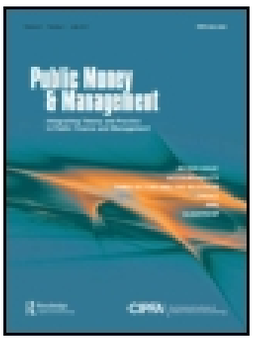

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How do network characteristics influence network managers' choice of strategies?

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ABSTRACT

As indicated in the research on networks over the past 10 years, network management strategies are very important for achieving results in governance networks. But what characteristics influence the deployment of network management strategies? Using quantitative data on network managers in environmental projects at the local level, this paper looks at three important network characteristics (network size, degree of hierarchy, and conflict level) and assesses their influence on three categories of network management strategies: connecting, exploring, and arranging. The results show that, for network managers, more hierarchy leads to a stronger likelihood of choosing connecting; a larger network size leads to more exploring and arranging; and more conflict correlates with less use of connecting and exploring.

IMPACT

Public sector managers have to deal with the complexities of the networks they encounter when they want to solve issues. The authors' research indicates that larger networks with more and a greater variety of actors need to be addressed by using more different network management strategies. A dilemma of the paper's findings is that more conflict in the network was correlated with employing fewer network management strategies. But, of course, the conflict itself and the need to address the policy problem ask for more intensified managerial effort, taking time and attention to really solve the conflict. This paper offers some possible ways out.

KEYWORDS

Networks; network characteristics; network management; network size

Introduction

The idea that much decision-making and service delivery takes place in networks of interdependent actors is now widely known and accepted. In the past 15 years in particular, there has been a surge in research on networks, both quantitative and qualitative, empirically testing the various espoused theoretical assumptions (Klijn & Koppenjan, 2016; Provan & Milward, 2001; Meier & O'Toole, 2007).

In general, a few topics dominate network research. A wide array of research, mostly connected to social network theories, focuses on network characteristics operationalized in contact frequencies or other relational characteristics. Part of this research also relates to network performance (for example Lewis, 2011). A significant amount of the research on networks devotes attention to network performance (Provan & Milward, 2001; Sandstrom & Carlsson, 2008; Meier & O'Toole, 2007). In addition, some literature looks at other network characteristics, like trust, in relation to network performance (Klijn, Edelenbos, & Steijn, 2010; Willem & Lucidarme, 2014; Markovic, 2017).

Network management: crucial in theory and practice

Another very prominent research topic, however, is the deployment of network management strategies to foster collaboration and outcomes in networks (Klijn, Steijn, & Edelenbos, 2010; McGuire & Agranoff, 2011; Markovic, 2017). Research in the past 15 years, especially large quantitative studies, shows the importance of networking (Meier & O'Toole, 2007; Akkerman & Torenvlied, 2013) and network management strategies for network performance and the collaborative process in networks (Klijn et al., 2010; Ysa, Sierra, & Esteve, 2014; Van Meerkerk, Edelenbos, & Klijn, 2015). In addition, case studies and practical experience have shown that network management is crucial in achieving acceptable and effective solutions (Mandell, 2001; Williams, 2012).

Given, therefore, that network management strategies are important for the realization of network performance and the collaborative process in networks, it is essential to know which factors influence the deployment of network management strategies. Managers and public sector leaders, as well as academics, need to know which contextual

conditions require specific managerial strategies. However, relatively little research has looked at network management as a dependent variable or tried to assess the important conditions that influence the specific types of network management strategies deployed in governance networks. This is not surprising, as research interest has focused primarily on the effect of network management on performance.

There are a few exceptions of course. Some publications pay attention to network managers' personal characteristics in explaining the level and nature of network management. Juenke (2005), for instance, shows that more experienced managers are more successful in their network management. This was confirmed by Edelenbos, Klijn, and Steijn (2011), who, in survey research on environmental projects, found that more experienced network managers use a greater variety of strategies and manage more intensively and are therefore more successful.

However, there may be other important conditions relating to specific governance network characteristics that influence the choice and use of network management strategies. In this article, we focus on three much-debated network characteristics: (1) network size; (2) degree of hierarchy; and (3) conflict level (see Mandell, 1990; Provan & Milward, 1995; Provan & Kenis, 2008; Maccio & Cristofoli, 2018). The following research question structured our research and this article:

> How do network size, degree of hierarchy, and conflict level in networks influence the choice of network management strategies?

To answer our research question, we conducted a survey among managers of environmental projects in The Netherlands ($N = 141$). We used data from the survey to distinguish types of network management strategies and network characteristics and investigate the relationship between the two by using structural equation modelling.

