirical data they yield, demystifying what is viable in real-world scenarios and what remains theoretical. Eppel (2012) advocates for a paradigm shift in policy implementation, encouraging stakeholders to perceive it as akin to a tangible, real-world experiment. While the nature of experiments implies potential failures, these setbacks are transformed into invaluable knowledge reservoirs, recalibrating future implementations. This philosophy resonates with Tenbensel's (2018) findings emphasizing the utility of experiments in deciphering the elements fostering or obstructing mutual interdependencies. Expanding on this concept, Termeer & Dewulf 2019) conceptualize experiments as small wins: More than solutions to multifaceted challenges but vehicles to garner political goodwill and endorsement of profound systemic transformation. He et al. (2022) echo a similar sentiment and introduce the notion of *experimentalist governance*. Their approach is rooted in CT and emphasizes piloting varied modalities tailored to the unique complexities inherent in diverse governance challenges. The literature highlights a consensus: experimentation and its occasional failures act as catalysts for individual and organizational metamorphosis (de Waard et al. 2021; Eppel 2012; Long et al. 2018) but also broader institutional learning and evolution (Farazmand 2007; He et al. 2022; Mahon et al. 2008). Accordingly, a paradigm that embraces experimentation can be a fundamental mechanism for informed progression and resilience and not just a risk-taking endeavor. The perspective underscores the need to integrate experimental approaches into policymaking and institutional strategies, ensuring adaptability in the face of unforeseen challenges.

Holistic perspective – Complexity theory pivots around the challenge posed by reductionist approaches and underscores the imperative of embracing a more holistic perspective. The holistic perspective is not merely an academic construct; its significance is evident in the studies reviewed. Holism accentuates the premise that individual actors do not function in isolation; they are invariably enmeshed in intricate networks of interrelations and interdependencies. The reviewed research dissects these intricate webs in a range of contexts: the interconnectedness between healthcare challenges and solutions (Gear et al. 2018), the juxtaposition of micro-level climate discourse against overarching global objectives (Pickering 2019), the deep-rooted nature of governance frameworks (Angst 2020), challenges in regulating cybercrime owing to interconnectivity (Porter and Tan 2023), and the symbiotic networks in conflict resolution processes (Day and Hunt 2022).

These studies highlight the profound need for *boundary elements* or *bridging entities* to amplify the propagation of advantageous systemic effects duly mediated through the interdependencies mentioned above (e.g., Roussy et al. 2020). Moreover, holism is not restricted to recognizing and navigating these interdependencies but extends to decoding the intricate mechanics of change. A recurring theme in the studies is the inherent unpredictability that characterizes emergent phenomena, often leading to unanticipated policy outcomes (e.g., Marjanovic and Cecez-Kecmanovic 2020; Peroff 2007; Sinclair 2011; Walter and Holbrook 2015). Various strategies are available to navigate this unpredictability. Signal et al. (2013), for instance, champion inclusive stakeholder engagement, which they argue not only elucidates interaction matrixes but also maps causality arcs, fostering well-informed, targeted interventions. Castelnovo and Sorrentino (2018) suggest that the principles of CT are crucial tools for identifying areas in policy execution where outcomes might deviate from goals. Early recognition of discrepancies helps policymakers anticipate challenges and adapt strategies to ensure aligned and effective implementation. This holistic and proactive approach can lead to more resilient and adaptive policy frameworks that can navigate the multifaceted challenges of complex politico-administrative systems.

The humble approach – Complex systems are inherently unpredictable and not easily tamed regardless of managers utilizing enabling leadership, bold experiments, and holistic perspectives. Literature underscores the importance of a humble approach when dealing with such multifaceted issues. For example, Dunlop and Radaelli (2016) advocated for *regulatory humility* to counter the *illusion of control*. The approach proposes cultivating a knowledge reservoir that reveres the

intricacies of complexity. Rigby et al. (2022) offered an insightful perspective, positing that while empirical, research-backed evidence is indispensable, successfully navigating complex policy challenges necessitates incorporating experiential knowledge to reveal the nuances involved. Perera et al. (2022) extended the idea and advocated for the astute modeling of systemic dynamics to capture and simulate the multifarious interactions and feedback loops characteristic of complex systems.

