1 Why Do We Need a Taxonomy in the Study of Networks?

Scholars of the social world are dedicated to the study of the intangible. We give names to things, we create conceptual boundaries in an effort to distinguish these things from other things, and collectively, we attempt to build a body of knowledge about something that has neither weight nor mass. Periodically, it is useful for a field to reflect on this practice. In 1897, Spencer challenged the nascent field of sociology to grapple with whether "society" could be regarded as an entity, distinguishable from other social entities. In this Element, we tackle the same challenge as we attempt to answer this question about the burgeoning literature on networks in the fields of public management and policy.

Networks in Public Management and Policy Studies

The study of networks of public and nonprofit organizations entered the lexicon in the late 1980s and early 1990s. Since that time, a once small community of network scholars has grown into a large, vibrant, and heterodox community. The study of networks in the field of public management and policy has expanded rapidly to encompass a wide array of contexts and phenomena. Among scholars contributing to this growing literature, there seems to be an implicit belief that not all networks are created equal; that "network type" matters in the application of relevant theory as well as the generalizability of results (Brown & Keast, 2003; Keast et al., 2004; Rethmeyer & Hatmaker, 2008; Isett et al., 2011; Kapucu et al., 2014; Lecy et al., 2014). As a result, scholars have sought to differentiate, categorize, and characterize network phenomena using a number of different labels. For example, it might seem reasonable to assume that the theoretical mechanisms and dynamics in contexts labeled as "governance network" will be similar to each other and characteristically different from a context labeled "goal directed network," or "service delivery network." However, most of these characterizations have neither a stable definition of attributes nor a robust theory to illuminate their implications relative to networks that do not conform to these attributes.

We argue the challenge is not the diversity of the phenomenon loosely coupled via a network perspective, nor is the problem the diversity of perspectives brought to bear in explaining networks operating in the public sphere. On the contrary, this diversity is a considerable strength and opportunity in the field. **What is a limiting factor is the lack of a taxonomy allowing scholars to communicate with each other, not to mention with students and policymakers, about this diversity in a manner that allows for the comparison of apples to apples**. This Element is an attempt to classify public management and policy network research into a taxonomy that organizes the many different

network types in use today and differentiates one type from another in a way that allows for the advancement of both theory and practice. Our interest is in classifying variation in the existential nature of the network entities studied in public management and policy and in providing scholars with an empirically verifiable set of delineating characteristics to guide this classification effort.

Proliferation of Network Labels: Defining the Problem

The concept of "a network" has had broad appeal, in part, because it has such intuitive flexibility. Once you start thinking about networks, you will likely not be able to stop yourself from seeing them everywhere. You will see them when you go to the grocery store and think about how your avocado made it from an organic farm in California to a grocery store in North Carolina. You will see them in your workplace in the patterns of alliances that you observe among your colleagues and among departments. You will see them in a morning news story of newly discovered terrorist cells found to be connected to a recent bombing in Syria. You will see them at your child's school as you struggle getting all the different specialists on the same page in developing a coherent plan for your child, who has special healthcare needs. You will see them at the organizing meeting you attend as a volunteer for an environmental group that is trying to address climate change.

The flexibility and broad applicability of network concepts and theories is particularly evident in the range of social contexts represented in scholarship about networks in public management and policy. By context, we are referring specifically to the actual entity being labeled as "a network" – not in the abstract, not metaphorically, but in specific instances. Coupled with this diversity of contexts is a sizable array of lenses and associated labels that scholars use to understand networks. These lenses are anchored in competing root metaphors as well the disciplinary agendas of various network scholars that we will discuss in subsequent sections. Again, neither this diversity of contexts nor the diversity of lenses within which to understand them constitutes a problem. In fact, we see this as a major strength of the field.