Theoretical framework and research hypotheses

There is broad consensus in the academic literature that the type of leadership and/or management required in networks differs significantly from the classic leadership image of leaders of organizations. Ansell and Gash (2008) talk about 'facilitating leadership', by which they signify that the task of a leader is to mediate between actors and empower the collaboration process. This is also the core message of virtually all the literature on networks and collaboration. Because actors are interdependent, and problem-solving needs the resources of many actors, network management is crucial to co-ordinate actions and bringing resources together (see also Gage & Mandell, 1990; Kickert, Klijn, & Koppenjan, 1997; Huxham & Vangen, 2005; McGuire & Agranoff, 2011). As mentioned in the introduction to our paper, previous research seems to prove that this idea is correct, as fairly strong correlations have been found between the deployment of network management strategies and (perceived) network performance (Klijn et al., 2010; Meier & O'Toole, 2007; Agranoff & McGuire, 2003; Klijn et al., 2015; Maccio & Cristofoli, 2018). This makes the question of which factors and network characteristics influence the deployment of network management strategies all the more interesting.

Types of network management strategies

The deliberate guidance of complex governance processes in networks is generally called 'network management' but is also referred to as 'network governance', 'collaborative governance', or 'meta-governance' (O'Toole, 1988; Mandell, 2001; Sørensen & Torfing, 2007). The literature mentions a wide variety of network management strategies to guide and structure interaction processes, so an exhaustive list is difficult to provide here (see Gage & Mandell, 1990; O'Toole, 1988; Agranoff & McGuire, 2003). Table 1 provides a summary (albeit a non-exhaustive one) of the types of strategies that have been identified, providing examples of each of the categories (see Klijn et al., 2010). We now briefly discuss the various types of network management strategies.

In networks, several actors with distinct organizational backgrounds are active and need to be connected. A certain kind of boundary-spanning activity is needed in networks in order to ensure that people cross their own organizational boundaries and establish cross-boundary collaboration (Levina & Vaast, 2005; Williams, 2012). Network managers thus act as boundary-spanners, as they try to establish connections among various actors and other project activities in the network (Van Meerkerk & Edelenbos, 2014). The network management literature emphasizes that the network manager first needs to identify the actors required for an initiative and actually create a situation in which they become interested in investing their resources (Hanf & Scharpf, 1978; Klijn & Koppenjan, 2016). Thus actors have to be invited to participate if they are not involved in the process. If this does not take place, then the resources of these actors also are not part of the decision-making process, which can frustrate the process of reaching possible solutions. The interactions in the collaborative process itself also have to be managed. This can be achieved by, for instance, appointing a process manager or broker,

Table 1. Overview of network management strategies.

Types of strategies	Process agreements	Connecting	Exploring	Arranging
Main strategies mentioned in the literature	Rules for entrance into or exit from the process, conflict-regulating rules, rules that specify the interests of actors or veto possibilities, rules that inform actors about the availability of information about decision-making junctures etc.	Selective activation or de-activation of actors, resource mobilization, initiating new series of interactions, coalition building, mediation, appointment of process managers, removing obstacles to co-operation, creating incentives for co-operation	Searching for goal congruency, creating variation in solutions, influencing (and explicating) perceptions, managing and collecting information and research, creating variation through creative competition	Creating new, *ad hoc* organizational arrangements (boards, project organizations etc.)

Source: Adapted from Klijn, Steijn, and Edelenbos (2010).

who invests time and energy in connecting the actions and strategies of actors with other involved actors.

When the collaborative process has started, strategies for *exploring (content)* are important to clarify actors' goals and perceptions (Fischer, 2003) but also to build (packages) of goals and creative solutions that: (1) keep the actors interested in the process and (2) are able to build coalitions of support among involved actors (McGuire & Agranoff, 2011; Klijn & Koppenjan, 2016). The use of knowledge and information, as well as stimulating variation in the discussion about solutions, are crucial in this process. Network managers are constantly scanning the network for useful information and also have an information-processing role, as they constantly select, transmit, and interpret relevant information originating in the organization's environment (Aldrich & Herker, 1977; O'Toole, 1988).

In addition, the collaborative process must be *arranged* and guided by organizational arrangements and process rules. The managerial strategy, arranging, means setting up (temporary) structures for consultation, interaction, and deliberation, for example project organization, and communication lines (Rogers & Whetten, 1982). The transaction costs of these arrangements must be kept as low as possible (Williamson, 1996) but, at the same time, the arrangements have to be acceptable to the actors involved (Klijn & Koppenjan, 2016).

Another important strategy mentioned in the literature is that of *process agreements* that is draft temporary sets of rules for interaction that structure the interactions and protect each actor's core values (Klijn & Koppenjan, 2016). The rules can be seen as ground rules for behaviour and interaction in the network on which the actors in the network have (explicitly) agreed. These temporary rules can be about the definition of the roles that actors take or get in the process, the rewards that can be collected in the process, conflict rules and rules about decision-making.

