

Complex Governance Networks: An Assessment of the Advances and Prospects*

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The case is made for a complex governance networks conceptualization. The contributions of the literatures on governance, networks, and complexity studies are discussed. Governance researchers challenged the traditional ways of thinking in public policy and administration and highlighted the multi-centered nature of policy and administrative processes. Governance networks researchers applied the refined network concepts and methods to our understanding of governance processes. Complexity researchers provide ontological and epistemological grounding to governance networks studies and conceptual and methodological tools to study the self-organizational, emergent, and coevolutionary processes within and among complex governance networks. It is argued that the concepts and methods of the three streams should be synthesized and that complex governance network researchers should incorporate the insights of well-established theories of policy processes, such as the institutional analysis and development framework and the advocacy coalition framework.

Keywords: Complexity, governance, networks, policy processes, public administration.

1. Introduction

It has long been recognized that the study and practice of public policy and administration are complex. In recent decades three streams of academic literature emerged that recognize this complexity: the literatures on governance, network studies, and complexity theory. Although each of these streams has evolved somewhat autonomously, there have been considerable overlaps among them and some attempts to synthesize selected concepts from them. My argument is that these streams can and should be joined together under a *complex governance networks* theoretical framework to make better sense of policy and administrative processes. As I demonstrate in this paper, the theoretical developments and supporting empirical work conducted in the three streams can constitute the bases of this framework, but there are also areas where more theoretical refinement is needed and more empirical studies would be required.

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As I briefly discuss in the following paragraphs, the three literatures have developed at different paces and each reached a different level of maturity. For instance, network conceptualizations and network analysis methods are more advanced than the conceptualizations and methods in the governance and complexity literatures. The fast-growing literature on governance studies has opened up new venues of research and practice, but compared to the networks studies they are less articulate. The applications of complexity theory in public policy and administration have been relatively more recent. A coherent and unified conceptual framework has not emerged from these applications yet, but, as I will argue, complexity theory offers a meta-theoretical framework that can help advance our understanding of complex governance networks.

In the following sections, I summarize the evolutions of the concepts and methods used in the governance, networks, and complexity literatures and highlight the strengths and shortcomings in each. These summaries are not meant to be exhaustive or definitive reviews of the literatures, but to highlight their potentials to jointly contribute to our understanding of complex governance networks.

2. Governance

The increased interest in governance in the academic literature in recent decades is the result of a series of related observations social theorists and public policy and administration researchers make: that societies have become multi-centered (Castells, 1996; Jessop, 1990), that in today's world no governmental or private actor has the capacity to solve the increasingly complex and dynamic problems of societies (Kooiman, 1993), and that consequently the roles of governments in policy processes have diminished, or at least changed (Kettl, 2002; Koliba, Meek, & Zia, 2011; Rhodes, 1997; Torfing, Peters, Pierre, & Sørensen, 2012). According to these authors, the policymaking capabilities of nation states have diminished and the political and policymaking processes have become multi-centered. This multi-centeredness creates institutional collective action dilemmas, according to Feiock (2013), and this fragmentation makes governance inherently complex (Feiock & Scholz, 2010).

All these observations underscore the multi-centered and complex nature of governance processes. The concept of governance has not been defined well. In the vague definition of the World Bank, which popularized the concept, governance refers to the relationships between governing bodies and the governed. Governance is the process "by which authority is conferred on rulers, by which they make the rules, and by which those rules are enforced and modified" (World Bank, undated, para. 1). In the public management literature, governance refers more narrowly to the funding and oversight roles of government agencies, especially regarding the activities of private organizations that have been contracted to provide public services (Provan & Kenis, 2007, p. 230). Lynn, Heinrich and Hill (2000) offer a definition that stresses the multiplicity of autonomous individuals and organizations that are involved in policymaking and the need to direct, control, and coordinate their actions: Governance is the "means for achieving direction, control, and

coordination of wholly and partially autonomous individuals or organizations on behalf of interests to which they jointly contribute” (p. 235).

