Policy and Society

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rpas20

Taming the snake in paradise: combining institutional design and leadership to enhance collaborative innovation

Jacob Torfing , Daniela Cristofoli , Peter A. Gloor , Albert J. Meijer & Benedetta Trivellato

To cite this article: Jacob Torfing , Daniela Cristofoli , Peter A. Gloor , Albert J. Meijer & Benedetta Trivellato (2020): Taming the snake in paradise: combining institutional design and leadership to enhance collaborative innovation, Policy and Society, DOI: 10.1080/14494035.2020.1794749

To link to this article: https://doi.org/10.1080/14494035.2020.1794749

Published online: 23 Jul 2020.

POLICY AND SOCIETY
https://doi.org/10.1080/14494035.2020.1794749

Routledge
Taylor & Francis Group

ARTICLE

OPEN ACCESS Check for updates

Taming the snake in paradise: combining institutional design and leadership to enhance collaborative innovation

Jacob Torfing[a], Daniela Cristofoli[b], Peter A. Gloor[c], Albert J. Meijer[d] and Benedetta Trivellato[e]

[a]Department of Social Sciences and Business, Roskilde University, Roskilde, Denmark; [b]Department of Business Administration and Law, Universita Degli Studi Di Milano Bicocca, Milan, Italy; [c]MIT Center for Collective Intelligence, Cambridge, MA 02142, USA; [d]School of Governance, Utrecht University, Utrecht, Netherlands; [e]Department of Sociology and Social Research, Università degli Studi di Milano-Bicocca, Milan, Italy

ABSTRACT

The growing expectations to public services and the pervasiveness of wicked problems in times characterized by growing fiscal constraints call for the enhancement of public innovation, and new research suggests that multi-actor collaboration in networks and partnerships is superior to hierarchical and market-based strategies when it comes to spurring such innovation. Collaborative innovation seems ideal as it builds on diversity to generate innovative public value outcomes, but there is a catch since diversity may clash with the need for constructing a common ground that allows participating actors to agree on a joint and innovative solution. The challenge for collaborative innovation – taming the snake in paradise – is to nurture the diversity of views, ideas and forms of knowledge while still establishing a common ground for joint learning. While we know a great deal about the dynamics of the mutually supportive processes of collaboration, learning and innovation, we have yet to understand the role of institutional design and leadership in spurring collaborative innovation and dealing with this tension. Building on extant research, the article draws suitable cases from the Collaborative Governance Data Bank and uses Qualitative Comparative Analysis to explore how multiple constellations of institutional design and leadership spur collaborative innovation. The main finding is that, even though certain institutional design features reduce the need for certain leadership roles, the exercise of hands-on leadership is more important for securing collaborative innovation outcomes than hands-off institutional design.

KEYWORDS

Governance networks; collaborative governance; leadership; institutional design; innovation

1. Collaborative innovation and the snake in paradise

Until recently, 'public innovation' was considered as an oxymoron. Fortunately, new research has demolished the longstanding myth that juxtaposes an innovative and dynamic private sector with an ossified public sector trapped in red tape, lack of incentives and centralized control (Mazzucato, 2013). The public sector is much more

CONTACT Jacob Torfing jtor@ruc.dk Department of Social Sciences and Business, Building 25.2, Roskilde University, Universitetsvej 1, PO Box 260, 4000 Roskilde, Denmark

innovative than its reputation, and persistently explores and exploits opportunities for developing and implementing new ideas that disrupt common wisdom and established practices at the level of service production, public policy and societal problemsolving (Borins, 2014).

In the last decade, there has been a growing interest in spurring public innovation. Globalization and the rapid development of new disruptive technologies force governments to find new ways of tackling unforeseen problem situations but also create new opportunities (Farazmand, 2009). Cross-pressure between the growing service expectations of increasingly affluent citizens and the increasingly scarce public resources makes it difficult to make ends meet without developing and implementing smarter public solutions (Torfing, 2019). Wicked and unruly problems such as climate change, obesity epidemics, inner-city decay cannot be solved by existing standard solutions, but call for out-of-the-box thinking and the creation of new and bold solutions (Ansell & Torfing, 2014; Crosby, Hart & Torfing, 2017; Hofstad & Torfing, 2017; Meijer, 2019; Seid et al., 2018).

Given the growing pressure on governments to enhance public innovation, it is important to bear in mind that innovation is not a goal in itself, but a means to enhance the production of public value (Osborne & Browne, 2011). Indeed, to avoid a blind pursuit of innovation for the sake of innovating, we should remember that public innovation is not always called for as continuous improvements are sometimes enough to deal with emerging problems and challenges. Moreover, the failure rate of innovation projects is often high and the outcome is not always desirable and might even be catastrophic in particular fields such as traffic regulation, nuclear safety and pension systems.

Still, when incremental changes are deemed insufficient to tackle complex problems, respond to societal challenges and take advantage of new opportunities, public organizations must be agile, future-oriented and ready to manage the risks associated with innovating their policies, services and organizational support systems. There are spectacular examples of innovative political leaders (Polsby, 1984) and public entrepreneurs (Doig & Hargrove, 1990; Roberts and King, 1996), inspiring reports about innovative solutions provided by private contractors (Edquist & Hommen, 1999), and strong cases of user-driven innovation (Bisgaard & Høgenhaven, 2010; Von Hippel, 1986). Nevertheless, recent research bids farewell to the idea of the hero innovator (Meijer, 2014; Sørensen & Torfing, 2011) and highlights the fact that public innovation is often a result of teamwork and collaborative efforts in networks, partnerships and swarms of public and private actors (Ansell & Torfing, 2014; Gloor, 2006; Hartley, 2005). Entrepreneurial leaders may play a key role in collaborative settings, but innovation leadership is often collective, distributed and shared (Bernier & Hafsi, 2007; Meijer, 2014).

The idea that multi-actor collaboration can spur innovation is well supported by innovation system theory (Freeman, 1991; Gloor, 2006; Hekkert et al., 2007) and theories of public innovation (Bommert, 2010; Gieske, Buuren and Bekkers, 2016; Hartley, Sørensen and Torfing, 2013). Arguments in favor of collaborative innovation include the idea that multi-actor collaboration helps to produce a more precise and nuanced understanding of the problem at hand, bring forth a greater richness of ideas, stimulate mutual learning, facilitate negotiated risk management, build joint ownership over new

and bold solutions, enable coordinated implementation and adaptation, and accelerate the diffusion of successful innovations (Torfing, 2016).

Collaborative innovation is a complex and risk-prone process, but when successful, it may spur the production of public value (Trivellato et al., 2019). Indeed, the focus on public value creation is a game-changer since it reveals that a broad range of public and private actors can contribute to public value production and thus might be invited to participate in collaborative processes aiming to enhance public innovation (Alford, 2010; Sørensen & Torfing, 2019). The snake in paradise, however, is that while innovation thrives on diversity and the disruption and learning derived from the clash between different views, ideas and forms of knowledge, collaboration is often predicated on a high degree of commonality between the actors that makes it easier to get along (Torfing, 2018). Finding a common ground for a diversity of actors to communicate with each other and deal constructively with their differences is therefore of key importance to collaborative innovation since there is a constant tension between the diversity that is needed for creative problem-solving, and the construction of the common ground that is needed to actually realize the innovation (Bassett-Jones, 2005; Gray, 1989). This tension needs to be dealt with through a combination of institutional design and leadership in order to reap the fruits of collaborative innovation. In short, the snake in paradise needs to be tamed.

Some researchers have focused on the structural properties of collaborative networks and shown how participatory diversity, which enhances expansive learning, and network density, which facilitates alignment, spur public innovation in the field of urban planning (Dente, Bobbio & Spada, 2005). Other scholars have focused on the basic organizational capacity for collaborative innovation (Gieske et al., 2016; Meijer, 2019). An important part of this research looks at the role of institutionalization (De Vries et al., 2016; Meijer, 2019) and institutional design (Ansell & Gash, 2018) that has also been a major theme in theories of network governance (Koppenjan & Klijn, 2004; Skelcher, Mathur & Smith, 2005; Sørensen & Torfing, 2016, 2009). Institutional design refers to the rules, norms and procedures that enable and constrain collaborative interaction and the search for and implementation of innovative solutions. Recent research shows that the design of collaborative chronic care network enhanced collaboration and resulted in innovation (Seid et al., 2018), but the empirical evidence gathered from single case studies must be further strengthened through comparative case studies.

While institutional design aims to shape the arena for collaborative innovation, the exercise of leadership aims to promote, encourage, support and facilitate collaboration and to stimulate transformative learning and creative problemsolving (Sørensen & Torfing, 2011; Crosby, Hart & Torfing, 2017). Public leaders may play different roles in processes of collaborative innovation (Ansell & Gash, 2012; Cristofoli, Trivellato & Verzillo, 2019; Trivellato et al., 2019). Sponsors and champions provide support, resources and a 'license to innovate' and stewards help to protect the integrity of the process. Conveners bring actors together, facilitators promote collaboration, and mediators aim to solve or mitigate the impact of conflicts. Finally, catalysts aim to disrupt the collaborative and cognitive processes in order to get the actors to think out of the box. A new empirical study shows that public leaders play a key role in creating and absorbing knowledge, integrating different forms of knowledge to create new insights and ideas, and reconfiguring knowledge to take into account new developments and events

(Trivellato et al., 2019). Another recent study reveals that 'rotating leadership', whereby leaders alternate between having central or more peripheral positions in teams and networks, play a key role in enhancing and mobilizing 'swarm intelligence' (Antonacci et al., 2017). These results attest to the importance of a leadership and its transformative and distributive character.