In the next section we focus on developing hypotheses for three of these four network management strategies: connecting, arranging, and exploring content. The reason for this is methodological, because our items for the last network management category (process rules) did not form a proper scale (whereas the others did).

Factors that influence network management strategies

The first main characteristic often mentioned in the literature is the degree of hierarchy in a governance network (Klijn & Koppenjan, 2016; O'Toole, 1988; Agranoff & McGuire, 2003). Although networks are defined by interdependence and a horizontal relationship, a certain degree of hierarchy still remains: some actors are more equal than others because of the abundance or the scarcity of their resources. In this respect, Provan and Kenis (2008) make a distinction between voluntary or participant-governed networks and mandated or lead organization-governed networks. Voluntary networks are created bottom-up by the professionals and organizations that will participate in the network, whereas mandated networks are created by policy diktat, for example by a government agency: 'In lead organization governance, all major network-level activities and key decisions are co-ordinated through and by a single participating member, acting as a lead organization. Thus, network governance becomes highly centralized and brokered, with asymmetrical power' (Provan & Kenis, 2008, p. 235). Mandell (1990) also argued that (strategic) management in a mandated network is different from management in a voluntary network. A mandated network has a greater degree of hierarchy than a voluntary network, which in turn relates in certain ways to different types of network management. Moreover, Rodríguez, Langley, Béland, and Denis (2007, p. 153) argue that 'multiple types of governance mechanisms need to be mobilized for effective collaboration in a mandated situation'. However, the literature stays largely silent on how exactly hierarchy specifically influences network management strategies.

Some literature, however, touches upon the subject of hierarchy in relation to network management strategies, but more indirectly, emphasizing network performance (Provan & Milward, 1995), effective

collaboration, and modes of governance (Rodríguez et al., 2007). Various scholars suggest that more hierarchy enables the leading organization to deploy more managerial strategies. Provan and Milward (1995), for instance, argue in their well-known paper that centralization (i.e. the situation where decision-making power is more concentrated in one of the organizations in the network) enhances the performance of the network. They also argue that centralized control allows for more co-ordination and monitoring. In addition, Provan and Kenis (2008) suggest at least a correlation between centralization and formalization of the organizational arrangement. Moreover, they argue that a low degree of centralization would work only in small and voluntary networks (Provan & Kenis, 2008).

Given that our empirical cases are closer to what could be termed 'mandatory' networks, as a governmental project organization leads/manages the governance network and in all the cases municipalities initiated and organized these environment projects in their cities, we expected to find a positive relation between hierarchy and arranging, as hierarchical mechanisms include management fiat, formalization, and monitoring (Rodríguez et al., 2007). However, the relation between degree of hierarchy and exploring is less clearly discussed in the literature. One could expect more centralization to relate to less exploring, as the central organization already has clear ideas about where to go and there is less need to explore new ideas and solutions. Also, the relation between degree of hierarchy and connecting is expected to be negative, as centralized leading organizational units must co-ordinate somehow, but do not really need to connect with people's interest, values, and viewpoints, as they have the power to make things happen. Formal authority leads to control over critical resources, and this might imply less necessity to connect to other actors in the network (Rodríguez et al., 2007). This leads to our first hypothesis:

> H1: A high degree of hierarchy in governance networks is positively related to the arranging strategy but negatively to the exploring and connecting strategies.

A second important network characteristic is network size (Provan & Kenis, 2008; Bryson & Crosby, 1992). The size of a network indicates the number of actors and the number of nodes between the involved actors. When a network is large, many actors, often also from different organizational backgrounds (public, private, societal origins), are related to one another. This means that we might expect a network manager to have to engage in more connecting strategies, as there are many nodes between people that have to be addressed by a connecting style of network management. The same applies for arranging as a type of management strategy. Provan and Kenis (2008) argue that larger networks need a more structured organizational form. The network manager must develop various (*ad hoc*) arrangements to bring together different actors around certain themes and tasks. Finally, size is also expected to be positively related to exploring content, as the network manager must engage in a lot of activities to ascertain the various perceptions of the problems and issues and to explore the problem/solutions combinations envisaged by various actors (see McGuire & Agranoff, 2011; Klijn & Koppenjan, 2016). The network manager has to deploy this kind of network management strategy to gather information from many actors in the network. Based on this reasoning, our second hypothesis was:

> H2: A large governance network size is positively related to the arranging, exploring content, and connecting management strategies.