The problem is that **we have no taxonomy with which to describe and differentiate different classes of networks outside of the lens we are using to understand it**. This has led to a proliferation of labels delineating "network types," which conflate the lens used to understand the network with the network itself. The field of public management and policy has spawned a plethora of labels for collaborative phenomena. The landscape is littered with labels like interorganizational networks, policy coalitions, whole networks, public management networks, governance networks, policy subsystems, cooperative networks, coordinative

networks, policy formation networks, mixed form governance networks, community coalitions, public–private partnerships, disaster response or emergency management networks, goal-directed networks, cross-sector collaborations, policy implementation networks, collaborative governance regimes (CGRs), and policy networks. Some will remember the 1988 British comedy with Michael Palin (formerly of Monty Python), Jamie Lee Curtis, and Kevin Kline in *A Fish Called Wanda*. It was a wonderful caper movie that featured a much-loved goldfish named Wanda. Many network scholars have their Wanda's. Milward and Provan (2006) have four. Each different from the other based on a label, limited specification, a general description, and an example.

- Information Diffusion Networks: The Global Futures Forum (GFF) is a multinational community limited to governmental intelligence organizations and other governmental organizations focused on foreign, internal, or international security issues that work at the unclassified level to make sense of emerging and future transnational and global security challenges (Wikileaks, 2011).
- Problem-Solving Networks: A Wildfire Incident Command System deals with a predicable problem like wildfires or floods that occur at regular intervals (Moynihan, 2009).
- Community Capacity-Building Networks: The Drug and Alcohol Recover and Education (DARE) network that used cops to teach kids about the dangers of drug use so they would be more likely to resist peer pressure to use them. This network persisted for many years despite mounting evidence that it was ineffective (Frumkin & Reingold (2004).
- Service Implementation Networks: These networks consist of contracts that link a set of service providers to a network administrative organization that acts to govern the network. In economic terms, the network has a joint-production function (Provan & Milward, 1995).

While all four types of interorganizational networks in the Milward and Provan (2006) typology have intuitive appeal such that scholars can put a name with a network, they are by no means unique or mutually exclusive. Each type merely reflects a different function that a network can exhibit, and it is possible to imagine one network that combines all of these functions. A healthcare network could be a service implementation network that links providers to clients. In a pandemic like COVID, it may be called upon to mount a mass vaccination campaign. To encourage vaccination, it may need to diffuse information about the safety and efficacy of the vaccines. In preparing to manage ongoing and future infectious diseases, it will need to work with its network of providers to build community capacity to better withstand the next public health

crisis. Types based on function are illustrative but do not serve to tell us that this network is different or similar in theoretically significant ways relative to other networks.

Other typologies that have sought to offer some organization to the plethora of ambiguously interrelated labels include early typologies by Brown, Keast, Mandell, and colleagues (Brown & Keast, 2003; Keast et al., 2004) who argued networks could be usefully categorized into three types: cooperative, coordinative, and collaborative. However, as pointed out by subsequent scholars (e.g., Lecy et al., 2014), delineation of these types focuses on the nature of interactive processes present and necessary capabilities for enacting these processes. While useful as a diagnostic and for advancing process theories in collective efforts, it is limited in helping us to distinguish one entity from another, as it was hard to imagine a network that only did one of these things at the exclusion of all others.

Similarly, review articles by Isett et al. (2011) and Kapucu et al. (2014) described three main types of networks: collaborative networks, policy networks, and governance networks. The distinguishing feature here being networks that respectively are all policy action (policy networks), all improvement of public good, service or value (collaborative networks), or a mix of the two (governance networks). Like the network named Wanda, this is also a useful heuristic, but in reality, it is unclear how many networks exist in the world that constrains their activities in this way. Based on existing studies there is reason to believe they may be quite rare. There is ample scholarship to suggest that improving public goods/public value often requires policy changes (Foster-Fishman et al., 2007; Pollack Porter et al., 2018) and it is hard to envision many public policy agendas that are not tied in some way to improving public goods or public value. We have yet to see scholarship employing this classification scheme justify its use through any sort of empirical confirmation that the network in question does only one of these activities to the exclusion of the others. Further, even if such delineations were reflective of practice, the theoretical relevance of these qualities is as yet underdeveloped. For example, are the collaborative processes, structures, and capabilities for changing policy through networks fundamentally distinct from the processes, structures, and capabilities needed for improving a public good through networks? Perhaps. However, this seems more reasonable as an empirical question rather than a taken-for-granted assumption that divides a literature.