Despite recent achievements, we need a much deeper understanding of the role of institutional design and leadership as approaches for dealing with the tension between innovation-enhancing diversity and the common ground that is needed to foster collaboration, agreement and joint solutions. Previous studies have tested the independent impact of different factors on collaborative outcomes (Provan & Milward, 1995; Turrini et al., 2010), but we need to study the effects of competing constellations of factors in order to understand how the presence and/or absence of different factors combine to produce successful outcomes such as collaborative innovation (Raab, Mannak, & Cambré, 2015).

Research on network performance shows that the outcomes of collaborative networks are positively affected by resource munificence, a centralized and integrated network structure, formal and informal coordination mechanisms, and network management (Cristofoli et al., 2014, 2015; Cristofoli and Markovic, 2015; Provan and Milward, 1995; Raab et al., 2015). While this finding suggests that features associated with hierarchical governance are crucial for enhancing effectiveness and efficiency of collaborative networks in the field of policy and service delivery, a different set of factors may be conducive for the production of collaborative innovation based on mutual learning and creative problem-solving in distributed networks of relevant and affected actors.

To further advance the research on the conditions for collaborative networks to produce innovative public value outcomes, we ask the following question: *How do different forms of institutional design and leadership combine to produce pathways to collaborative innovation of public value?* To answer this question, we will use a Qualitative Comparative Analysis (QCA) of 32 cases from the Collaborative Governance Data Bank. This article first provides a brief account of the theoretical framing of the empirical analysis in order to justify the causal links between conditions and outcomes. We then present the methodological background for and steps in the Qualitative Comparative Analysis (QCA) that allows us to identify necessary and sufficient conditions for the emergence of successful collaborative innovation outcomes. The Methods section is followed by a presentation and discussion of our empirical findings. The conclusion summarizes the argument and lists a number of future research avenues.

2. Institutional design and leadership as preconditions for collaborative innovation

Collaborative innovation denotes a particular strategy for enhancing innovation. Innovation in itself is defined as the development and implementation of new solutions that break with the dominant ideas and practices in a particular context (Hartley, 2005; Torfing, 2018). Collaboration involves a plethora of public and/or private actors in a joint effort to transform the state of affairs through sustained interaction based on dialogue, contestation and agreement (Gray, 1989). Relations of interdependency and the hope that mutual exchange of experiences, ideas and resources will bring forth new and better

solutions to common problems or challenges will tend to keep the actors together, despite the presence of diverging interests, ideas and forms of knowledge. Diversity may help to prevent the development of 'tunnel vision' and 'group think' and thus spur disruptive learning and innovation. However, some studies find that there is a reverse U-shaped relation between partner diversity and innovative step change: diversity can both be too low and too high (Leeuw, Lokshin, & Duysters, 2014). In order to prevent diversity from resulting in either destructive conflicts or a dialogue of the deaf a certain degree of alignment between the diverse partners is needed. Requisite alignment can be secured by a well-designed and facilitated face-to-face interaction between the partners that over time will help to build trust, empathy and mutual understanding that in turn will facilitate creative problemsolving and the fostering of a joint agreement on bold solutions (Dente, Bobbio and Spada, 2005).

Recent research claims that collaborative innovation has a comparative advantage over hierarchical and market-based innovation strategies (Bommert, 2010; Roberts, 2000; Torfing, 2016). Hierarchical innovation strategies authorize a small group of top-level value-driven decision makers to deal with a particular problem and come up with a swift solution that is implemented downwards through the chain of command and draws on centrally allocated resources. However, the quality of the innovative solution will tend to suffer from the failure to solicit input from relevant and affected actors. Hence, the solution may not hit the target and solve the problem at hand because the problem definition is inadequate, the solution reflects the dominant leadership discourse, and its feasibility is low. These problems are partly solved by market-based innovation strategies that involve a large number of competing and incentivized actors in the design of innovative solutions and allow them to question the solutions preferred by established authorities. The winner of the competitive race gets to design the innovative solution and receives a reward from the government and/or newly won customers. However, while competition may spur innovation, it tends to hamper innovation by preventing knowledge sharing and information exchange and wasting valuable resources on rivalry and parallel investments in research and development. Collaborative innovation both mobilizes the wisdom of the crowd and ensures exchange of knowledge, ideas and resources in the joint search for new and better solutions. Moreover, it transgresses the organizational boundaries of the public bureau and private firm by inviting all actors that possess relevant innovation assets such as experience, ideas, resources and courage to participate in the collaborative innovation process (Bommert, 2010).

The advantage of collaborative innovation is accompanied by a series of potential obstacles. It may prove difficult to motivate relevant and affected actors to participate, the transaction costs associated with prolonged interaction are often considerable, the participants may have a hard time communicating with and understanding each other due to their different vantage points and vocabularies, and destructive conflicts may prevent joint dialogue, learning and the fostering of agreement. Moreover, the actors may be risk-averse in the face of disruptive innovations and implementation of new solutions in loosely coupled networks tends to be tricky due to the absence of stable rules, a clear division of labor, and the absence of hierarchical control (O'Toole, 1997). Fortunately, institutional design and leadership may help to overcome these problems and spur collaborative innovation by creating a framework for empowered participation and

sustained collaboration and facilitating alignment, learning and join decision-making (Torfing, 2016).

Alexander defines institutional design as 'the devising and realization of rules, procedures, and organizational structures that will enable and constrain behavior and action so as to accord with held values, achieve desired objectives, or execute given tasks' (Alexander, 2005, p. 213). This definition covers the various accounts of institutional design advanced by different strands of the new institutionalism (Peters, 2012). At a more concrete level, institutional design involves the selection of participants, the creation of a regulatory framework for collaborative interaction, and the formation of procedures for making and tracking joint decisions and their outcomes.

Leadership in public organizations is normally defined as the attempt to achieve a particular set of goals with and through others by means of influencing their motivation, steering their attention, and directing their efforts (Jensen et al., 2019). In the context of collaborative innovation, this type of directional leadership is less pronounced. Hence, leadership has to be re-conceptualized as the adaptive activities to bring actors together, create trust, enhance information sharing, facilitate collaboration, spur mutual learning, manage risks, and track results (Crosby & Bryson, 2010; Morse, 2010, Silvia & McGuire, 2010). Such leadership activities are often performed collectively, distributed among several actors or shared between a group of actors appointed by the key partners in the collaboration (Bolden 2011; Ospina, 2017; Meijer, 2014; Provan & Kenis, 2008). In principle, leadership can be performed by both public and private actors, but the public actors often have an advantage as they have the centrality, authority, resources and organizational backup needed to lead collaborative innovation.

While we know a great deal about how institutional design and leadership affect the ability of collaborative networks to coordinate and provide public services in an effective manner, we know much less about how institutional design and leadership of collaborative networks enhance innovation. In order to deepen our understanding of how different combinations of institutional design and leadership support processes of collaborative innovation and produce successful outcomes, we shall first make the following conjectures.

First, concerning the role of institutions, we expect clarity of the rules governing interaction, and transparent procedures for decision-making to enhance collaborative innovation. Clarity of rules enhances collaborative innovation because it helps to reduce uncertainty and tensions and to build trust in the fairness of the collaborative process and the ability of the participants to influence the more or less innovative outcomes of the collaborative process (see the literature on rules in networks: Klijn, 2001; Koppenjan & Klijn, 2004; Ostrom, Gardner, Walker, & Walker, 1994). Finally, transparent decision-making is also conducive for collaborative innovation as it helps to ensure fairness and accountability and thus prevent that the collaborative arena is captured by a small group of actors aiming to further their own interests at the expense of other actors or the wider community (see the literature on the importance of transparency: Hood & Heald, 2006; Klijn & Koppenjan, 2014).

Second, as hinted above, leadership may assume different roles that help initiating and sustaining collaboration and stimulating innovation (Crosby and Bryson, 2010; Morse, 2010, Silvia and McGuire, 2010). The most proactive leadership roles supporting collaborative innovation are: 1) the convener role that aims to bring relevant and affected

actors to the table by means of clarifying and emphasizing the interdependence, aligning their goals and building relations of trust in the face of diverging interests; 2) the stewardship role that seeks to protect the collaborative process from external pressures and attempts to either undermine or highjack the process and thus makes it worthwhile for potential participants to spend time and energy on the collaborative endeavor to spur innovation; 3) the mediator role that helps resolving or mediating conflicts by creating boundary objects, acting as a translator between actors with different views and vocabularies and establishing a common ground for creating problem-solving; and 4) the catalyst role that stimulates innovation by inviting new actors into the process, soliciting new and disruptive knowledge, and advancing different forms of risk management. These different leadership roles may be applied in different parts of the collaborative innovation process, but since such processes are often complex and chaotic and full of overlaps, jumps and iterations, they may also be used simultaneously.