A third network characteristic that we examined in our research was the level of conflict in a network (Labianca, Brass, & Gray, 1998; Koppenjan, 2007). Values and interests of various actors are often different and might even be contradictory (Klijn & Koppenjan, 2016). This implies that co-operation in networks is not without conflict (Koppenjan, 2007; Ansell & Gash, 2008). Durable dependency relations do not necessarily imply that no conflict will emerge over the distribution of costs and benefits in concrete policy processes. It is precisely this tension between co-operation and conflict that needs to be resolved by network management (Scharpf, 1978; McGuire & Agranoff, 2011). Moreover, the horizontal nature of governance networks, and the lack of a dominant actor, does not imply that resources are equally distributed among actors. So, the existence of various and often contradictory perceptions and interests on the part of the actors will very likely lead to significant degrees of conflict in networks, which will evoke certain types of network management strategies. As network management is often presented as a way of dealing with the complexity and conflicts within networks (Huxham & Vangen, 2005; McGuire & Agranoff, 2011), we expected network managers to be more active, i.e. to deploy more network management strategies, in networks characterized by more conflict (this despite the acknowledgement that deploying network management strategies in networks with a high level of conflict is also more difficult and laborious). Connecting and arranging will be especially necessary in networks with more conflicts. In networks with more conflicts, network managers have to bridge between nodes in the network. The same relationship applies for arranging, as conflict in networks makes it more necessary to bring people together and to

meditate and broker between actors with conflicting perceptions and interests. With respect to exploring content, we expected to find that a high level of conflict would make it necessary to intentionally explore information, knowledge, and content to resolve the conflict:

> H3: A higher level of conflict in a network will be positively related to arranging, exploring content, and connecting management strategies.

Methodology

We collected data from a web-based survey held in 2011 (April–July) among leading project managers in the four largest cities of The Netherlands (Amsterdam, Rotterdam, The Hague, and Utrecht) and managers in two private firms (P2 and DHV) that were operating as project managers in these four cities. No significant statistical differences existed between respondents from the four different municipalities or consultancy firms according to ANOVA tests comparing the six groups.

Three preparation sessions were held with eight project managers from the four participating cities to discuss the clarity and relevance of the questions and to validate our survey. Surveys were sent (with one email reminder and a phone reminder), with the consent of their organizations, to all project leaders of urban projects in implementation. We explicitly selected the project managers because they would know what was going on in the surveyed projects and were equipped to answer specific questions concerning other actors in the network, project management and so forth. To safeguard the independence of our data, we arranged with the participating organizations that they send emails to each leading project manager of a specific urban project. In this way, we made sure that we had one manager for each project. In total, 288 project leaders from the four municipalities and 57 project leaders from the two consulting firms were approached. Respondents were asked to fill in the survey for the specific urban project (and the network around that project) of which they were project leader (and which they had to mention at the start of the survey). Data were collected for 141 projects, as 141 managers answered the survey. Table 2 describes the population and the response rate (40.9%).

Table 2. Responses to the survey.

	Population	Response (absolute)	Response (percentage)
Municipalities (4)	288	117	40.6
Private organizations of project managers (2)	57	24	42.1
Total	345	141	40.9

The managers were involved in a variety of projects, but most of the projects involved restructuring parts of their city. Because we co-operated with the municipalities, we could be sure that we reached the relevant project leader for each of the projects. Some of the projects concerned restructuring/building dwellings in a neighbourhood; others concerned business functions and/or commercial functions (shopping malls and so forth). Our study considered the group of interdependent actors around the urban projects as the network. An issue with surveying a population like ours was that a list of all urban projects in The Netherlands simply does not exist. We do believe that our approach resulted in a representative response of project managers involved in urban projects in the four cities we studied. Co-operation with the local governments and the private firms resulted in an inclusive list of managers leading urban projects in these cities. The response rate of 41% is better than average for an email survey (Sheehan, 2001). Based on the pretest of the survey with the panel of participants, the response rate, and the discussion with project managers in a post-survey seminar (open for all project managers in the four municipalities in which we discussed the results of the survey), we believe that the projects reported by the survey respondents were representative for the population of urban projects in the cities we studied.

Characteristics of the networks around the urban projects included in this study

Networks are characterized, as most authors argue, by (1) a significant number of interdependent actors; (2) that are involved in policy-making or service delivery; and (3) policy issues that mostly have a boundary-crossing character (see McGuire & Agranoff, 2011; Klijn & Koppenjan, 2016; Ansell & Gash, 2008).

The urban projects in our survey were complex projects developed within governance networks. The networks around the projects on which the managers reported mostly included more than 10 organizations (66%). The different types of organizations were derived from the literature (for example Klijn et al., 2010) and the sessions with the eight project managers to validate our survey questionnaire. Most of the networks included societal interest groups (94.3%), private developers (78.6%), architectural firms (79.4%), housing associations (60.7%), and various governmental organizations (other local governments, regional government, and national government).