Rijken et al. (2020) introduced the pivotal role of knowledge brokers—individuals uniquely positioned at the crossroads of research and policy decision-making. Their primary mandate extends beyond facilitating a more informed decision-making process to broadening the discourse around multifaceted challenges, ensuring a diverse array of perspectives are considered. Walton (2016), in turn, underscores the temporal aspect, emphasizing that grappling with complexity, especially in policy evaluation, demands a more prolonged engagement than conventional linear methodologies. Furthermore, that engagement entails a critical paradigm shift in policymakers' and stakeholders' thinking on evaluation outputs. Grossmann and Haase (2016) also found it important to approach the problem targeted by policy even-mindedly. Only then could policymakers craft holistic, adaptive, and, above all, effective strategies and policies. In practice, that would mean navigating away from the anchoring effect of preconceived notions and being receptive to evidence, even if it contradicts established beliefs or initial assumptions.

Discussion

Morçöl (2012) posited that CT might offer a legitimate alternative to established theories of public policy and administration; however, he also questioned whether it could offer a truly distinct and superior alternative. Similarly, Cairney (2013) contemplated whether CT signifies cumulative knowledge or merely serves as theoretical punctuation. A systematic literature review offers a robust methodological approach to address such reservations because scrutinizing existing research generates fresh insights or viewpoints as researchers build on the work of their predecessors with a critical perspective (Post et al. 2020:353). The process can manifest in multiple ways: Drawing from the mechanism-based theorizing of Post et al. (2020:357), this article adopts a macro-meso-micro framework (Osborne et al. 2022; see also Coleman 1990; Hill and Hupe 2022). The objective here is to apply a CT perspective to analyze dynamic processes within a politico-administrative system.

Macro level – At the macro level, CT offers a nuanced understanding of the interplay between societal and institutional values, rules, and norms that guide political and administrative actions. Macro dynamics are seen as high-tier policies and societal values that influence the trajectory of policy cycles. Continuous nonlinear interactions culminate in the formation of macro patterns. CT elucidates how numerous, recurrent, nonlinear interactions among components of a system give rise to macro structures and patterns that emerge spontaneously without explicit planning or guidance. Moreover, such established patterns can be altered by external occurrences or internal dynamics, leading to the emergence of a new pattern. (Eppel and Rhodes 2018:950.) The principle of path dependency, emphasized in CT, acknowledges the impact of past decisions on present and future policy directions, indicating the weight of historical choices at this level. Attractors provide a framework to understand general trends and behaviors in politico-administrative systems. Embracing CT leads to a more holistic view, recognizing systems as dynamic and evolving rather than as merely static constructs. The challenge lies in balancing the stability of systems, supported by negative feedback loops, with the potential for change and evolution, driven by positive feedback, all within the confines of established societal and institutional structures.

Nevertheless, the macro perspective's broad reach can sometimes oversimplify the intricate details of political and administrative actions. The emphasis at this level is mainly on overarching systems, an approach that, despite being anchored by societal norms, policy environments, and

institutional structures, may inadvertently miss subtleties. The influence of high-level policies and societal values on macro dynamics is undeniable, but one must question if such a comprehensive perspective truly encapsulates the diverse realities at play. For example, Eppel (2017:850) argued that comprehending the entirety of a dynamic system in a scientifically controlled manner is challenging without breaking it down into components. Abstract, small-scale approaches such as agent-based modeling might be an exception. The principle of path dependency, while shedding light on the long-term effects of historical decisions, might also constrain the potential for innovative shifts. As Cairney (2012:352) puts it, there is a risk of adopting a deterministic stance, namely "a tendency to treat the system as a rule-bound structure that leaves minimal room for the role of agency." Furthermore, attractors could overshadow other underlying factors influencing broader trends in politico-administrative systems. When CT promotes a holistic view, it can occasionally risk oversimplifying systems by labeling them dynamic. The pressing challenge extends beyond balancing stability with evolution to incorporate the critical examination of the deep-rooted prejudice within societal and institutional structures.

Meso level – The meso-level analysis revolves around the interactions between individual entities (micro) and the broader system (macro). At this juncture, policies rely on organizational norms, mid-level governance structures, and inter-organizational collaboration. Complexity is evident as these entities showcase the ability to self-organize, adapt, and evolve in harmony with their environments, revealing the unpredictable and nonlinear paths of change to the extent that Koliba and Zia (2012) refer to a complexity-friendly meta-level framework. Meso-level strategies, such as the *possibility space,* illuminate potential pathways for adaptation and innovation. The pivotal role of leadership, particularly in the guise of "smart interventions" (Klijn 2008:313), becomes clear, especially in translating overarching goals into tangible actions. Experimentation emerges as a defining feature, acting as a vessel for institutional learning and resilience, thus offering vital empirical insights for policy and strategic adjustments.