On the basis of this summative review, two institutional design conditions (namely, clarity of rules and/or transparency of decision-making) and four leadership roles (acting as a convener, steward, mediator, and/or catalyst) emerge as conducive to collaborative novel solutions. Extant studies suggest that institutional design and leadership factors may complement each other and jointly spur collaborative innovation since they provide a way to deal with the challenge of generating diversity and establishing a common ground (Ansell & Torfing, 2014; Sørensen; Torfing, 2016, 2016). Theoretically, we expect that institutional rules provide a basis for dealing with this tension, but in the absence of these rules leadership will be needed to manage this tension.

Consequently, we embrace the idea that it is a combination of institutional design conditions and leadership roles produce successful collaborative innovation outcomes and to deal with the tension between nurturing the diversity of views, ideas and forms of knowledge while aiming to establish a common ground for joint learning ('taming the snake in paradise'). We expect that each of these institutional design and leadership conditions individually is necessary for collaborative innovation outcomes to occur. What remains to be explored is how these factors combine, and which combinations are sufficient to sustain collaborative innovation and produce public value.

3. Research methods

In order to explore how institutional design conditions (clarity of rules and/or transparency of decision-making) and leadership roles (acting as convener, steward, mediator and/or catalyst) can differently combine, and which combinations can simultaneously lead to novel solutions, we studied 32 collaborative innovation networks drawn from the Collaborative Governance data bank.

In the following, we will first describe the empirical setting and briefly elaborate on the Collaborative Governance data bank. Secondly, we will present fuzzy-set QCA (fsQCA) as the analytical tool employed in this study. Thirdly, we will describe the criteria we used for the operationalization and calibration of conditions.

3.1 Empirical setting and data collection

The data used in this study originate from the Collaborative Governance Data Bank. As explained in the introduction to this Special Issue, the Collaborative Governance Data Bank purports to 'provide a collective repository for collaborative governance case studies from around the world. The mission of the repository is to foster rich but systematic medium and large-N analysis of the conditions, processes, and outcomes of collaborative governance'. In this sense, all cases included in the data bank are examples of collaborative governance, defined as 'a collective decision-making process based on more or less institutionalized interactions between two or more actors that aims to establish common ground for joint problem solving and value creation'. The cases are drawn from different countries and different policy domains. At the date of the study, the data bank included 39 cases of collaborative governance.

For the purposes of our study, we focused on the collaborative governance cases that featured innovation being an objective. This led to exclude two cases from the analysis because the creation of innovative solutions was not among the drivers of the collaboration. Next, we further excluded five cases where data were not sufficiently reliable or were missing. These considerations led us to exclude seven cases from the analysis, which left us with 32 cases.

All the 32 selected cases are cases of collaborative innovation, which is defined as offering 'an alternative approach to innovation that is particularly suited to the public sector. The public sector aims to produce public value, and both public and private actors (including service users and citizens) can contribute to the production of public value and are likely to be motivated to collaborate in its pursuit' (Torfing, 2019, p. 2). These collaborations take place in several countries in Europe, North America, East Asia and Australasia, different policy domains (including agriculture, culture, environment, health, infrastructure, security, social employment, etc.), and at various jurisdictional level (local, regional, national, supranational, cross-border, multilevel). Table 1 displays the characteristics of the selected collaborative innovation cases in terms of country, policy domains and jurisdictional level at which the collaboration takes place. In the Appendix, a list of cases is provided.

Table 1. Overview of the collaborative innovation cases.

Jurisdictional level	Policy domains *	Countries
Local (12)	Agriculture (2)	Australia (3)
Regional (5)	Culture (6)	Canada (1)
National (4)	Economy Trade (2)	Colombia (1)
	Education (4)	Denmark (1)
Local & Multilevel (1)	Environment (14)	Germany (1)
Local & Regional (5)	Infrastructure (5)	Vietnam (1)
Local, Regional & National (2)	Health (6)	Italy (1)
Local, Regional & Multilevel (1)	Security (5)	Netherlands (10)
Local, Regional, National & Multilevel (1)	Social Employment Planning (8)	Norway (1)
Local, Regional, National, Cross-border & Supranational (1)	Technology/Transport (1)	Sweden (1)
		USA (11)

Number of cases in parenthesis

* More than one policy domains is possible for each case

Table 2. Data collection.

Number of cases	Data collection
12	Documents and Interviews
10	Documents and Interviews and Observations
3	Documents and Interviews and Survey
4	Documents and Interviews and Observations and Survey
1	Interviews and Observations
1	Documents and Survey

The data result from an extensive process of collection and analysis conducted by the researcher who provided data. As Table 2 shows, multiple data collection methods were used to collect data for each case, including documentary analysis, interviews, surveys and participant observation. This allowed to triangulate information and provide more reliable data.

A scale from 1 to 5 was used to provide data for each item included in the data bank.

We chose to focus on data related to the middle of the period observed. The main criterion for case selection was that innovation should be an objective of the collaboration, as previously explained: we chose those cases that had such objective (at least) in the middle of the period observed because of the following reasons. The choice of the start of period may have been misleading, because collaborations may not have innovation as an explicit objective at the outset, but may develop it over time as relationships consolidate and the terms of the collective aims become clearer. Similarly, the choice of the end of period may have been misleading, as this might coincide with a stage of the collaboration where partners move to other priorities and innovation is not an explicit objective anymore (possibly also because it has already been implemented). In summary, choosing the middle of the period appears to be the most comprehensive option, that is the least likely to leave out cases which indeed had innovation as an objective of the collaboration. As a consequence, the middle of period of measures were used for all the conditions throughout the paper.

3.2 Fuzzy-set QCA

In order to explore how multiple combinations of factors (or configurations of conditions, in QCA parlance) can produce the expected outcome, we chose to employ the fuzzy-set Qualitative Comparative Analysis (fsQCA) (Ragin, 2000).

QCA is a set-theoretic method, based on a few basic principles (Ragin, 2000; Schneider & Wagemann, 2012). First, it conceives the conditions and the outcome as a set. Cases are therefore assigned as members or nonmembers of a set (the process of assigning cases in a set is labelled 'calibration'), and the effect of each individual causal condition is measured as set membership. Secondly, the relationships between conditions and outcome are explored through a set theoretic analysis of subset relations, thus assuming interconnection among conditions as the rule rather than the exception (Ragin, 2008). Thirdly, results coming from a set-theoretic method shed light on the existence of causal complexity. Causality is complex because of conjunctural causation (i.e. conditions combine to produce an outcome), equifinality (i.e. there may be more than one pathway to a given outcome), and asymmetry (i.e. the same outcome may be produced by the presence as well as the absence of a certain condition, depending on its combination with other conditions) (Misangyi et al., 2017; Ragin, 2008). Last but not least, the shift to set-subset relationships

allows researchers to explore necessity and sufficiency in causal relationships: conditions are necessary for those situations where each time the outcome is present, the condition is also present; conditions are sufficient in those situations where each time the condition is present, the outcome is also present. In this perspective, in contrast with conventional regression approaches, which focus on the net effects of individual independent variables (conditions in QCA parlance) on an outcome, QCA allows to identify multiple causal 'recipes' (Ragin, 2000, 2008) simultaneously associated with an outcome. In our case, this corresponds to identify multiple combinations of institutional design conditions and leadership behaviors that simultaneously produce innovative solutions. In this perspective, it is apparent how the QCA approach is particularly well suited to our study.

On top of it, QCA is particularly apt to analyze medium-N samples, like the one in our study (Ragin, 2009).

In this work, we adopt fuzzy-set QCA (fsQCA) (Ragin, 2009), which allows researchers to calibrate partial membership in sets using values in the interval between 0 (non-membership) and 1 (full membership). In this way, 'fsQCA allows to include more information in the analysis, distinguishing between differences among cases both in kind and in degree. This results in a higher content validity' (Schneider & Wagemann, 2012; Warsen et al., 2019, p. 6).

3.3 Operationalization and calibration

In order to determine the cases' membership in the sets representing the outcome and the conditions, a process of 'calibration' is needed; this requires the identification of thresholds (or 'anchors') that allow us to distinguish which cases can be considered to be fully in or fully out of the set under consideration, and the cross-over point of maximum ambiguity regarding membership of a case in the set of interest (Greckhamer, Furnari, Fiss, & Aguilera, 2018). Empirical and theoretical knowledge of the cases are relied upon to define these anchors (Ragin, 2000, 2008).

Conditions and outcomes originate from the Collaborative Governance Data Bank. Table 3 displays the items of the collaborative data bank used to measure each condition and the outcome.