We also checked whether the urban projects were really boundary-crossing public issues. We measured this by focusing on task complexity: how many and what kinds of development and/or spatial activities were included in the project (Klijn et al., 2010)?

Table 3. Measurement items and constructs' reliability for latent variables.

Items and constructs*	Factor loading	Corrected item-to-total correlations	Alpha/ composite reliability
Network management: connecting			0.70/0.71
1. The leaders of the project consulted with the people who carried it out. Decisions were made collectively (C1)	0.56	00.51	
2. The project leaders took into account existing interpersonal relationships, their basis, and how they were generated and developed (C2)	0.73	0.61	
3. When deadlocks were reached, or problems arose in the project, the management tried to find common ground between the positions of the conflicting interests (C3)	0.72	0.45	AVE 0.45
Network management: exploring			0.68/0.67
1. In this project, special attention is paid to the sharing of diverse points of view (E1)	0.63	.45	
2. Sufficient attention is paid in this project to the involvement of external organizations that can bring in new ideas and solutions (E2)	.65	0.50	
3. During the collection of information, emphasis was placed on establishing starting points and common information needs (E2)	0.63	.53	AVE 0.41
Network management: arranging			0.71/0.72
1. Relevant governmental organizations are involved via organized forms of deliberation (for example platforms) (A1)	0.72	0.52	
2. Relevant private organizations are involved via organized forms of deliberation (for example platforms) (A2)	0.78	0.62	
3. Relevant societal organizations are involved via organized forms of deliberation (for example platforms) (A3)	0.52	0.43	AVE 0.47

*These items were measured on a five-point Likert scale ranging from (1) strongly disagree to (5) strongly agree.

Consequent to the preparation sessions with the eight project managers, we enquired about six different kinds of spatial activities/tasks: infrastructure (rail and public highways); water management; housing; social facilities (schools, sports facilities); development and/or regeneration of business areas; and development of city parks (see Klijn et al., 2010). Measured on a five-point Likert scale, on average more than three of these tasks played a medium to large part in the projects; confirming the boundary-crossing nature of the projects. As mentioned, as all projects were initiated by the municipalities, we could consider the networks around these projects as mandated (Provan & Kenis, 2008).

Measurement of variables

In this section, we discuss the different scales used to measure our core variables: the network characteristics, network management, and the actor characteristics we take along. As a survey was used, all variables are perceived variables. Table 3 presents the specific items on the network management scales, their factor loadings, and the construct reliabilities. In the subsequent section, we discuss the convergent and discriminant validity of the measurement model.

Network management strategies

Three different types of network management strategies were measured, based on earlier research (see Klijn et al., 2010). For each strategy, three items were used. The factor loadings for each item and reliability scores are presented in Table 3. All factor loadings of the items for the latent factors were larger than 0.50, a very conservative cut-off level (Hair, Anderson, Tatham, & Black, 1995), which is a first important indicator demonstrating convergent validity. Furthermore, the composite reliability indexes of the three scales all exceeded the 0.60 threshold (Fornell & Larcker, 1981). To further assess the reliability of the measures, we computed corrected item-to-total correlations and Cronbach's alphas. All items had corrected item-to-total correlations that were greater than 0.40, which represents a general threshold (Field, 2005). The Cronbach's alphas of connecting and arranging exceeded the widely accepted cut-off value of 0.70. The Cronbach's alpha of exploring was just below this value.

Independent variables: perceived hierarchy and conflict in the network and network size

We used single items with a 10-point horizontal rating scale to measure the perceived degree of hierarchy and conflict level in the governance network. Horizontal rating scales provide two opposite attitude positions and require respondents to place their own views on a 10-point scale (De Vaus, 2013). Concerning conflict, managers were asked to rate the amount of conflict on a 10-point scale ranging from many conflicts between organizations in the network to no conflicts between organizations in the network. For hierarchy, managers were asked to rate whether the network was characterized by many top-down-directed interactions or no top-down-directed interactions. Both items were reversely coded for the analysis.

To measure network size, managers were asked on a five-point Likert scale to indicate the number of organizations in their network, ranging from four organizations or less to 20 organizations or more.

Common source bias

The data collection process used in this study could induce a common source bias, as the data were based on single informants and self-reported (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). However, as our aim was to explain the level and type of strategies used, we asked about the use of specific activities, for which the managers themselves were a good source.

Further, we took various design measures to reduce the problem of common source bias. We tested the survey items extensively and discussed them with people from the organizations participating in the survey. The dependent and independent variable items were presented on different pages in the survey.

Moreover, we performed *post hoc* statistics to test for the possible problem of common method bias. Statistically, we conducted the Harman one-factor test in SPSS and the unmeasured latent method construct in AMOS to assess whether the majority of the variance could be explained by a single factor (Podsakoff et al., 2003). The results confirmed that common method bias did not pose a threat to the study.