Then the question is, who or what will direct, control, and coordinate these actors? Can governments do that? What is a “government,” or “the state,” anyway? According to Rhodes (1997, p. 57), in the “new era of governance” what we call “the state” is no longer a unified entity that is sovereign over a territory; it is actually composed of networks of what is traditionally considered “governmental” actors and other societal actors. Then, can these governmental actors direct, control, or coordinate other actors? According to Buijs, Van der Bol, Teisman, and Byrne (2009), the guiding ability of governmental agencies has diminished in recent decades because their actions are “highly influenced by the spontaneous actions of many other agents” (p. 97). Kettl (2002, p 161.) and Agranoff (2007, p. 192) argue that governmental actors still play special roles in governance processes: They can guide, steer, control, and manage non-governmental actors. What really are the roles governmental entities in governance processes? As I discuss in the next section, some governance networks researchers addressed this question, but more conceptual and empirical work needs to be done to answer the question.

3. Networks

The theory, methods, and empirical studies on networks have deep roots and they are at fairly advanced stages of development. The sociometric studies of Moreno and others in the 1930s were the precursors of today’s social network analyses (SNA) (Wasserman & Faust, 1994, pp. 9–17). The SNA methods have come a long way since these initial sociometric studies, as a result of the advances in graph theory, statistical and probability theory, and algebraic models, according to Wasserman and Faust. These methods are described in detail in Wasserman and Faust’s book and others (e.g. Freeman, 2008; Knoke & Yang, 2008; Scott, 2013).

There have also been advances in conceptualizing and empirically investigating the relations in social networks. One of these key advances in the concept of “governance networks,” which is used usually in conjunction with, or interchangeably with, the terms “policy networks” or “public management networks.” Each of these three concepts has its conceptual history and there are differences, as well as similarities, among them (for different usages and meanings of the terms, see Compston, 2009 and Agranoff, 2007). Governance networks is the most meaningful of the three because it captures the basic insights of the governance conceptualizations discussed in the previous section.

In governance network conceptualizations, some of the key insights of network and complexity theories, and others, blended together. The history of this concept and the current state of its applications are discussed in depth by Koliba et al. (2011). Koliba, Meek, and Zia’s characterizations of governance networks include the self-organizing, and interdependent organizational and individual actors (e.g. resource dependencies) in them. In their comprehensive analysis of the complexity of governance networks, Klijn and Koppenjan (2004, 2014) also draw on the insights of network and complexity theories.

In their comprehensive review of the governance/policy literature, Provan, Fish, and Sydow (2007) note that although there is no overarching conceptualization that would guide empirical studies of governance networks yet, the studies on them have advanced at two levels: the micro level (analyses of individual and organizational actors) and the macro level (analyses of “whole networks”). Provan and his colleagues point out that the micro-level studies have helped answer questions like, what are the impacts of network ties on organizational performance, which positions in networks are most influential, and how the positions within networks in response to changes within and outside the network? They note that although many measures have been developed to analyze whole networks (e.g. measures of centralization, density, fragmentation), there are very few whole network studies and they are mostly conceptual, anecdotal, or descriptive case studies.

Shrestra, Berardo, and Feiock's (2014), article is a good example of how far advanced and refined micro-level network conceptualizations have become. They propose a model to be used in studying how actors shape their formal and informal relationships in dealing with institutional collective action problems. In the SNA literature models of these multiple, forms of relationships are called “multiplex networks.” Shrestra and his colleagues contribute to our understanding of multiplex networks by offering specific mechanisms of coordination and cooperation in them.

Provan & Kenis's (2007) typology of governance networks is one of the very few macro-level conceptualizations. They observe that there are participant-governed networks, lead-organization governed networks, and networks with a network administrative organization. Agranoff (2007) also developed a typology of public management networks: informational networks, developmental networks, outreach networks, and action networks. According to Provan, et al. (2007), governance network studies should go beyond these typologies and answer some key questions about the macro structures of networks.

For example, what are the conditions of the emergence of different network structural forms? Particularly, what is the role of governmental entities in shaping and constraining network structures? These questions have not been answered in the literature. Another problematic area is how networks evolve. For example, does network evolution occur in predictable ways? Do networks change continually or reach points of stability? There are some studies on how the relations among network actors evolve over time, but they focused mainly in the network dynamics at micro levels (e.g. Doz, 1996; Human & Provan, 2000; Isett & Provan 2005; Morçöl, Vasavada, & Kim, 2013; Ring & Van de Ven, 1994).