As mentioned above, the anchors for calibration should be determined to the extent possible on the basis of theoretical and/or empirical knowledge (Ragin, 2000, 2008). However, given the characteristics of our dataset, and given that we have no theoretical and/or contextual reason to support another calibration, we decided to use properties of our sample to determine the anchors (as done, e.g. by Greckhamer, 2016). In order to identify the thresholds for the calibration, we, therefore, relied on Tosmana,[1] a software often used for QCA which provides a threshold-setter. This can be used to set and adapt thresholds while viewing the data distribution, and may, therefore, assist in finding the correct thresholds in the calibration process of a QCA (Cronqvist, 2003). We adopted the thresholds suggested by the threshold-setter. Table 4 below lists the thresholds we adopted for the calibration of the conditions and of the outcome.

[1]Cronqvist, Lasse. (2017). Tosmana [Version 1.6]. University of Trier. Internet: https://www.tosmana.net.

Table 3. Operationalization of conditions and outcomes.

Conditions and outcome	Items from the data bank (Likert scale from 1 to 5)	Label in the QCA analysis
Clarity of rules	24. To what extent were the procedural ground rules for the collaboration clearly explicated by and for the participants? (1 = Very little articulation of ground rules, 5 = Very detailed articulation)	CLA
Transparency of decision-making	27. To what extent were the decision-making processes in the key collaborative forums transparent? (1 = Rarely clear to participants how decisions were taken, 5 = Almost always clear)	TRASP
Convener	32. To what extent was the leadership effective in convening/bringing together the relevant and affected actors (1 = Highly ineffective, 5 = Highly effective)	CONV
Steward	33. To what extent was the leadership effective in guarding the focus and integrity of the collaborative process intended in this case? (1 = Highly ineffective, 5 = Highly effective)	STW
Mediator	34. To what extent was the leadership effective in resolving or mitigating conflicts between actors? (1 = Highly ineffective, 5 = Highly effective)	MED
Catalyst	35. To what extent was the leadership effective in creating and realizing concrete opportunities for creative problem-solving resolving? (1 = Highly ineffective, 5 = Highly effective)	CAT
Innovative solutions	55.3. To what extent did the collaboration produce the following outputs or outcomes? Create innovative solutions in existing policies, programs, practices (1 = Very low, 5 = Very high).	INNSOL

Table 4. Calibration of conditions and outcome.

Conditions and outcome	Full non-membership	Crossover point	Full membership
CLA	2	3	4
TRASP	2.75	3.5	4.25
CONV	2.75	3.5	4.25
STW	2	3	4
MED	2	3	4
CAT	2	3	4
INNSOL	2	3	4

4. Findings from the qualitative comparative analysis

In order to perform the fsQCA, we used the fs/QCA 2.5/3.0 software (Ragin, 2006).[2] As recommended, we first performed an analysis of necessity in order to explore the presence of conditions that are necessary for the outcome. A condition is necessary when each time the outcome occurs, the condition is also present (Ragin, 2006). Secondly, we performed an analysis of sufficiency in order to identify conditions, or combinations of conditions, that are sufficient for the outcome occurrence. A condition is sufficient when each time the condition is present, the outcome is also present (Ragin, 2006).

4.1 Analysis of necessity

The first step in the QCA procedure is to perform an analysis of necessity. The aim is to ascertain whether any of the conditions are necessary for causing the outcome, or whether the outcome occurs only when one of the conditions is present. This implies looking, first, at the conditions' consistency scores, which measure the degree to which

[2]Ragin & Davey. 2014. Fs/QCA (Computer Program), Version (2.5/3.0). Irvine, CA: University of California.

the cases support the following rule: the more cases that fail to meet this rule for necessary conditions, the lower will be the consistency score (Ragin, Drass, & Davey, 2006). The commonly accepted consistency threshold is 0.9 (Schneider, Schulze-Bentrop, & Paunescu, 2010): any condition featuring consistency scores above this score, in their presence or absence, should be subject to closer scrutiny, as a possibly necessary condition for the outcome to occur. Secondly, the coverage scores need to be taken into consideration. The coverage for necessary conditions may be interpreted as a measure of the relevance of a necessary condition, with high values indicating relevance, and low values indicating trivialness. As a consequence, relevant necessary conditions should not only pass the consistency test but should also display a high coverage. On the other hand, given that coverage measure for necessity captures only one source of trivialness, a better approach to evaluate the relevance of necessary conditions involves also computing the Relevance of Necessity (RoN) parameter (Schneider & Wagemann, 2012).

Table 5 above shows that no conditions can be considered as necessary for the outcome, as the consistency threshold is below the 0.9 scores. Further considerations about the coverage values or the RoN parameter are then not required. Hence, neither any of the design conditions nor any of leadership conditions are necessary for the production of collaborative innovation outcomes.

4.2 Analysis of sufficiency

The subsequent step involves performing an analysis of sufficiency. Through a process of minimization, the analysis of sufficiency produces a simpler equation for the conditions, or combinations of conditions (configurations in QCA parlance), leading to the expected outcome (the so-called 'minimal formula'). It explains which configurations are sufficient for the outcome.

First, the analysis of sufficiency requires the construction of the Truth Table (Ragin, 2000, 2008), which displays all logically possible causal combinations of the six conditions (see Table 6) and assigns the empirical cases to one of these configurations.

We selected 1 as frequency threshold, corresponding to the minimum number of cases that must be observed for each configuration in order for it to be considered relevant for purposes of causal analysis of sufficiency. We set the frequency threshold equal to 1 as this is normally the case with small-medium samples (Ragin, 2008). A consistency cut-off

Table 5. Analysis of necessity.

Condition	Consistency	Coverage
CLA	0.667239	0.815748
~CLA	0.397595	0.715058
TRASP	0.586947	0.762835
~TRASP	0.471876	0.78054
CONV	0.70073	0.75
~CONV	0.343066	0.780273
STW	0.811936	0.790552
~STW	0.228424	0.658416
MED	0.803778	0.74463
~MED	0.225419	0.765306
CAT	0.848003	0.904718
~CAT	0.232289	0.531957

Note: the ~ sign indicates absence of the condition

Table 6. Truth table.

CLA	TRASP	CONV	STW	MED	CAT	INN SOL	N	RAW CONS	PRI CONS	CASES
1	0	0	1	0	1	1	1	1	1	S (Cons: 1,0000)
1	0	0	1	1	1	1	1	1	1	E (Cons: 1,0000)
0	0	0	1	1	1	1	2	1	1	X, AD (Cons: 1,0000)
1	1	0	1	1	1	1	2	1	1	V, AF (Cons: 1,0000)
0	0	1	1	1	1	1	3	0.974843	0.965015	A, G, AB (Cons: 0,9748)
1	0	1	1	1	1	1	3	0.963746	0.95539	F, N, T (Cons: 0,9637)
0	1	1	1	1	1	1	2	0.865385	0.706587	AA, AC (Cons: 0,8654)
1	1	1	1	1	1	1	12	0.859155	0.818436	C, D, J, L, M, O, P, R, U, W, Y, AE (Cons: 0,8592)
0	0	0	0	0	0	0	1	0.75	0.226415	Q (Cons: 0,7500)
1	1	0	0	0	0	0	2	0.746412	0.345679	B, I (Cons: 0,7464)
0	1	0	1	1	0	0	1	0.553398	0.178572	Z (Cons: 0,5534)
1	0	1	0	1	0	0	1	0.504854	0.30137	H (Cons: 0,5049)
1	0	1	1	1	0	0	1	0.425287	0.253731	K (Cons: 0,4253)

also needs to be defined. Consistency describes the proportion of cases exhibiting any particular configuration leading to the expected outcome. Following Ragin (2008), who recommends a consistency cut-off higher than 0.75, we adopted a consistency threshold equal to 0.8 since this corresponds to a drop in the consistency scores that is visible in our data (Vis, 2009).

Anyway, we did not base our decisions about which causal combinations to include in the minimization process only on the consistency threshold. We conducted a much more finely grained analysis of the Truth Table. As Table 6 reveals, fixing the consistency cut-off at 0.8 leaves us with eight configurations for the analysis. Four combinations exhibit a raw consistency of 1. Four configurations (rows 5, 6, 7, 8) exhibit an imperfect raw consistency (raw consistency <1), even if higher than the selected threshold of 0.8. This leaves room for contradictions. In other words, this means that among the cases displaying such configurations there are cases that exhibit a negative outcome (contradictions). In order to better explore the nature of such contradictions and see whether there is deviant case consistency in kind (true logical contradictions), we plot each row against the outcome. Only row 8 exhibits one case that is a true logical contradiction (case J – The Statewide Steering Committee to Reduce Family Violence in Victoria, Australia). Normally, if true logical contradictions do occur, the row should be excluded from the minimization process. Nevertheless, here the decision is less clear-cut. The other 11 cases displaying such combination of conditions and outcome are not true logical contradictions. As case J is the only Case with a serious inconsistency, we considered the qualitative data, together with the relevant scores at the start and at the end of the period under study, to reach an informed decision.

Case J relates to the establishment of a multi-agency Committee in charge of devising and implementing an effective strategy to reduce family violence in the state of Victoria, Australia. While there was no formal goal-setting process at the beginning, with attention devoted mainly to relationship-building, over time the Committee began to conceptualize an integrated response to family violence. This, in turn, led to the creation of an integrated service delivery model, and the establishment of a state-wide Family Violence Advisory Committee along with regional and local Governance Committees to facilitate cooperation

and ensure consistency. The case describes the creation and implementation of a family violence response system that was actually perceived as 'a model' for other states.