Control variables

We selected four control variables to test whether the measured effects on our dependent variable, network management strategies, had not been caused by certain specific characteristics of the project or the reporting manager (see Table 4). With regard to the projects, we included two control variables in our analyses, based on the literature. The literature shows that increased task complexity can increase the variety and/or level of network management or boundary-spanning activities undertaken (see Klijn et al., 2010; Van Meerkerk & Edelenbos, 2014). Therefore, we included task complexity as a control variable.

Next, we examined the phase of the project. This variable was about the completed activities within the project, such as the development of the final project plan and the realization of the first physical constructions. It is possible that some network management strategies were used more intensively in different phases of the project. In 81% of the sample projects, a master plan had been developed and established by the city council and, in 40%, the first physical constructions had been built.

With regard to the reporting managers, we included the number of years that each respondent had been involved in the project as the manager, as this could relate to the type and level of strategies used. The mean score on this variable was 3.0 years, which is a considerable amount of time. However, the standard deviation (2.1 years) was quite high, and this strengthened the case to include this variable as a control. Furthermore, we included the general experience (measured in years) of the project manager with complex urban projects as a control variable. Our main argument here is that, with the more time they spend working in the field, network managers will have more experience of analysing and understanding network relationships, and more skills in bringing people together to promote sense-making among actors in the governance network, as well being better able to set up collaborative relationships (Juenke, 2005). Although most project managers involved in the survey were relatively experienced in the management of urban projects (more than 13 years on average and a modus of seven years), there were strong differences (a standard deviation of 7.2 years).

Analysis of the data

We used structural equation modelling (SEM) to conduct data analysis and to test the conceptual model. This has several advantages compared to regression analysis (Byrne, 2010). First, SEM allows simultaneous, rather than separate, analysis of all the variables in the model, and it enables measurement of direct and indirect effects. Second, SEM has the capability to deal with latent variables, by using separate factor loadings for the observed indicators (the survey items), thereby incorporating both unobserved constructs and observed indicators in the model. Third, whereas traditional multivariate procedures are incapable of either assessing or correcting for measurement error, SEM provides explicit estimates of these error variance parameters, thereby improving the accuracy of the data analysis (Byrne, 2010).

Results

Table 4 presents the means, standard deviations, and correlations for all model constructs and control variables. The mean scores for the three strategies were a bit above the mid-range of the scales, indicating that the managers generally deployed quite a number of network management strategies. Connecting strategies were generally conducted more than arranging strategies and, in particular, more than exploring strategies. The (reversed) mean scores for both perceived hierarchy and conflict were just above the mid-range of the scale. In general, more than 14 different organizations were involved in the networks.

The various network characteristics correlated differently with the different types of network management strategies, and some of them were not

Table 4. Means, standard deviations, and correlations.

	M	SD	Connecting	Exploring	Arranging	Hierarchy	Size	Conflict	General experience	Project experience	Task complex.	Project phase
Connecting (1-5)	3.90	.63	1									
Exploring (1-5)	3.52	.69	.534**	1								
Arranging (1-5)	3.72	.66	.314**	.400**	1							
Hierarchy (1-10)	6.08	2.00	.186*	.112	.197*	1						
Size (1-5)	3.28	1.29	.136	.215*	.248**	.027	1					
Conflict (1-10)	6.15	2.00	-.122	-.226**	-.023	-.262**	-.080	1				
General experience	13.01	7.23	.134	.123	.099	-.028	.128	-.132	1			
Project experience	2.99	2.12	.123	.111	.038	-.037	.162	-.035	.193*	1		
Task complexity (1-6)	3.76	1.58	.100	.162	.130	.176*	.292**	-.021	.052	.131	1	
Project phase (1-6)	3.21	1.34	.297**	-.005	.014	.024	-.026	.007	.035	.280**	.131	1

**$p < 0.01$; *$p < 0.05$.
N is in between 133 and 141 (pairwise deletion of missing values).

correlated. Perceived hierarchy in the network was positively related with connecting and arranging strategies (at the 0.05 level), but not with exploring strategies. Network size was positively (and more strongly) related with exploring (at the 0.05 level) and arranging (at the 0.01 level) strategies, but not with connecting strategies. Conflict only shows a correlation, negatively, with exploring strategies (at the 0.01 level). The last finding is contrary to what we expected in our hypotheses.

One of the control variables was positively correlated with one of the managerial strategies: projects that were in a later stage had a stronger presence of connecting strategies. Furthermore, and unsurprisingly, network size and perceived hierarchy were positively correlated with the task complexity of the projects.

Then, we performed a structural equation analysis to examine the data in more depth. The fits of the model were good (CFI: 0.952, TLI: 0.902, RMSEA: 0.048, PCLOSE: 0.521).