Another important area of study is network effectiveness. More specifically, what kinds of network structures are more effective? Forrest's (2003) review of the international literature on policy networks indicates that there are conflicting findings about whether open (more inclusive) networks or closed (less inclusive) networks are more effective. The studies also have conflicting findings about the implications of policy networks for democracy: Some suggest that networks can increase participation in policymaking. Others find the informal nature of networks give power elites the opportunity to enhance their powers and decrease transparency and accountability in policymaking.

4. Complexity

Governance processes and the structures of governance/policy/public management networks are complex, as many theorists who represent various perspectives acknowledge (e.g. Koliba et al., 2011; Peters, 1993; Sharkansky, 2002). Then the question is, what do we mean by complexity? Complexity theorists make two key contributions in answering this question. First, they show that complexity theory concepts challenge the deep ontological and epistemological assumptions of the Newtonian/positivist science, which dominates most of the social science research (Morçöl, 2002). Second, complexity theorists define the concept of complexity and offer the conceptual and methodological tools to be used in identifying and describing the complex patterns and mechanisms of natural and social systems. Thus they help us better understand the structural properties and dynamics of governance networks/systems, as well as the relationships among the elements (actors, agents) involved in these systems.

Complexity theory has the potential to make significant contributions to our understanding of governance networks, but it is not a well-developed theory—not yet. This is why many researchers would not even use the term “complexity theory” because, they argue, there is no coherent body of concepts that this name refers to (e.g. Mitchell, 2009). Kiel (2014), on the other hand, argues that the conceptual development of complexity theory in the public administration and policy studies is complete. In my view, no complete and comprehensive theory of the complex governance networks has been formulated, but the term “complexity theory” can still serve a useful purpose as a *meta-theoretical framework* (the body of related concepts—such as, nonlinearity, self-organization, emergence, and coevolution—and analytical tools—such as, agent-based simulations) from which concepts and analytical tools can be drawn to be applied in the studies of governance processes (Morçöl, 2012a). In this paper I use the terms complexity theory and complexity theorist to refer to this framework, although it is only loosely articulated as of now, and those who contributed to it; I will leave aside the debates on the appropriateness of the uses of these terms.

A few authors applied complexity concepts and methods in their studies of policy systems/governance networks (e.g. Gerrits, 2012; Geyer & Rihani, 2010; Kiel, 1994; Morçöl, 2012a; Rhodes, Murphy, Muir, & Murray, 2011; Teisman, van Buuren, & Gerrits, 2009), but there is no commonly applied framework in these studies. There are two theoretical frameworks that are emerging, however: the socio-ecological systems framework and the micro–macro framework. In this section, I will summarize the general implications of complexity theory and then discuss these two emerging frameworks and the methodological advances made in the studies of governance networks within these frameworks.

Complexity theorists challenge some of the core assumptions of the Newtonian/positivist sciences and propose a Post-Newtonian understanding of science, as I discussed elsewhere (Morçöl, 2001, 2002, 2005, 2012a). Complexity researchers are not in full agreement on the epistemological implications of the theory. Mitchell (2009) and Richardson (2007, 2010) argue that the theory suggests a pluralistic epistemology, whereas Prigogine

and Stengers (1984) argue that it suggests a phenomenological view of science and in Cilliers's (1998) view it suggests a post-structuralist epistemology. Despite these different characterizations, most complexity researchers, if not all, agree that the theory offer a different view of scientific knowledge.

A significant implication is that complexity is not a residual category, a category that can be used to dump into what we do not understand about natural or social phenomena. Therefore, researchers should aim to understand the complexities of the phenomena, not reduce them into simplified and linear explanations. Complexity theorists offer a set of concepts and methodological tools to help us understand complexity (see Morçöl, 2012a). They stress, for example, that what makes a system complex is not only in the large number of elements it is composed of, but also in the differences among its components and particularly the nonlinearity in the relations among them. Complexity theorists also offer conceptualizations of the self-organizational mechanisms in systems, emergence of structural properties in systems, and co-evolution of systems.

These conceptualizations are compatible with, and provide the theoretical bases of, some of the key propositions in the governance network conceptualizations: that the actions of multiple self-organizing actors constitute governance processes and that no governmental or private actor alone has the capacity to solve the increasingly complex problems of societies (Kooiman, 1993). Complexity theorists suggest that the macro (structural) properties of complex systems are emergent: These systemic properties emerge from the interactions of the systems elements; they are not designed. Because complex systems are self-organizational and composed of self-organizing elements (actors, agents), they cannot be controlled or directed centrally, nor can their "problems be solved" centrally.