We Need a New Direction

Our intent is not to litigate the conceptual distinctiveness of the myriad of labels associated with network entities; that ship has sailed. We are not interested in

wading into debates about whether governance networks are different from (Kapucu & Hu, 2020), the same as (e.g., Klijn, 2020), subordinate to (e.g., Kenis, 2016), or superordinate of (e.g., Koliba et al., 2018) collaborative networks. It is our belief that the use of these labels generally offers far more insight into the disciplinary background and research agenda of the author than provides clarity about the delineating characteristics of the entity of interest. Most commonly, scholars (ourselves included) employ a conceptual lens and research interest, say in policy making or collaborative service delivery *through* networks, and subsequently label our focal network in accordance with this interest.

In this way, these labels are failing us. We cannot continue to confuse the entity, itself, with the lens used to understand it. Why? Because we assert there are real, meaningful, and theoretically important differences in the variety of entities labeled as "networks" in the field of public management and policy. Creating a taxonomy of entities that allows for the classification of networks as either unlike or like other entities is an important step forward for a scientific field. This is not a plea for scholars to stop using their preferred labels; rather, **it is a plea for scholars to provide specific information about the delineating characteristics of their entity of interest in conjunction with those labels so we can all get smarter faster.** If we are to advance theories unique to these specific entities, we need to be able to distinguish scholarship and theorizing situated within one network entity from theories and research situated within another. A taxonomy should identify network classes based on clear criteria that can be applied to delineate entities that fundamentally differ from one another in theoretically important ways, and therefore can be presumed to be relatively incomparable. This does not mean that concepts relevant to one class cannot have relevance for another class; only that translation of concepts and theories across classes must be done with careful attention to what makes the classes unique. To abuse our title-track apples metaphor, we need to be able to distinguish scholarship on the apple networks from the scholarship on the orange networks. Equally important, if we are to leverage the interdisciplinary advantages of our field, scholars examining the same network from the perspective of different lenses need to be able to talk to each other (Lemaire et al., 2019). If we are all studying apples but calling them different things, our progress in understanding apples will be slow at best.

Need for a Taxonomy

In the *Architecture of Complexity*, Herbert Simon (1962) argued that hierarchical systems will evolve more rapidly than nonhierarchical systems because

subsystems create stable entities that can be put together to form more complex entities. It is for this reason that disciplines form from aligned subdisciplines comprised of compatible domains of inquiry. While there are downsides to this – requiring fields to be mindful of integration as well as differentiation to avoid ideas clustering into impermeable silos – differentiation is both important and inevitable as complexity increases (Simon, 1946; Lawrence & Lorsch, 1967). Applied in the context of research areas such as the study of networks, taxonomic definitions and categories create the basis for assigning different theoretical mechanisms to different network types, creating a shorthand, such that a network occupying a certain taxonomic category can be assumed to be consistent with the features unique to that category. When the taxonomy is applied correctly, this creates a measure of control for those features within the various types of networks, allowing scholars to better focus on the variables of interest believed to vary within that type. Without a robust taxonomy, the applicability of findings from one network study to another is at best unclear, at worst inappropriate. **The central argument of this Element is that scholarship on networks in public management and policy lacks a theoretically robust taxonomy for meaningfully characterizing and categorizing networks and related phenomen**a; in fact, it lacks any taxonomy.

What Is a Taxonomy?

Smith (2002) argues there are two basic approaches to classification. The first is typology, which conceptually separates a given set of items multidimensionally. The key characteristic of a typology is that its dimensions represent *concepts* rather than empirical *cases.* The dimensions are based on the notion of an ideal type, a mental construct that deliberately accentuates certain characteristics, not necessarily something found in empirical reality (Weber, 1949). As such, typologies create useful heuristics and provide a systematic basis for comparison. Their central drawbacks are categories that are neither exhaustive nor mutually exclusive, are often based on arbitrary or ad hoc criteria, are descriptive rather than explanatory or predictive, and are frequently subject to the problem of reification (Bailey, 1994).

A second approach to classification is taxonomy. Taxonomies differ from typologies in that they classify items based on empirically observable and measurable characteristics (Bailey, 1994, p. 6).

While taxonomies and typologies are both classification structures, the difference lies in the way in which each is developed: empirically (taxonomy) versus conceptually (typology).