Moreover, the analysis of the scores of Case J for the outcome measure (extent to which the collaboration produced innovative solutions in existing policies, programs, practices) confirms that the score assigned at the end of the period (3 out of 5) is higher than the corresponding score at the beginning and in the middle of the period (1 in both instances). Therefore, we may conclude that Case J performs quite well, and just falls out of the set of high performance because significant collaborative innovation outputs only emerged at the end of the period. Therefore, we decided to include the relevant truth table row in the minimization process. As a consequence, we maintained all the eight configurations for the minimization process.

The minimization process may yield three possible solutions: (i) a 'complex' solution that avoids using any counterfactual cases (rows without cases, or logical remainders); (ii) a 'parsimonious' solution, which permits the use of any remainder that will yield simpler (or fewer) recipes; and (iii) an 'intermediate solution', which uses only the remainders that survive counterfactual analysis based on theoretical and substantive knowledge (which is input by the user). We opted for the complex solution as it does not rest on any assumptions about the logical remainders (i.e. configurations that are not empirically observed) and is the subset of all the other solution terms. In producing it, the researcher refrains from making assumptions about any logical remainders and is exclusively guided by the empirical information at hand (Ragin, 2009; Schneider and Wagemann (2012)).

The solution is expressed by the following minimal formula:

~TRASP*STW*MED*CAT +

CLA*STW*MED*CAT+

CONV*STW*MED*CAT +

CLA*~TRASP*~CONV*STW*CAT => INNSOL

The * sign indicates the logical operator 'and', and the + sign indicates the operator 'or'; the tilde sign (~) is used to indicate negation or absence of a condition. The notation => denotes the logical implication operator.

In other words, four paths leading to novel solutions are identified (see Table 7 below). The overall solution coverage is 0.747531, showing that the 74% of innovative solutions are explained by the four paths, and the solution consistency is 0.921164, indicating that 92% of the empirical data presenting the four configurations are innovative. The intermediate solution is identical to the complex solution. Only the parsimonious solution presents some differences.

Two additional measures may be used to assess the fit of each configuration: raw consistency and raw coverage.

Raw consistency refers to the proportion of empirical data consistent with the expected outcome, while raw coverage measures the proportion of instances of the outcome that exhibits a certain causal combination or path (Fiss, 2007, 2011). A solution or path is informative when its consistency is above 0.75–0.80, and its raw coverage is higher than 0.25 (Urueña & Hidalgo, 2016): all our configurations exhibit

Table 7. Overview of the configurations leading to innovation through collaboration.

	1	2	3	4
CLA		●		●
TRANS	○			○
CONV			●	○
STW	●	●	●	●
MED	●	●	●	
CAT	●	●	●	●
Raw coverage	0.350365	0.488192	0.617003	0.096608
Unique coverage	0.038643	0.046372	0.051954	0.019751
Consistency	0.985507	0.887588	0.914122	1.000000
Cases with greater than 0.5 membership in term:	F, G, A, N, T, E, X, AB, AD	C, Y, AF, T, R, P, M, N, O, L, J, F, U, V, W, E, AE, D	A, C, Y, W, R, G, N, T, P, M, F, O, L, J, U, D, AA, AB, AC, AE	E, S

Solutions coverage: 0.747531 Solution Consistency: 0.921164
Frequency cut-off: 1 Consistency cut-off: 0.8
Complex solution
Legend: Black circles represent the presence of a causal condition, and white circles represent the negation of a causal condition. Blank cells represent irrelevant conditions.

a consistency score above 0.80, and three configurations (n. 1, 2 and 3) exhibit a raw coverage above 0.25 (configuration n. 4 has a raw coverage of 0.096608). As the coverage of configuration n. 4 is lower than the commonly accepted threshold of 0.25, we decided to exclude this configuration from the interpretation. It is in fact not very informative.

The solution shows that the activities of catalyst and steward appear to be INUS conditions (i.e. insufficient but necessary parts of causal recipes which are themselves unnecessary but sufficient), as they characterize all four configurations. This is reasonable, as the catalyst works towards creating and realizing concrete opportunities for creative problem-solving, whereas the steward ensures that all the relevant interests are taken into consideration, and that certain interests do not prevail over others.

Configuration n. 3 seems to suggest that, to the extent that all four leadership roles are present and combine, clarity of rules and transparency of decision-making do not matter for a successful outcome, i.e. the production of innovative solutions, to occur. Hands-on leadership apparently compensates the absence of hands-off institutional design.

Conversely, configurations n. 1 and 2 suggest that the role of the convener may not be relevant in combination with certain institutional design features.

Configuration n. 2 may apply to those cases where the rules that govern the collaboration have been set clearly and shared effectively, so that: (i) all the relevant and affected actors have been made aware of the opportunity or requirement to participate, and (ii) their participation was successfully enabled by the presence of those same rules, in combination with the leadership activities of steward, catalyst, and mediator. In addition to the presence of a steward and catalyst, the mediator here may be important to resolve conflicts between actors, thereby suggesting that rules alone may not be enough to set the terms of an effective collaboration among diverse actors. Tensions and conflicting views may arise – and may even be beneficial to the innovative process – but they need to be reconciled for the collaboration not to be irreparably disrupted.

Configuration n. 1, on the other hand, applies to those cases where transparency of decision-making is absent. Here a mediator may also be critical for a successful outcome (together with a steward and catalyst) as these non-transparent decision-making processes may cause distrust among actors and the perception that their views are not taken into adequate consideration. This may occur irrespective of the presence or absence of

clear rules, insofar as the actors perceive that they are not respected. The mediator here works to ensure that perceptions of unfairness do not arise and/or are addressed properly, so that, as in the previous case, the collaboration does not suffer disruption because of growing distrust.

These three configurations suggest that our selected institutional design features may play quite different roles for the production of collaborative innovations, when combined with the four different forms of leadership. At the extreme, they do not play any role when the combination of all four leadership behaviors is are present (configuration n. 3). On the other hand, our results suggest that certain combinations of leadership behaviors may be crucial in combination with certain institutional design features that produce unexpected and/or adverse consequences. This may be the case, for instance, when clear rules are present but not sufficient to ensure effective collaboration (n. 2), or when non-transparent decision-making risks to endanger that collaboration (n.1). The convener may or may not be present in the cases that correspond to configurations 1 and 2, but the convener does not play a role for collaborative innovation to occur: what counts is a combination of the three other activities, which succeed in steering the collaboration in an effective way while keeping disruptive forces under control.

Closer study of the configurations reveals that only six cases with innovative solutions are uniquely covered cases: they hold a membership value higher than 0.5 in only one sufficient path (Schneider & Wagemann, 2012). Cases X and AD are only covered by configuration 1, and cases AF and V only hold a membership value higher than 0.5 in configuration 2. For configuration 3 these cases are AA and AC. This results in a low unique coverage for each configuration. Only 3.86%, 4.63% and 5.19% of the outcome are explained specifically by the three paths, respectively. In other words, the three configurations partially overlap. Most cases have a membership higher than 0.5 in multiple configurations. Except for case E, all the other cases are always explained by configuration 3. Therefore, configuration 3 consists of a mix of cases where all the selected leadership behaviors are enacted.

What makes a difference between the cases covered by configuration n. 3 is the role played by the institutional frameworks.

In some cases, the absence of transparency of decision-making makes the convener role not relevant and requires the exercise of leadership as mediator, stewardship and catalyst (this is the case of cases covered simultaneously by paths 1 and 3). Case N (Area C, congestion charge zone in Milan, Italy) is an example of this, as part of the objects and of the actors of decision-making evolved during the course of the project based on emerging needs. In fact, Area C was launched with just a basic system of rules, with the understanding that its development would be carried out based on actual citizens' and stakeholders' behavior and necessities. It soon became clear that the self-identification of affected actors was more effective and efficient than identification by the municipal administration, and the role of the convener was simply not required. On the other hand, the other three leadership roles clearly played a role in this case, as the Municipality needed to ensure that all the requests by various stakeholders be considered and processed appropriately (*stewardship*), that complaints by citizens and even intra-Municipality conflicts be addressed effectively (*mediator role*), and that creative solutions to accommodate citizens' needs be devised as extensively as possible (*catalyst role*).