A key observation complexity theorists make about policy/governance systems is that the relations between the policy actions of governments and "their outcomes" are nonlinear and therefore the outcomes are not easily predictable or controllable (Salzano, 2008). There is no direct causal connection between policy actions and social outcomes; social processes and structures, such as "policy outcomes" emerge from the nonlinear interactions of self-conscious and self-organizing actors. Axelrod (1997) and Holland (1995, 1998) made significant contributions to our understanding of the emergence of social (macro) structures and processes in general, which can be applied in studies of governance networks.

A key implication of the emergent nature policy outcomes is that policy interventions can at best be used to "nudge" systems toward socially desirable states (Zia, et al., 2014). As Stewart and Ayres (2001) put it, public policies should be viewed as interventions into self-organizing social systems and the aim of a policy intervention should not be to reach a pre-determined goal, but to enable the "target system to enhance . . . its capacity for self-steering" (p. 87). Therefore, the success of a policy intervention should be based on how much the self-steering capacity of the target system has been enhanced.

Complexity researchers demonstrated that governance/policy systems/networks do not self-organize in isolation; they coevolve with natural systems. The term coevolution was coined by Ehrlich and Raven (1964) and the theory of the coevolution of biological

systems was refined by Kauffman (1993, 1995). Kauffman posits that as organisms, which are self-organizing systems, adapt to their environments to survive, their environments (other species) adapt to their adaptive behaviors, i.e. all these systems coevolve. Gerrits's (2008, 2010) case studies of the estuaries in Northern Europe demonstrated that policy systems coevolve with natural systems and ignoring these coevolutionary processes can lead to unexpected adverse outcomes.

The notion that governance/policy systems coevolve with other systems is closely related to one of the two emerging frameworks in complexity theory applications in the studies on governance networks: the *socio-ecological systems framework*. This framework is illustrated in the works of Zia (2013) and Zia et al., (2014), as well as in Gerrits's (2008, 2010). This framework is rooted in the earlier socio-technical systems conceptualizations in organization theory (Perrow, 1986, pp. 119–156). In the socio-ecological (or socio-technical) systems framework, social systems are conceptualized as closely intertwined with natural systems. The researchers who adopted this framework studied the mechanisms of the interactions of human systems with specific technologies that were developed to harness/control/manipulate natural phenomena (e.g. Perrow's study of nuclear power plants) or those interactions with specific or general ecologies (e.g. Gerrits's study on estuaries and Zia's (2013) conceptualization of global warming).

The socio-ecological systems framework is primarily concerned about system-(macro-) level interactions and processes. The second framework that is emerging in the complexity studies of governance systems is the *micro-macro framework*, whose primary focus is the interactions among network actors (i.e. the micro level) and the macro structures and patterns that emerge from these interactions. More specifically, the "micro-macro problem" is the problem of how the actions of individual actors generate collective outcomes and how, in turn, the collective structures (social institutions, systems of rules) affect individual actions. This theoretical problem is also known as the "agency-structure problem" (Simmel's sociology), the "transformation problem" (European sociology), or the "collective action problem" (rational choice theories; for a specific articulation, see Feiock, 2013) (Coleman, 1986).

As I discussed extensively elsewhere (Morçöl, 2012a, 2012b), emergence is the central concept of complexity theorists' conceptualizations of micro-macro processes (e.g. Axelrod, 1997; Holland, 1995, 1998; Sawyer, 2005). Complexity researchers have made significant advances in understanding the mechanisms of emergence, but there are conceptual and empirical problems to be addressed (see Morçöl, 2012a, pp. 89–92). For example, once emerged, are macro-level (system-, or network-level) properties "irreducible" (do they constitute a separate realm that should be studied completely separately from the actions of individual actors? Also, how do the macro properties of governance systems affect the actions and beliefs/perceptions of individual actors?

Within both the socio-ecological and micro-macro frameworks, many questions remain unanswered, but complexity researchers have developed, or adopted from others, innovative methods and applied them to address these questions empirically. For example, to study system-(macro-) level interactions and processes, they used phase diagrams to

study “phase spaces” (e.g. Zia, et al., 2014) and systems dynamics modeling to study the complex interactions of system-level variables (e.g. Fiddaman, 2007).