As Figure 1 shows, there was no single significant relation between hierarchy and any of the network management strategies. This is not what we would have expected from the theory—as expressed in our first hypothesis.

We cannot support the expected positive relations between hierarchy and arranging, or the negative relation between hierarchy and exploring and connecting. Moreover, we found that conflict had negative effects on both connecting and exploring network management strategies, but the relation with connecting strategies was not significant. This is clearly not in line with our theoretical expectation. Conflict had no effect on arranging strategies. The

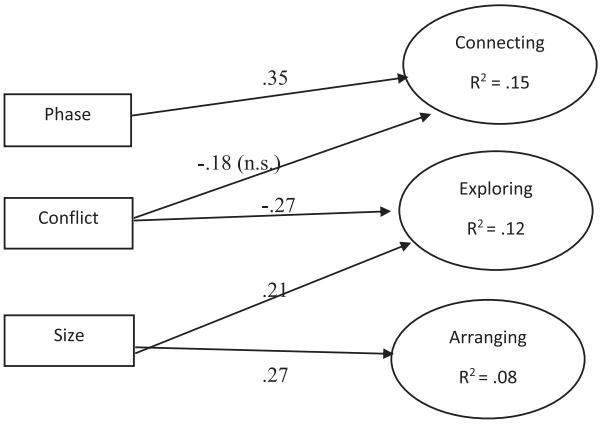

Figure 1. SEM model with network characteristics and three network management strategies. Notes: Standardized regression coefficients are reported: **$p < 0.01$; *$p < 0.05$. Function estimate means and intercepts used to deal with some missing values. Correlations between the dependent variables were modelled, but are not depicted here for expositional clarity. Model fit indices: CMIN/DF: 1.19; CFI: 0.97; RMSEA: 0.04; PCLOSE: 0.70

third hypothesis was the best supported. Network size had the expected positive effects on arranging and exploring. So, in larger networks, network managers deploy more arranging and exploring strategies. However, we did not find the expected positive relation with connecting. Our control variable, project phase, has positive significant effect on connecting. So, as projects proceed, more connecting strategies are used.

Conclusion and discussion

We investigated the influence of three network characteristics—network size, conflict, and hierarchy—on the deployment of the strategies exploring, connecting, and arranging by network managers. Do network managers respond to certain network characteristics in their choice of certain network management strategies? Overall, we can conclude that network size is an important network characteristic explaining the choice of certain network management strategies, especially exploring and arranging. We did not find any effect as a result of hierarchy. The results for conflict as a network characteristic were less conclusive and contrary to our expectations: more conflict was related with a lower level of connecting strategies. Below, we dig deeper into the meaning of these results for theory and practice

We are aware that our research has some limitations. First, it was based on (self-reporting) survey results in which both the dependent and the independent variables were measured subjectively, via key respondents and their perceptions. Moreover, we looked at specific projects regarding urban development in governance network settings in one country: The Netherlands. Other fields, like education and healthcare, were not taken into account. This hampers the external validity of our research findings.

Despite these limitations, we believe that this paper is valuable for drawing meaningful conclusions. The research on relating network characteristics and network management strategies is largely open, and our results provide enough indications that looking for relations between network characteristics and network management strategies is valuable and interesting.

Influence of network characteristics on network management

A first important finding from our research was that hierarchy seems to have no significant effect on the use of the three network management strategies (connecting, exploring, and arranging). This is not what we expected based on the (scarcely) available literature (Provan & Milward, 1995; Provan & Kenis, 2008). This could be a typically Dutch bias, as The Netherlands is very much a consensus society where hierarchy play a smaller role than in other countries (see Hofstede, 1983 or https://www.hofstede-insights.com/product/compare-countries). In that case, network characteristics would be influenced by larger (cultural) country characteristics (for other indications of this, see Klijn et al., 2015). Another explanation could be that, in our research, we looked at specific urban and spatial planning projects, whereas the available research focuses on other domains, like service delivery and health (Provan & Kenis, 2008; Provan and Milward, 1995). In these domains, hierarchy is possibly more important than in urban (and environmental/infrastructural) projects. What is needed is a fuller comparison of the network characteristics between different domains in which governance networks emerge and then how these governance networks relate to various kinds of network management strategies. This field of research is still very open.