Although the meso level intends to bridge the macro and micro dimensions, it can occasionally become isolated within its own boundaries, potentially overlooking authentic interactions across the various levels. The dynamic interplay between individual entities and the larger system raises questions about its efficacy in capturing the true essence of this relationship. For example, collaborative governance does not simply emerge when summoned; it necessitates proactive measures to convene, motivate, and align pertinent actors (Peters et al. 2022:58). In addition, while self-organization can be a potent force, it demands careful nurturing and cultivation (e.g., Wheatley 1999). Furthermore, organizational designs and intermediary institutions might inadvertently perpetuate existing norms, hindering innovation. The evident complexity, marked by adaptability and co-evolution, needs to be assessed for its responsiveness to swift external shifts. While strategies such as the possibility space sound promising, their real-world effectiveness demands thorough empirical validation.

Micro level – At the micro level, attention narrows to individual stakeholders comprising policymakers, administrators, and the general public. Each plays a distinct role within the multifaceted process of the policy cycle. Concepts from CT offer guiding principles or heuristics that influence the interplay among the various components and also provide insights into understanding the micro dynamics within the mechanisms at work (Eppel 2017:850). Here, the nuances of complexity come to the forefront as individuals navigate, interpret, and apply policies in their respective environments. Grassroots actors embedded in their local contexts offer valuable insights, translating broad policies into actions that align with their specific settings. Complexity theory provides a lens to reveal the intricate web of relationships among these actors, highlighting their collective contribution to the wider system. The individual perceptions, biases, and decisions, while diverse, collectively influence broader policy outcomes. Iterative feedback mechanisms gain importance in this context, shaping and adjusting the direction of policy initiatives. In the words of Morçöl (2012), CT offers a micro-level mechanism to elucidate the macro patterns that have intrigued public policy scholars. There is a recognized need for policies that are both grounded and adaptable, reflecting the varied and sometimes unpredictable nature of human interactions.

Nevertheless, the micro perspective's intense focus on individual players can overshadow the collective dynamics in operation. While it delves deeply into the intricacies of the policy cycle, there is a potential to overemphasize individual agency, which could sideline broader systemic influences along with their opportunities and hindrances. Complexity theory, while providing a robust framework to elucidate the interconnected roles of various actors, is no panacea. As Klijn (2008:313) pointed out, the intricate nature and numerous emergent characteristics of complex systems make them challenging to manage. Given the prevailing dynamics, self-organization, and emergence, it is often wiser to adapt to these changes rather than strive to control them. In such circumstances, a policymaker tends to focus more on adapting and responding to shifts than on imposing a predetermined direction. Astute critiques are required to ensure that the theoretical understanding of these interwoven networks translates effectively into real-world policy outcomes. If the framework is misapplied, it could lead to an over-reliance on individual actors in the system, potentially jeopardizing broader objectives. For example, Room (2011) notes that emergence arises from micro-motives leading to macro-behavior, which in turn establishes an environmental context for those same micro-motives. This duplex nature of emergence epitomizes the downward causation (Blitz 1992). An example of this is how a social norm emerges from individual interactions and then goes on to influence individual behavior. Furthermore, while policy adaptability is increasingly championed in the age of dynamic and ever-evolving challenges, its universal applicability remains a subject of debate. Embracing adaptability necessitates a thorough exploration of its implications, both intended and unintended, across diverse contexts (e.g., Margetts et al. 2010). Without such a critical lens, there is a risk of overlooking potential pitfalls or unintended consequences in various sociopolitical landscapes.

Employing a macro-meso-micro framework can reveal how CT influences politico-administrative action across different layers of analysis. The interconnectedness of these levels means that changes at one level can propagate throughout the entire system, emphasizing the need for holistic strategies addressing those dynamic interactions. The system's macrostructure is interconnected with both its micro-structure, which involves interactions among its agents, and its meso-level structures, all without requiring active direction (see Checkland 1981). A comprehensive approach can facilitate a more nuanced understanding of policy cycles encompassing creation, implementation, evaluation, and maintenance. That approach would acknowledge the system's inherent unpredictability and the need for adaptability at all levels. However, it is imperative to note that while the macro-meso-micro framework offers a structured lens to examine the implications of CT, it is not without its limitations. The delineation between the levels can sometimes be ambiguous, and the framework may not capture all the intricacies of every politico-administrative context. Additionally, while the approach targets comprehensive understanding, it should be applied with caution and in conjunction with other analytical tools to ensure no critical aspects are overlooked. Relying solely on this framework without considering its potential constraints could lead to incomplete or skewed interpretations of complex policy dynamics.