Social network analyses (SNA) and agent-based simulations have been used to study micro–macro interactions and transformations. SNA methods are used to investigate “how large-scale systemic transformations emerge out of the combined preferences and purposive actions of individuals. . . . [They provide] conceptual and methodological tools for linking changes in microlevel choices to macrolevel structural alterations” (Knoke & Yang, 2008, p. 6). These methods have been applied at increasing rates in the studies on the complex governance networks that deal with natural disasters (e.g. Kapucu, 2006; Kapucu, Arslan, & Collins, 2010) and health and human service delivery networks (Provan, Huang, & Milward, 2009). ABS are used to study the dynamics of micro–macro relationships and transformations in complex systems (e.g. Johnston, Nan, Zhong, & Hicks, 2008; Zia, Norton, Noonan, Rodgers, & DeHart-David, 2006). I discussed the strengths and shortcomings of SNA and ABS elsewhere (Morçöl, 2012a, pp. 210–243).

One of the major shortcomings of both methodologies is that researchers must remove from their analyses the contexts of the cases and situations they study. In qualitative case studies (QCS), which are more commonly used by European complexity researchers (e.g. Teisman et al., 2009; Rhodes et al., 2011), this de-contextualization problem is lessened. QCA have been applied successfully to describe the structural properties of complex policy/governance systems and the properties of policy actors. QCA has the shortcoming of being too particular and not allowing researchers make generalizations, however. Therefore, in studies of governance networks, ideally, SNA, ABS, and QCA) should be combined, as I proposed and discussed elsewhere (Morçöl, 2012a, p. 248).

5. Conclusions

Governance researchers challenged the traditional ways of thinking in public policy and administration and raised questions about a series of important issues, from whether governments can control multi-centered governance processes, to how autonomous policy/administrative actors interact in these processes. Governance theorists have offered only few answers to the questions they raised, however. The students of “governance networks” began to answer some of these questions.

Complexity theorists and researchers have contributed to our understanding of governance networks by describing how networks structures emerge from the interactions of self-organizing actors (individuals and organizations) (see Morçöl, 2012a, pp. 11–119) and how governance networks (or policy systems) coevolve with natural systems (e.g. Gerrits, 2008, 2010). Two frameworks have emerged from these studies: the socio-ecological systems framework, whose main focus is the system- (macro-) level, and the micro–macro framework, as I discussed in the previous section. It is yet to be seen which directions these two emerging frameworks will take. Ideally, these frameworks should be combined to gain more a comprehensive understanding of complex governance networks. More comprehensive insights can be gained also by combining the multiple analytical tools used

by complexity researchers: systems dynamics modeling, agent-based simulations, social network analyses, and qualitative case studies.

Can the complex governance networks conceptualization and the methods associated with help us understand how the governance processes work in the emerging multi-centered societies (Castells, 2000; Jessop, 1990)? Can these conceptual and methodological tools help the current fragmented political and administrative systems deal with their institutional collective action dilemmas (Feiock, 2013)? To be able to meet these challenges, complex governance networks researchers need to engage theoretically the insights and systematic conceptualizations made by other theorists and could learn from them.

The institutional analysis and development framework of Ostrom (1990, 2005) and the advocacy coalition framework of Sabatier (Sabatier & Jenkins-Smith, 1993) are the primary candidates for such engagements. Ostrom expressed her interest in complexity theory and its concepts in multiple occasions (e.g. Ostrom, 2005, pp. 242–243, 256; 2007). Sabatier and his colleagues adopted some of the key concepts of systems theorists (e.g. policy subsystems) and made frequent references to network concepts in the later versions of their framework (Sabatier & Weible, 2007). Complex governance network researchers would benefit from learning from the insights of Ostrom and Sabatier.

Ostrom made significant contributions to our understanding of the conditions of self-governance (self-organization). She and her colleagues demonstrated with their studies over a few decades that the self-organizational processes in the management of “common pool resources” (i.e. natural or human-made resources that are shared by large numbers of economic actors) are conditioned by various factors and mechanisms and they codified these factors and mechanisms. Her and their works are exemplary for complexity researchers. They demonstrate that for a theoretical framework to be influential (Ostrom’s works were cited in over 70,000 other works, as of April 2014, according to Google Scholar, and she was awarded the Nobel Prize in Economics in 2009), it should be carefully and meticulously constructed and its concepts and propositions should be empirically verified.