In other cases, it is the presence of clarity of rules that combines with the mediator, steward and catalyst activities (these are cases covered simultaneously by paths 2 and 3). Case M (collaborative policy-making committees in Gentofte, Denmark), for example, was governed by a written mandate that defined the policy problem calling for an innovative solutions, the type of solution requested by the city council, the previous policies and decisions to be respected in the collaborative innovation process, and the deadline for presenting the result in the City Council. The mandate also detailed the kind of actors to be invited into the collaborative policy-making committee that was in charge of developing a new youth policy. Since the committee brought together 10 young people and five established politicians, mediation was clearly needed. Public administrators with professional experience as facilitators served as *mediators* and they also took on the *stewardship* role of ensuring that everybody was heard and protected the integrity of the innovation process. Finally, they used brainstorming, invited external guest and organized innovation camps in order to disturb the committee members and encourage them to think out of the box. The catalyst role was important because the traditional meeting format in a dull room in the City Hall seemed to discourage creativity. Similarly, case W (Infant Mortality CoIIN) illustrates the importance of the presence of all four roles of steward, convener, mediator, and catalyst. The goal of the Infant Mortality CoIIN (CoIIN = Collaborative Improvement and Innovation Network) was to reduce disparities in infant mortality among the different segments of the US population. The project was started by the head of the Maternal and Child Health Bureau of the Obama administration. He assumed the role of *convener* by bringing together government health officials of all states of the US as participants in the project. He succeeded in *mediating* potential conflicts among the different states to keep the project nationwide on track. The leadership team was also successful as a *steward*, keeping the focus on reducing infant mortality for disadvantaged parts of the US population for the entire duration of the project. The *catalyst* function was maintained by combining innovative approaches for learning – using the IHI breakthrough series (The Breakthrough Series: IHI's Collaborative Model for Achieving Breakthrough Improvement, 2003) which provides an institutional framework for organizational learning – with the concept of Collaborative Innovation Networks (COIN) (Gloor, 2006) to develop innovative solutions for instance for addressing social determinants of health and childhood trauma.

5. Discussion

We started our exploration of public innovation outcomes by proposing that both institutional design and leadership provide plausible strategies for dealing with the challenge of having both a diversity of actors and a common ground for managing differences and developing and implementing new and promising solutions. The research findings highlight that for public innovation projects to succeed, it seems that the exercise of hands-on leadership is more important than governing collaboration hands-off through institutional rules. Based on our analysis of 32 cases from around the world, on the local, regional, national and supranational level, in areas as diverse as agriculture, culture, education, environmental protection, and health, we find that it is not really necessary to have clear rules at the beginning of the project. What matters much more is the key role of the steward responsible for protecting the integrity of the

collaboration, the mediator that helps to resolve conflicts or turn them into constructive learning and the catalyst that encourages the actors to think out of the box. It is also not really necessary to make the decision-making rules transparent while the project is ongoing. However, what is key is to have trusted and trustworthy leadership that is capable of creating an environment where the goals and the focus of the collaboration process are maintained, conflicts are mediated and the actors are encouraged to think out of the box. In the absence of transparent rules, the presence of a mediator is critical to the production of successful outcomes. When the collaborative innovation process is based on clear rule, the convener role seems to be unimportant.

The limited importance of clear and transparent rules in public decision-making runs counter to conventional democratic values that tend to highlight the importance of clear ground rules and transparent decision-making as a condition for fairness. This may suggest a trade-off between democracy and the production of innovative solutions to pressing problems. As long as there is a competent leadership of collaborative processes, they may produce innovative outcomes even if there are no rules to ensure the democratic quality of the process. However, similar results have been found in prior work, for instance by de Fine Licht (2011), and also Levy (2007) who observed that non-transparent decision-making might lead to legitimate outcomes that work and enjoy widespread support.

The key implication of our findings for public leaders is that the success of collaborative innovation projects is based on 'soft' factors such as trusted and trustworthy leadership. Besides the role of the steward, it is one of the catalysts which also seems to be a common success factor of the observed cases. While the role of the steward centers on guarding the focus and integrity of the collaboration process, the catalyst provides concrete opportunities for creative problem solving by providing an 'appropriate disturbance' that helps the actors to escape the dangers of tunnel vision and group think. Conflict mediation is also a key to success, especially when there is a lack of transparent rules, and if there are neither clear nor transparent rules, the convener roles also seem to be important.

Rather than relying on a set of clear and transparent rules that could possibly be codified, formalized and imbedded in a standardized framework for publicly initiated, or even legally mandated, innovation networks, public leaders must become competent conveners, stewards, mediators and catalysts. Learning to lead collaborative innovation process may appear challenging since most of them are trained in transactional and transformative leadership of their employees and have limited experience with leading processes of multi-actor collaboration aiming to produce innovative public value outcomes.

6. Conclusion

This paper aims to enhance our theoretical understanding of the role of institutional design and leadership on the production of successful collaborative innovation outcomes. We proposed that both institutional design and leadership may help dealing with the tension – which we prosaically referred to as 'taming the snake in paradise' – between fostering and maintaining enough diversity to stimulate learning and innovation and creating a common ground for multi-actor collaboration that enables compromise formation agreement and joint implementation of new and promising solutions. As such, we aimed to answer the following question: How do different forms of institutional design and leadership combine to produce pathways to collaborative innovation of public value?

On the basis of an fsQCA analysis of 32 cases drawn from the Collaborative Governance Data Bank, we established four pathways to collaborative innovation of public value that consists of different combinations of clear and/or transparent rules and four different leadership roles. Our research helped to nuance the theoretical expectation that institutional rules provide a basis for dealing with this tension, but in the absence of these rules, leadership will be needed to manage this tension and identify specific pathways. We can draw three specific conclusions about these pathways. The first conclusion is that the steward and catalyst leadership roles are an element in each pathway and thus important for realizing collaborative innovation outcomes. The second conclusion is that, when a combination of all four leadership roles is present, the two selected institutional design features do not matter for novel solutions to occur. The third conclusion is that the convener role is not important when there is a relative absence of certain institutional design features.

These conclusions extend our understanding of the role of institutional design and leadership in collaborative innovation (Hartley, 2005; Blomqvist & Levy, 2006; Bommert, 2010; Sørensen & Torfing, 2011; Torfing, 2019). They confirm and nuance the idea that we need to understand leadership and institutional design as complementary conditions for realizing collaborative innovation outcomes. An additional conclusion is that the absence of rules ensuring transparency may be conducive to collaborative innovation. This conclusion fits the idea that innovation thrives on a certain isolation from the outside world. This finding has been firmly established in the literature on strategic niche management (Kemp, Schot, & Hoogma, 1998; Schot & Geels, 2008), but needs to be developed further in the literature on collaborative innovation in the public sector. In further developing these insights, researchers will also need to consider the fundamental role of transparency in democracy (Hood & Heald, 2006; Meijer, 2013).

How do our analysis and finding help practitioners to spur collaborative innovation in the face of the pervasiveness of wicked problem and unmet social needs? Our paper highlight that practitioners need to acknowledge the tension between the need for diversity and the need for common ground: collaborative innovation is not an easy path and framed in a metaphorical way, the snake in paradise needs to be tamed. This requires leadership. The research highlights that establishing leadership in the form of the various roles discussed here is crucial to collaborative innovation outcomes since these multi-actor processes often take place in the absence of rules. Leadership must always consist of stewardship and catalyzing facilitation. Clear rules may help and reduce the need for the convener role. These forms of leadership require the utmost attention since they are key conditions for successful collaborative innovation.

This exploration of the role of institutional design and leadership in collaborative innovation also generates a new set of questions. A first question concerns the interaction between institutional design and leadership over time. Longitudinal analyses can result in a better understanding of the interaction between these two components over time. Are rules developed and does this result in other forms of leadership? A second question concerns the role of context. A comparative case analysis can result in a better understanding of the relation between (institutional) context and the role of institutional design and leadership. A final question revolves around the role of transparency. What our analysis cannot answer, and what we have to defer to future research, is if too much transparency might even be detrimental to successful public innovation initiatives.

The results of this paper highlight that a fuzzy-set qualitative case analysis can help to develop a firm theoretical understanding of the role of different factors in collaborative innovation. This type of analysis helps researchers to zoom in and zoom out on certain patterns and therefore develop a clearer view on patterns of collaborative innovation that have their idiosyncratic dynamics in each individual case. Our analysis shows that these patterns are nuanced but can still be understood in theoretical terms based on principles from set theory. This type of analysis provides a way forward in developing mature theories of collaborative innovation. On the other hand, our fuzzy-set analysis is not without limitations. The analysis is developed on the basis of 32 cases and 6 conditions; it produces 13 combinations out of the 64 that are theoretically possible, and one of the successful combination in the Truth Table reflects 12 (of the 32) cases. This sheds light on the limited diversity issue and the treatment of the logical remainders. Whereas this needs to be highlighted as part of the analysis, it is worthwhile to remember that the presence of limited diversity is more of a rule than an exception, as social phenomena tend to occur in clusters, and this naturally leads to logical remainders. Moreover, despite this single cluster of cases within one row, the remaining cases are widely distributed across 12 other combinations: this allowed us to perform a purposeful analysis, and to obtain a meaningful solution. The resulting four paths contribute to a better understanding of how institutional design principles and leadership roles may be instrumental in the pursuit of successful collaborative innovation outcomes.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Jacob Torfing is MA, PhD and professor in Politics and Institutions at Department of Social Sciences and Business, Roskilde University, Denmark and professor 2 at Nord University in Norway. He is director of The Roskilde School of Governance at Roskilde University. His research interests include public sector reforms, political leadership, collaborative innovation and co-creation. He has published several books and scores of articles on these topics.

Daniela Cristofoli is PhD in management and research fellow at Università degli Studi di Milano-Bicocca. Her research interests includes network management and public governance. In particular, her research focuses on the micro foundations of networked collaboration.