A Network Taxonomy

When scholars refer to something as a "network," they should be able to clarify what they mean. A taxonomic definition does not have to be extensive to be clear. "Taxonomic definitions identify the minimum number of properties that are sufficient to demarcate one group of entities from all other entities. Their role is to demarcate the kind of entity to which a label refers, not to express in detail the nature of that kind" (Hodgson, 2019, p. 208). A taxonomic definition that is both parsimonious and clear is the one for mammals. "A mammal is a clade (branch) of animal where the females suckle their young" (Hodgson, 2019, pp. 207–208). While there are many things this definition does not tell us about mammals, there is no danger of confusing a mammal with a reptile. The usefulness of creating these definitions ensures that one person studying a class of network is talking about the same thing as someone else who is studying the same class of network. It should be noted that **it is not the task of a taxonomy to explain why networks work the way they do.**

We start this journey by asserting that **definitional to networks *of any class* are three core conditions:** (1) networks are fundamentally rooted in a relational perspective that considers actors and the nature of their relationships to each other, (2) networks involve at least three actors, and (3) each actor in the network is empowered with a nontrivial degree of agency or autonomy. If the first condition is not true, there is no network to consider. If the second is not true, it is purely a dyadic relation, and network perspectives and theories are likely to have limited relevance. If the third condition is not true, it is a purely hierarchical relationship between actors. While hierarchy is frequently embedded within networks (Koliba et al., 2018; Steelman, Nowell, Velez, and Scott, 2021), most network theories and concepts hinge on the assumption of horizontal interactions between actors who have some degree of autonomy. If relationships are primarily governed through hierarchy, it implies a context better fit to bureaucratic theory rather than network theories and concepts.

Three Taxonomic Classes of Networks

In light of the aforementioned three conditions, we argue the level classification of greatest theoretical import is rooted in the boundaries that delineate the entity being referred to as a network. If we can do this, we can begin to distinguish one network class from another. We focus on the definitional boundaries that constitute networks for three reasons. First, they are empirically verifiable. In order to consider a network of any type, the entity must first be recognized and legitimated as an entity and distinguished from that which is not the network. The qualities that make a network an entity can be subjected to scrutiny, verified,

or challenged by outside observers. Second, the theoretical mechanisms at play under different boundary assumptions are distinct. Concepts and theories developed under one taxonomic class are not likely to transfer to another class without modification. Third, these classes offer theoretically important information about the nature of the network context itself, independent of the lens used to study it, thereby facilitating the comparison of apples to apples.

The taxonomy we propose for all networks conceptualized and studied in public management and policy can be sorted into three taxonomic classes: structural-oriented, system-oriented, and purpose-oriented. Each class has a different theoretical base: structural-oriented networks view the world from a relational perspective with a focus on understanding network effects on individuals and ties; system-oriented networks are theoretically anchored in systems, policy domains, and policy subsystems' perspectives; purpose-oriented networks are theoretically anchored in the social psychological literature on the formation of groups and collective action within organized collectives.

The following are the taxonomic definitions of each class of networks.

Structural-Oriented Networks

Taxonomic Definition: Structural-oriented networks are representations of social structure with arbitrary analyst-imposed boundaries; **these networks are delineated from the other classes in that the collection of actors and their ties are not presumed to represent any higher-order entity**.

Scholars create structural-oriented networks by applying graph analytic techniques (i.e., social network analysis) to a sample population of nodes to understand the consequences of social structure for either nodes or ties. Structural**-oriented studies of networks are either egocentric or dyadic in nature.** The delineation between these two subtypes is whether the theoretical focus is on the node or edge (or both). Nodes refer to actors within a network that have agency to make or delete ties. Edges refer to ties between actors on some predefined relationship (e.g., friendship, communication, advice giving). In **dyadic** studies, networks are conceptualized and delineated in terms of aggregates of their most fundamental unit of measure – the characteristics of a relationship of one actor to another actor in a population of interest. Key questions within this class of research focus on explaining variation in partner selection (who interacts with whom and why) and the quality and nature of ties (e.g., for review, see Sicilliano et al., 2021. Studies of patterns of diffusion of innovation through networks are a common example of this type of network research (e.g., Damanpour, 1991).