Ostrom’s impressive framework is based on the simplifying assumptions of rational choice theory about human behaviors, such as that they are (boundedly) rational actors (Ostrom, 2005, chap. 4). Sabatier’s framework, which is also impressive and based on decades of meticulous conceptualization and empirical verification, is based on a different set of assumptions. One of his key propositions is that the belief systems of policy actors play roles in how they come together to form advocacy coalitions (networks) in policy processes. These beliefs systems are not necessarily “rational” in the sense that rational choice theory assumes them to be. Because complex governance researchers study social systems (networks), it is crucial for them to understand the beliefs (or more broadly the social constructions) of the actors these networks as they are, and not simply assume that they are (boundedly) rational.

Ostrom’s and Sabatier’s frameworks, as well as the meticulous conceptual and empirical works that contributed to their developments, can be inspirational for complex governance networks researchers and theorists.

References

- Agranoff, R. (2007). *Managing within networks: Adding value to public organizations*. Washington, DC: Georgetown University Press.
- Axelrod, R. (1997). *The complexity of cooperation: Agent-based models of competition and collaboration*. Princeton, NJ: Princeton University Press.
- Buijs, J.-M., Van der Bol, N., Teisman, G. R., & Byrne, D. (2009). Metropolitan regions as self-organizing systems. In G. Teisman, A. van Buuren, & L. Gerrits (Eds.), *Managing complex governance systems: Dynamics, self-organization and coevolution in public investments* (pp. 97–115). London, England: Routledge.
- Castells, M. (1996). *The rise of the network society*. Oxford, UK: Blackwell.
- Cilliers, P. (1998). *Complexity and postmodernism: Understanding complex systems*. London, England: Routledge.
- Coleman, J. S. (1986). Social theory, social research, and a theory of action. *The American Journal of Sociology*, 91(6), 1309–1335.
- Compston, H. (2009). *Policy networks and policy change*. New York, NY: Palgrave Macmillan.
- Doz, Y. L. (1996). The evolution of cooperation in strategic alliances: Initial conditions or learning processes? *Strategic Management Journal*, 17, 55–83.
- Ehrlich, P. R., & Raven, P. H. (1964). Butterflies and plants: A study in coevolution. *Evolution*, 18, 586–608.
- Feiock, R. C. (2013). The institutional collective action framework. *Policy Studies Journal*, 41(3), 397–425.
- Feiock, R. C., & Scholz, J. T. (Eds.). (2010). *Self-organizing federalism: Collaborative mechanisms to mitigate institutional collective action*. Cambridge, England: Cambridge University Press.
- Fiddaman, T. (2007). Dynamics of climate policy. *System Dynamics Review*, 23 (1), 21–34.
- Forrest, J. B. (2003). Networks in the policy process: An international perspective. *International Journal of Public Administration*, 26, 591–607.
- Freeman, L. C. (Ed.). (2008). *Social network analysis* (Vols. 1–4). Los Angeles, CA: SAGE.
- Gerrits, L. (2008). *The gentle art of coevolution: A complexity theory perspective on decision making over estuaries in Germany, Belgium and the Netherlands* (PhD Dissertation, Erasmus University Rotterdam). Retrieved from <http://publishing.eur.nl/ir/repub/asset/11152>.
- Gerrits, L. (2010). Public decision making as coevolution. *Emergence: Complexity & Organization*, 12(1), 19–28.
- Gerrits, L. (2012). *Punching clouds: An introduction to the complexity of public decision-making*. Litchfield Park, AZ: Emergent Publications.
- Geyer, R., & Rihani, S. (2010). *Complexity and public policy: A new approach to 21st century politics, policy and society*. London, England: Routledge.
- Holland, J. H. (1995). *Hidden order: How adaptation builds complexity*. New York, NY: Basic Books.
- Holland, J. H. (1998). *Emergence: From chaos to order*. New York, NY: Basic Books.
- Human, S. E., & Provan, K. G. (2000). Legitimacy building in the evolution of small-firm networks: A comparative study of success and demise. *Administrative Science Quarterly*, 45, 327–365.
- Isett, K. R., & Provan, K. G. (2005). The evolution of interorganizational network relationships over time: Does sector matter? *Journal of Public Administration Research and Theory*, 15, 149–165.
- Jessop, B. (1990). *State theory: Putting the capitalist state in its place*. State College, PA: The Pennsylvania State University Press.
- Johnston, E. W., Nan, N., Zhong, W., & Hicks, D. (2008). Between implementation and outcomes, growth matters: Validating an agent-based modeling approach for understanding collaboration process management. *The Innovation Journal: The Public Sector Innovation Journal*, 13(3), 1–31.
- Kapucu, N. (2006). Interagency communication networks during emergencies: Boundary spanners in multi-agency coordination. *American Review of Public Administration*, 26(2), 207–225.
- Kapucu, N., Arslan, T., & Collins, M. L. (2010). Examining intergovernmental and interorganizational response to catastrophic disasters: Toward a network-centered approach. *Administration & Society*, 42(2), 222–247.
- Kauffman, S. (1993). *The origins of order: Self-organization and selection in evolution*. New York, NY: Oxford University Press.