Peter Gloor is a research scientist at the Center for Collective Intelligence at MIT's Sloan School of Management where he leads a project exploring Collaborative Innovation Networks (COINs). He is also founder and chief creative officer of software company galaxyadvisors and a Honorary Professor at University of Cologne.

Albert Meijer is a professor of Public Innovation at the Utrecht University School of Governance where he leads a research group on public management and has founded the Governance Lab Utrecht. His research focuses on processes of technological innovation in the public sector with a key interest in smart cities, coproduction, transparency and e-government.

Benedetta Trivellato is assistant professor of Management at the Department of Sociology and Social Research of the Università degli Studi di Milano-Bicocca. Her main research interests include innovation in the public sector; public networks governance and leadership; and social innovation and sustainability.

ORCID

Benedetta Trivellato http://orcid.org/0000-0002-5125-257X

References

Alexander, E. R. (2005). Institutional Transformation and Planning: From Institutionalization Theory to Institutional Design. *Planning theory, 4*(3), 209–223.

Alford, J. (2010). Public value from co-production with clients. In M. H. Moore & J. Benington (Eds.), *Public value: Theory and practice* (pp. 144–157). Basingstoke: Palgrave Macmillan.

Ansell, C., & Gash, A. (2012). Stewards, mediators, and catalysts: Toward a model of collaborative leadership1. *The Innovation Journal*, *17*(1), 2.

Ansell, C., & Gash, A. (2018). Collaborative platforms as a governance strategy. *Journal of Public Administration Research and Theory*, *28*(1), 16–32.

Ansell, C., & Torfing, J. (Eds). (2014). *Public innovation through collaboration and design*. London: Routledge.

Antonacci, G., Colladon, A. F., Stefanini, A., & Gloor, P. (2017). It is rotating leaders who build the swarm: Social network determinants of growth for healthcare virtual communities of practice. *Journal of Knowledge Management. 21*(5), 1218–1239.

Bassett-Jones, N. (2005). The paradox of diversity management, creativity and innovation. *Creativity and Innovation Management*, *14*(2), 169–175.

Bernier, L. and Hafsi, T. (2007), 'The changing nature of public entrepreneurship', *Public Administration Review, 67*(3), 488–503.

Bisgaard, T., & Høgenhaven, C. (2010). Creating new concepts, products and services with user driven innovation. Nordic Council of Ministers.

Blomqvist, K., & Levy, J. (2006). Collaboration capability–a focal concept in knowledge creation and collaborative innovation in networks. *International Journal of Management Concepts and Philosophy*, *2*(1), 31–48.

Bolden, R. (2011). Distributed Leadership in Organizations: A Review of Theory and Research. *International journal of management reviews, 13*(3), 251–269.

Bommert, B. (2010). Collaborative innovation in the public sector. *International Public Management Review*, *11*(1), 15–33.

Borins, S. (2014), The Persistence of Innovation in Government: A Guide for Public Servants, Washington, DC: IBM Center for The Business of Government.

Cristofoli D., Trivellato B., Verzillo S. (2019). Network management as a contingent activity. A configurational analysis of managerial behaviors in different network settings. *Public Management Review, 21*(12), 1775–1800.

Cronqvist, L. (2003). Presentation of TOSMANA: Adding multi-value variables and visual aids to QCA. Paper presented at the Conference paper for the COMPASS Launching Conference in Leuven, Belgium, 16–17 September 2003.

Cronqvist, L. (2017). Tosmana, version 1.54. Trier, Germany: Univ. of Trier. Retrieved March, 2018, from. http://www.tosmana.net

Crosby B, P 't Hart and J Torfing (2017) Public value creation through collaborative innovation. *Public Management Review 19*(5), 655–669.

Crosby, B. C. and Bryson, J. M. (2010), 'Integrative leadership and the creation and maintenance of cross-sector collaborations', *Leadership Quarterly, 21*(2), 211–230.

de Fine Licht, J. (2011). Do we really want to know? The potentially negative effect of transparency in decision making on perceived legitimacy. *Scandinavian Political Studies*, *34*(3), 183–201.

De Vries, H., Bekkers, V., & Tummers, L. (2016). Innovation in the public sector: A systematic review and future research agenda. *Public administration, 94*(1), 146-166.

Dente, B., Bobbio, L. and Spada, A. (2005), 'Government or governance of urban innovation?', DIPS, 162, 1–22.

Doig, J. W. and Hargrove, E. C. (1990), Leadership in Innovation: Entrepreneurs in Government, Baltimore, Maryland: The John Hopkins University Press
Edquist, C. and Hommen, L. (1999), Systems of innovation: theory and policy for the demand side, *Technology in Society, 21*, 63–79.
Farazmand, A. (2009). Building Administrative Capacity for the Age of Rapid Globalization: A Modest Prescription for the twenty-first century. *Public Administration Review, 69*(6), 1007-1020.
Fiss, P. C. (2007). A set-theoretic approach to organizational configurations. *The Academy of Management Review*, *32*(4), 1180–1198.
Fiss, P. C. (2011). Building better causal theories: A fuzzy set approach to typologies in organization research. *The Academy of Management Journal*, *54*(2), 393–420.
Freeman, C. (1991), 'Networks of innovators: A synthesis of research issues', *Research Policy, 20* (5), 499–514.
Gieske, H., van Buuren, A., & Bekkers, V. (2016). Conceptualizing public innovative capacity: A framework for assessment. *The Innovation Journal, 21*(1), 1.
Gloor, P. A. (2006). *Swarm creativity: Competitive advantage through collaborative innovation networks*. Oxford: Oxford University Press.
Gloor, P. A. (2006), Swarm Creativity: Competitive Advantage through Collaborative Innovation Networks, Oxford: Oxford University Press
Gray, B. (1989). Collaborating: finding common ground for multiparty problems. San Francisco: Jossey-Bass.
Greckhamer, T. (2016). CEO compensation in relation to worker compensation across countries: The configurational impact of country-level institutions. *Strategic Management Journal. 37*(4), 793–815.
Greckhamer, T., Furnari, S., Fiss, P. C., & Aguilera, R. V. (2018). Studying configurations with qualitative comparative analysis: Best practices in strategy and organization research. *Strategic Organization*, *16*(4), 482–495.
Hartley, J. (2005), 'Innovation in governance and public service: past and present', *Public Money and Management, 25*(1), 27–34.
Hartley, J., Sørensen, E. and Torfing, J. (2013), 'Collaborative Innovation: A Viable Alternative to Market Competition and Organizational Entrepreneurship', *Public Administration Review, 73* (6), 821–830.
Hekkert, M. P., Suurs, R. A., Negro, S. O., Kuhlmann, S., & Smits, R. E. (2007). Functions of innovation systems: A new approach for analysing technological change. *Technological forecasting and social change, 74*(4), 413–432.
Hofstad, H., & Torfing, J. (2017). Towards a climate-resilient city: Collaborative innovation for a 'green shift'in Oslo. In Carbon Footprint and the Industrial Life Cycle (pp. 221–242). Springer, Cham
Hood, C., & Heald, D. (2006). Transparency: The key to better governance? (Vol. 135). Oxford University Press for The British Academy.
Hood, C., & Heald, D. (2006). *Transparency: The key to better governance?* Oxford: Oxford University Press.
Jensen, U. T., Andersen, L. B., Bro, L. L., Bøllingtoft, A., Eriksen, T. L. M., Holten, A. L., ... & Westergård-Nielsen, N. (2019). Conceptualizing and measuring transformational and transactional leadership. *Administration & Society*, *51*(1), 3–33.
Kemp, R., Schot, J., & Hoogma, R. (1998). Regime shifts to sustainability through processes of niche formation: The approach of strategic niche management. *Technology Analysis & Strategic Management*, *10*(2), 175–198.
Klijn, E. H. (2001). Rules as institutional context for decision making in networks: The approach to postwar housing districts in two cities. *Administration & Society*, *33*(2), 133–164.
Klijn, E. H., & Koppenjan, J. F. M. (2014). Accountable networks. In M. Bovens, R. E. Goodin, & T. Schillemans (Eds.), *The oxford handbook of public accountability* (pp. 242–256). Oxford: Oxford University Press.