Conclusions

The current literature review indicates that using the complexity-theory lens can unveil a multi-dimensional picture of politico-administrative systems. This observation aligns with studies regarding the policy cycle model as an oversimplification of reality (e.g., Fischer 2003). The review reveals that the process is not linear, where signaling of policy ideas is followed by neutral evidence gathering on various options, where implementation matches the decided course. The role of evaluation is to support policy embedding or, if necessary, direction change. Focusing on emergent phenomena in interactions and attractors guiding self-organization offers an interpretation, for instance, as to why policies sometimes progress swiftly and other times stagnate. The reviewed studies offer some practical guidance on running politico-administrative systems.

The CT lens also reveals opportunities for alternative approaches. Understanding them requires embracing a both-and mindset rather than an either-or one. Instead of top-down control or bottom-up emergence, complex environments require adaptive leadership and governance (Murphy et al. 2017; Uhl-Bien and Arena 2018; Paananen et al. 2022), and a shift from 'reducing complexity' to 'embracing complexity' (Castelnovo and Sorrentino 2024).

The current research draws on Cairney (2012). It concludes that CT is better suited to offering actionable guidance to professionals than contributing to broader theoretical discussions about the dynamics of the politico-administrative system. Following Raadschelders's (2008) understanding of government, a complexity-informed interpretation—supported by enabling leadership, an emphasis on experimentation, a holistic perspective, and a humble approach—can guide practitioners' understanding. That understanding will help help address three pivotal questions: "Where are we going?", "Is it desirable to go there?" and "What can we do to get there?" (Raadschelders 2008:929).

Complexity theory is frequently characterized as an anti-reductionist approach. Certain interpretations hold it signifies a paradigm shift in research (e.g., Mitchell 2009). However, more cautious observers perceive it as an evolution rather than a revolution, suggesting its value might be limited (e.g., Kiel 2014). However, the current literature review suggests that CT is a viable alternative to the traditional theoretical frameworks used in politico-administrative system research. From a pragmatic perspective, the increasing prevalence of empirical research employing CT in leading academic journals speaks volumes on researchers' faith in its applicability. From a theoretical standpoint, much of the terminology of CT builds upon previously established knowledge. Complexity theory may not be as radical an approach as many proponents suggest.

A *cynic* would suggest the issue is not one of a paradigm shift but more like old wine in a new bottle (see Mitchell 2009). Studies have asked what unique contributions CT can make that have not been considered in traditional theoretical approaches utilized in public administration studies (e.g., Eppel 2017). The complexity perspective might offer insights that some would describe as obvious and little more than common sense (Geyer and Rihani 2010:186). It is important to remember that CT has its roots in the natural sciences and that borrowing theories from one discipline to bolster another is common but not without risk (Whetten et al. 2009). Despite certain commonalities, the differences between biological and politico-administrative systems are fundamental. Although both types of systems can drift into a state CT describes as far-from-equilibrium, the reasons differ significantly. For instance, an imbalance in a thermodynamic system arises from the simultaneity of hot and cold substances, whereas in politics, imbalances stem from varied and opposing interests. Furthermore, scholars warn of the dangers of theory-driven cherry-picking. According to Day and Hunt (2022), that occurs when researchers focus exclusively on the aspects of the phenomena under study that fit an interpretation using CT. The result is an interpretation forced through the lens of complexity and not necessarily an understanding of the target phenomenon. An *idealist* might see CT as an opportunity to enhance understanding of the dynamics of politico-administrative systems, phenomena evolving from actor interactions, and the complexity of societal problems. This approach is deemed particularly useful in situations involving wicked problems (see Head 2022). To paraphrase Richardson (2008), CT can be perceived as the art of balancing the knowledge we have, even if it is inherently uncertain and incomplete. The allure of its theoretical framework might lie more in unifying existing ideas rather than introducing new ones, and proving its empirical superiority over well-established theories could require time.

Democratic societies are clearly overrepresented in research leveraging CT. That does not necessarily mean that authoritarian societies are immune to complexity. A more plausible interpretation is that complexities are visible in democracies because they inherently involve visible conflicts and struggles between different interests (e.g., Dahl 1998). Both democratic and authoritarian societies host natural complexity (complexity by nature), but only in democracies do we find deliberate complexity (complexity by design). Despite its negative connotation, the deliberate complexity in democracies is not a problem but rather a characteristic. In this review, deliberate

complexity manifests in various stages of the policy cycle as enabling leadership, leveraging experiments, a holistic approach, and decision-making grounded in respect for complexity.

The current review indicates that CT is a promising and evolving approach to the study of politico-administrative phenomena. There is a clear growth in empirically oriented research on complexity published in reputable academic journals.

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