- Kauffman, S. (1995). *At home in the universe: The search for laws of self-organization and complexity*. New York, NY: Oxford University Press.
- Kettl, D. F. (2002). *The transformation of governance: Public administration for twenty-first century America*. Baltimore, MD: The Johns Hopkins University Press.
- Kiel, L. D. (1994). *Managing chaos and complexity in government: A new paradigm for managing change, innovation, and organizational renewal*. San Francisco, CA: Jossey-Bass.
- Kiel, L. D. (2014). Complexity theory and its evolution in public administration and policy studies. *Complexity, Governance & Networks, 1*, 71–78.
- Klijin, E.-H., & Koppenjan, J. F. M. (2014 this issue). Complexity in governance network theory. *Complexity, Governance & Networks, 1*, 61–70.
- Knoke, D., & Yang, S. (2008). *Social network analysis* (2nd ed.). Los Angeles, CA: SAGE.
- Koliba, C., Meek, J. W., & Zia, A. (2011). *Governance networks in public administration and policy*. Boca Raton, FL: CRC Press.
- Kooiman, J. (1993). Social-political governance: Introduction. In J. Kooiman (Ed.), *Modern governance: New government–society interactions* (pp. 1–6). London, England: SAGE.
- Koppenjan, J. F. M., & Klijin, E.-H. (2004). *Managing uncertainties in networks*. London, England: Routledge.
- Lynn, L. E., Heinrich, C. J., & Hill, C. J. (2000). Studying governance and public management: Challenges and prospects. *Journal of Public Administration Research and Theory, 10*, 233–261.
- Mitchell, M. (2009). *Complexity: A guided tour*. Oxford, UK: Oxford University Press.
- Morçöl, G. (2001). What is complexity science: Postmodernist or postpositivist. *Emergence: A Journal of Complexity Issues in Organizations and Management, 3*(1), 104–119.
- Morçöl, G. (2002). *A new mind for policy analysis: Toward a post-Newtonian and postpositivist epistemology and methodology*. Westport, CT: Praeger.
- Morçöl, G. (2005). Phenomenology of complexity theory and cognitive science: Implications for development of an embodied knowledge of public administration and policy. *Administrative Theory & Praxis, 27*(1), 1–22.
- Morçöl, G. (2012a). *A complexity theory for public policy*. London, England: Routledge.
- Morçöl, G. (2012b). The micro–macro problem as the core problem of complexity theory of policy processes. In L. Gerrits, P. Marks, & F. Boons (Eds.), *COMPACT 1: Public Administration in Complexity* (pp. 307–322). Litchfield Park, AZ: Emergent Publications.
- Morçöl, G., Vasavada, T., & Kim, S. (2013). Business improvement districts in urban governance: A longitudinal case study. *Administration & Society* (published online before print January 31, 2013, doi: 10.1177/0095399712473985).
- Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge, UK: Cambridge University Press.
- Ostrom, E. (2005). *Understanding institutional diversity*. Princeton, NJ: Princeton University Press.
- Ostrom, E. (2007). Biography of Robert Axelrod. *PS, Political Science and Politics, 40*(1), 171–174.
- Perrow, C. (1986). *Complex organizations: A critical essay* (3rd ed.). New York, NY: McGraw Hill.
- Peters, B. G. (1993). *American public policy: Promise and performance* (3rd ed.). Chatham, NJ: Chatham House.
- Prigogine, I., & Stengers, I. (1984). *Order out of chaos: Man's new dialogue with nature*. New York, NY: Bantam Books.
- Provan, K. G., Fish, A., & Sydow, J. (2007). Interorganizational networks at the network level: A review of the empirical literature on whole networks. *Journal of Management, 33*(3), 479–516.
- Provan, K. G., Huang, K., & Milward, B. (2009). The evolution of structural embeddedness and organizational social outcomes in a centrally governed health and human services network. *Journal of Public Administration Research and Theory, 19*(4), 873–893.
- Provan, K. G., & Kenis, P. (2007). Modes of network governance: Structure, management, and effectiveness. *Journal of Public Administration Research and Theory, 18*, 229–252.
- Rhodes, M. L., Murphy, J., Muir, J., & Murray, J. A. (2011). *Public management and complexity theory: Richer decision-making in public services*. London, England: Routledge.
- Rhodes, R. A. W. (1997). *Understanding governance: Policy networks, governance, reflexivity and accountability*. Maidenhead, UK: Open University Press.