Koppenjan, J. F. M., & Klijn, E. H. (2004). *Managing uncertainties in networks: A network approach to problem solving and decision making*. London: Routledge.
Leeuw, T., Lokshin, B., & Duysters, G. (2014). Returns to alliance portfolio diversity: The relative effects of partner diversity on firm's innovative performance and productivity. *Journal of Business Research*, *67*(9), 1839–1849.
Levy, G. (2007). Decision making in committees: Transparency, reputation, and voting rules. *American Economic Review*, *97*(1), 150–168.
Mazzucato, M. (2013), The Entrepreneurial State: Debunking Public vs. Private Sector Myths, London: Anthem Press
McGuire, M., & Silvia, C. (2010). The Effect of Problem Severity, Managerial and Organizational Capacity, and Agency Structure on Intergovernmental Collaboration: Evidence from Local Emergency Management. *Public Administration Review, 70*(2), 279–288.
Meijer, A. (2013). Understanding the complex dynamics of transparency. *Public Administration Review*, *73*(3), 429–439.
Meijer, A. J. (2014). From hero-innovators to distributed heroism: An in-depth analysis of the role of individuals in public sector innovation. *Public Management Review*, *16*(2), 199–216.
Meijer, A. J. (2019). Public innovation capacity: Developing and testing a self-assessment survey instrument. *International Journal of Public Administration*, *42*(8), 617–627.
Misangyi, V. F., Greckhamer, T., Furnari, S., Fiss, P. C., Crilly, D., & Aguilera, R. (2017). Embracing causal complexity: The emergence of a neo-configurational perspective. *Journal of Management*, *43*(1), 255–282.
Morse, R. S. (2010), 'Integrative public leadership: Catalyzing collaboration to create public value', *The Leadership Quarterly, 21*(2), 231–245.
O'Toole, L. J. (1997). Implementing public innovations in network settings. *Administration & Society*, *29*(2), 115–138.
Osborne, S. P. and Brown, L. (2011), 'Innovation in public services: engaging with risk', *Public Money and Management, 31*(3), 4–6.
Ospina, S. M. (2017). Collective Leadership and Context in Public Administration: Bridging Public Leadership Research and Leadership Studies. *Public Administration Review, 77*(2), 275–287.
Ostrom, E., Gardner, R., Walker, J., & Walker, J. (1994). *Rules, games, and common-pool resources*. Ann Arbor: University of Michigan Press.
Peters, B. G. (2012). Institutional theory: the new institutionalism. New York: Continuum.
Polsby, N. W. (1984), Political Innovation in America: The Politics of Policy Initiation, New Haven, CT: Yale University Press.
Provan, K.G., & Milward, B. H. (1995). A Preliminary Theory of Interorganizational Network Effectiveness: *Administrative Science Quarterly*, *40*(1) 1–33.
Provan, K.G., & Kenis, P. 2008. Modes of network governance: Structure, management and effectiveness. *Journal of Public Administration Research and Theory*. *18*(2), 229–52.
Raab, J., Mannak, R. S., & Cambré, B. (2015). Combining structure, governance, and context: A configurational approach to network effectiveness. *Journal of Public Administration Research and Theory*, *25*(2), 479–511.
Ragin, C. C. (2000). *Fuzzy-set social science*. Chicago, IL: University of Chicago Press.
Ragin, C. C. (2006). Set relations in social research: Evaluating their consistency and coverage. *Political Analysis*, *14*(3), 291–310.
Ragin, C. C. (2008). *User's guide to fuzzy-set/qualitative comparative analysis 2.0*. Arizona: Department of Sociology, University of Arizona.
Ragin, C. C. (2009). Qualitative comparative analysis using Fuzzy Sets (fsQCA). In B. Rihoux & C. C. Ragin (Eds.), *Configurational comparative methods. Qualitative Comparative analysis (QCA) and related techniques*. (pp. 87–121) Thousand Oaks, CA: Sage.
Ragin, C. C., Drass, K. A., & Davey, S. (2006). *Fuzzy set/qualitative comparative analysis 2.0* [computer program]. Tucson, Arizona: Department of Sociology, University of Arizona.
Roberts, N. C. and King, P. J. (1996), Transforming Public Policy: Dynamics of Policy Entrepreneurship and Innovation, San Francisco, CA: Jossey-Bass.

Schneider, C. Q., & Wagemann, C. (2012). *Set-theoretic methods for the social sciences: A guide to qualitative comparative analysis*. Cambridge: Cambridge University Press.
Schneider, M. R., Schulze-Bentrop, C., & Paunescu, M. (2010). Mapping institutional capital of high-tech firms: A fuzzy-set analysis of capitalist variety and export performance. *Journal of International Business Studies*, *41*(2), 246–266.
Schot, J., & Geels, F. W. (2008). Strategic niche management and sustainable innovation journeys: Theory, findings, research agenda, and policy. *Technology Analysis & Strategic Management*, *20* (5), 537–554.
Seid, M., Dellal, G., Peterson, L. E., Provost, L., Gloor, P. A., Fore, D. L., & Margolis, P. A. (2018). Co-designing a collaborative chronic care network (C3N) for inflammatory bowel disease: Development of methods. *JMIR Human Factors*, *5*(1), e8.
Skelcher, C., Mathur, N., & Smith, M. (2005). The Public Governance of Collaborative Spaces: Discourse, Design and Democracy. *Public administration*, *83*(3), 573–596.
Sørensen, E., & Torfing, J. (Eds.). (2016). Theories of democratic network governance. Basingstoke: Palgrave-Macmillan.
Sørensen, E. and Torfing, J. (2009), 'Making governance networks effective and democratic through metagovernance', *Public Administration*, *87*(2), 234–258.
Sørensen, E., & Torfing, J. (2011). Enhancing collaborative innovation in the public sector. *Administration & Society*, *43*(8), 842–868.
Sørensen, E. and Torfing, J. (2011), 'Enhancing collaborative innovation in the public sector', *Administration and Society, 43*(8), 842–868.
Sørensen, E., & Torfing, J. (2019). Interactive political leadership in theory and practice: How elected politicians may benefit from co-creating public value outcomes. *Administrative Sciences*, *9*(3), 1–23.
The Breakthrough Series: IHI's Collaborative Model for Achieving Breakthrough Improvement. IHI Innovation Series white paper. Boston: Institute for Healthcare Improvement; 2003. www.IHI.org
Torfing, J. (2016). *Collaborative Innovation in the Public Sector*. Washington, DC: Georgetown University Press.
Torfing, J. (2019). Collaborative innovation in the public sector: The argument. *Public Management Review*, *21*(1), 1–11.
Trivellato B., Mariani L., Martini M., Cavenago D. (2019) Leading knowledge mobilization for public value: The case of the congestion charge zone (Area C) in Milan. *Public Administration* *97*(2)311–324.
Trivellato B., Mariani L., Martini M., Cavenago D. (2019). Leading knowledge mobilization for public value: The case of the congestion charge zone (Area C) in Milan. *Public Administration* *97*(2)311–324.
Turrini, A., Cristofoli, D., Frosini, F. & Nasi, G. 2010. Networking literature about determinants of network effectiveness. *Public Administration*, *88*(2), 528–555.
Urueña, A., & Hidalgo, A. (2016). Successful loyalty in e-complaints: FsQCA and structural equation modelling analyses. *Journal of Business Research*, *69*(4), 1384–1389.
Vis, B. (2009). Governments and unpopular social policy change: Regime specific or radical shift towards workfare? *European Journal of Political Research*, *48*, 31–57.
von Hippel, E. (1986), 'Lead Users: A Source of Novel Product Concepts', *Journal of Management Science*, *32*(7), 791–805.
Wang, W. (2016). Exploring the determinants of network effectiveness: The case of neighborhood governance networks in Beijing. *Journal of Public Administration Research and Theory*, *26*(2), 375–388.
Warsen, R., Klijn, E.H., & Koppenjan J. (2019). Mix and Match: How Contractual and Relational Conditions Are Combined in Successful Public–Private Partnerships. *Journal of Public Administration Research and Theory*, *29*(3),375–393.

Appendix. List of cases.

	CASES	Case
1	A	Australian collaboration to develop front-of-pack food labelling policy
2	B	Independent Inquiry into Container Deposit Legislation in NSW
3	C	Blackfoot Challenge (Montana, USA)
4	D	Desert Tortoise Habitat Conservation Planning
5	E	Joint Committee for Counterterrorism of the Dutch national government agencies
6	F	Community Enterprise Het Klokhuis
7	G	Community Enterprise De meevaart
8	H	Collaborative governance in Vietnam flooding
9	I	Chinchina Besin Management Plan
10	J	The Statewide Steering Committee to Reduce Family Violence in Victoria, Australia
11	K	Homelessness policy development and program funding in Vancouver, Canada
12	L	public-private-people collaboration in peri-urban area development; Netherlands
13	M	collaborative policy making committees in Gentofte; Denmark
15	N	Area C – Milan
17	O	Baker River Hydroelectric Project
18	P	Delaware Inland Bays
19	Q	Narragansett Bay (RI)
20	R	Rhode Island's Salt Ponds
21	S	Lake Tahoe
22	T	Tampa Bay
23	U	Tillamook Bay, Oregon
24	V	Foodborne disease outbreak in Germany
25	W	Infant Mortality CoIIN
26	X	Living Lab Stratumseind
27	Y	Friends of Redington Pass
28	Z	Local Network for Combating Illiterarcy (City A, The Netherlands)
29	AA	Local Network for Combating Illiterarcy (City B, The Netherlands)
32	AB	Revitalisation of Central Dandenong, Melbourne
34	AC	Okay, here's how it goes (Fight Against Organized Crime, Motorcycle Club)
36	AD	The 'Neighborhood Renewal Program', City of Stockholm
37	AE	Collaborative policy making committees in Svelvik Municipality, Norway
39	AF	Wanted Partners (Fight Against Organized Crime, Human Trafficking)