The second type of structural-oriented networks is ego networks. In this type, networks are conceived of as attributes of actors, often viewed as strategic assets that can be manipulated and organized by the actor in pursuit of their objectives. Burt's (1995) structural hole theory is a modern and methodologically sophisticated example. It can explain managers' promotions (Burt, 1995), their creativity (Burt, 2004), and the formation of interlocking directorates (Burt, 1995). This kind of theory is advanced by demonstrating its broad applicability, its scope conditions, and contingencies (Burt, 1997). These networks can also be viewed as a source of constraint for an actor, reinforcing specific norms, values, and ideas and serving to create a redundancy of information exchange (e.g., Coleman, 1988; Burt, 2001). Egocentric and dyadic structural-oriented networks are discussed in depth in Section 3.

System-Oriented Networks

Taxonomic Definition: System-oriented networks are networks for which **the network and its boundaries are a reflection of analyst-imposed decision rules presumed to delineate the relevant population of actors, and their relations, associated with some system of interest**.

Systems of interest generally refer to a system for managing some issue of public concern or public policy. For example, systems for managing watersheds, responding to domestic violence, reducing teen pregnancy, or delivering health care to a given population of individuals are all systems of interest for which system-oriented network studies have been conducted. These networks are defined and literally brought into being by a network analyst – the person who conceives of the network – and do not have an agreed-upon identity outside of the imaginings of the analyst. The network analyst may be a scholar, policy maker, or practitioner. Laumann et al. (1983) referred to these networks as nominalist networks, stating that "Here, the analyst self-consciously imposes a conceptual framework [of the network] constructed to serve his or her own analytic purposes" (p. 66). The network analyst does this by way of applying implicit or explicit decision rules that define who is and is not relevant to the system of interest and subsequently, to the network. As such, issues of boundary specification within the use and study of system-oriented networks are particularly paramount as different analysts, policy makers, or practitioners may look at the same system and yet conceive of the relevant network of actors quite differently (Nowell et al., 2018). Issues of boundary specification in system-oriented networks are discussed in Section 4.

Purpose-Oriented Networks

Taxonomic Definition: Purpose-oriented networks are networks that have self-actualized as entities by meeting the criteria of **being bounded, self-referencing collectives comprised of actors who consciously affiliate to the collective around some shared purpose**. A network is bounded when members can reliably identify other members and distinguish them from nonmembers. A network is self-referencing when it gives itself a name and gains a collective identity as an entity associated with its stated purpose.

While each actor in a purpose-oriented network will have their own portfolio of unique interests, ambitions, and motivations for affiliating with the collective, there is some common sense or recognition of a shared purpose for why the collective exists. As such, the purpose-oriented network is **sociologically real** to its members. By this, we mean that **purpose-oriented networks have established a shared identity**, **and members both endorse their affiliation with this shared identity** and **have a means by which they can reliably identify other members and distinguish them from nonmembers.** This shared identity is generally based around some articulation of a concern. Burns and Stalker (1961) described "a concern" as the focus around which purposeful organizing occurs. In order for an organization to exist, there must be a shared concern or purpose around which organizing occurs. In the same way, in order for a network to be self-referencing, a concern must also exist as this concern or purpose is the reason for both affiliation and organizing. Further, members must have instituted some type of forum for convening members around the concern.[1] Examples of these kinds of networks include a Firewise Council comprised of public and private landowners and other stakeholders who meet regularly to identify actions to improve wildfire resilience of their community or a community collaborative comprised of representatives of organizations and agencies who serve the homeless population who meet regularly to share information and identify service gaps and redundancies.

In the following sections, we present this taxonomy in detail and apply it as an organizing framework to help bring greater clarity and definition to the current literature of networks in public management and policy. In Section 2, we begin by tracking the intellectual lineages that have shaped the current approaches and agendas that define the study of networks within the field. We examine the disciplinary lenses that have come to inform our different assumptions and approaches in studying networks. In Sections 3–5, we take a deeper look at each of these three classes of networks with a focus on the network literatures most

[1] For additional discussion on purpose-oriented networks, see Carboni et al., 2019