- Richardson, K. A. (2007). Complex systems thinking and its implications for policy analysis. In G. Morçöl, (Ed.), *Handbook of decision making* (pp. 189–222). Boca Raton, FL: Taylor and Francis.
- Richardson, K. A. (2010). *Thinking about complexity: Grasping the continuum through criticism and pluralism*. Litchfield Park, AZ: Emergent.
- Ring, P. S., & Van de Ven, A. H. (1994). Developmental processes of cooperative interorganizational relationships. *Academy of Management Review*, 1, 90–118.
- Sabatier, P. A., & Jenkins-Smith, H. (1993). *Policy change and learning: An advocacy coalition approach*. Boulder, CO: Westview Press.
- Sabatier, P. A., & Weible, M. (2007). The advocacy coalition framework: innovations and clarifications. In P. Sabatier (Ed.), *Theories of the policy process* (2nd ed., pp. 189–220). Cambridge, MA: Westview Press.
- Salzano, M. (2008). Economic policy hints from heterogeneous agent-based simulations. In K. Richardson, L. Dennard, & G. Morçöl (Eds.), *Complexity and policy analysis: Tools and methods for designing robust policies in a complex world* (pp. 167–196). Goodyear, AZ: ISCE.
- Sawyer, R. K. (2005). *Social emergence: Societies as complex systems*. Cambridge, UK: Cambridge University Press.
- Scott, J. (2103). *Social network analysis* (3rd ed.). Los Angeles, CA: SAGE.
- Sharkansky, I. (2002). *Politics and policymaking: In search of simplicity*. London, England: Lynne Rienner.
- Shrestha, M., Berardo, R. & Feiock, R. C. (2014). Solving institutional collective action problems in multiplex networks. *Complexity, Governance & Networks*, 1, 49–60.
- Stewart, J., & Ayres, R. (2001). Systems theory and policy practice: An exploration. *Policy Sciences*, 34(1), 79–94.
- Teisman, G. R., van Buuren, A., & Gerrits, L. (Eds.). (2009). *Managing complex governance systems: Dynamics, self-organization and coevolution in public investments*. London, England: Routledge.
- Torring, J., Peters, G. B., Pierre, J., & Sørensen, E. (2012). *Interactive governance: Advancing the paradigm*. Oxford, UK: Oxford University Press.
- Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications*. Cambridge, UK: Cambridge University Press.
- World Bank (undated). What is governance. Retrieved from <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/MENAEXT/EXTMNAREGTOPGOVERNANCE/0,contentMDK:20513159~pagePK:34004173~piPK:34003707~theSitePK:497024,00.html>. Accessed on February 28, 2014.
- Zia, A. (2013). *Post-Kyoto climate governance: Confronting the politics of scale, ideology and knowledge*. London, England: Routledge.
- Zia, A., Kauffman, S., Koliba, C., Beckage, B., Vattay, G., Bombliès, A. (2014). From the habit of control to institutional enablement: Re-envisioning the governance of social-ecological systems from the perspective of complexity sciences. *Complexity, Governance & Networks*, 1, 79–88.
- Zia, A., Norton, B. G., Noonan, D. S., Rodgers, M. O., & DeHart-David, L. (2006). A quasi-experimental evaluation of high-emitter non-compliance and its impact on vehicular tailpipe emissions in Atlanta, 1997–2001. *Transportation Research Part D*, 11, 77–96.