A second conclusion is that a network characterized by conflicts among network actors is negatively related to exploring as network strategy: network managers do not choose exploring as a network management strategy if they are responding to conflict situations. In theory, network management is often proposed as a way to deal with conflicts within networks, as managers have to bridge nodes in the network and connect to people (Huxham & Vangen, 2005; McGuire & Agranoff, 2011). However, we did not find any relationships between conflict and arranging and connecting as network management strategies. We expected that managers would search and explore for content and information to resolve issues and conflicts but, in reality, managers do not choose this strategy explicitly. In the literature on mediation, joint fact-finding is often stressed as a management strategy (Ehrmann & Stinson, 1999); it was also stressed in our conceptualization and operationalization of exploring as network management strategy. Again, we need more research to investigate and explain this relationship in more detail, for example by additional qualitative—in-depth—investigations. A possible explanation, however, is that conflicts also make network management strategies more complicated (especially looking for new solutions and generating extra information as conflicts tend to focus actors on their own interests and actors reject additional information that does not match their own perceptions—see Klijn & Koppenjan, 2016).

A third conclusion from our research is that network size, as a network characteristic, matters the most. We found that size positively influences arranging and exploring network management strategies: network managers choose these strategies to cope with the (increasing) size of the network. In response to network size, when many actors from various organizational backgrounds (public, private, and

societal) are part of a network, a connecting strategy is not deployed, as it might take too much time to become closely attached to individual standpoints and values, and it is more salient to develop arranging and exploring strategies. In these two strategies, more information is collected about the actors to understand the various perceptions of problems and solutions (McGuire & Agranoff, 2011; Klijn & Koppenjan, 2016). Moreover, arranging is more appropriate, as the network manager must develop various (ad hoc) arrangement to bring together different actors around certain themes and tasks (Provan & Kenis, 2008). Furthermore, connecting was seen to be enacted more strongly in the later phases of a project, when it is more important to build strong actor relationships as the specific project developments and consequences become more salient.

Practical relevance

Our findings show that managers have to work harder in larger networks and employ more and diverse network strategies. Moreover, they need to spend more time on formally organizing the network (in our survey we called this 'pay attention to arranging') but also on connecting various actors to each other and implementing a process of exploration to find acceptable solutions that can motivate various necessary actors to support those solutions. However, we also found a paradox in that in situations where there was more conflict in networks, fewer network management strategies were employed. In conflict situations, a manager's coping strategy might be to select certain strategies and intensify this strategy to solve the conflict, for example by inserting more explicit process design rules to create a safer environment to mitigate the conflicts. Another strategy might be to focus on increasing the level of trust between actors rather than proceeding with the desired solution. This could create the basis for more solid interactions, as well as diminishing the level of conflict.

Disclosure statement

No potential conflict of interest was reported by the authors.

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References

Agranoff, R., & McGuire, M. (2003). *Collaborative public management: New strategies for local governments*. Georgetown University Press.

Akkerman, A., & Torenvlied, R. (2013). Public management and network specificity: Effects of colleges' ties with professional organizations on graduates' labour market success and satisfaction. *Public Management Review*, *15*, 522–540.

Aldrich, H. A., & Herker, D. (1977). Boundary spanning roles and organizational structure. *The Academy of Management Review*, *2*(2), 217–230.

Ansell, C. A., & Gash, A. (2008). Collaborative governance in theory and practice. *Journal of Public Administration Research and Theory*, *18*(4), 543–571.

Bryson, J. M., & Crosby, B. (1992). *Leadership for the common good: Tackling public problems in a shared power world*. Jossey-Bass.

Byrne, B. M. (2010). *Structural equation modeling with AMOS. Basic concepts, applications, and programming*. Routledge.

De Vaus, D. (2013). *Surveys in social research*. Routledge.

Edelenbos, J., Klijn, E.-H., & Steijn, B. (2011). Managers in governance networks: How to reach good outcomes? *International Public Management Journal*, *14*, 420–444. doi: 10.1080/10967494.2011.656055

Ehrmann, J. R., & Stinson, B. L. (1999). Joint fact-finding and the use of technical experts. In L. Susskind, S. McKearnan, & J. Thomas-Larmer (Eds.), *The consensus building handbook*. Sage.

Field, A. P. (2005). *Discovering statistics using SPSS*. 2nd ed. Sage.

Fischer, F. (2003). *Reframing public policy: Discursive politics and deliberative practices*. Oxford University Press.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*, 39–50.

Gage, R. W., & Mandell, M. P. (Eds.). (1990). *Strategies for managing intergovernmental policies and networks*. Praeger.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). *Multivariate data analysis*. Prentice-Hall.

Hanf, K. I., & Scharpf, F. W. (Eds.). (1978). *Interorganizational policy making: Limits to co-ordination and central control*. Sage.

Hofstede, F. (1983). National cultures in four dimensions. A research-based theory of cultural differences among nations. *International Studies of Management & Organization*, *13*(1–2), 46–74.

Huxham, C., & Vangen, S. (2005). *Managing to collaborate: The theory and practice of collaborative advantage*. Routledge.

Juenke, E. G. (2005). Management tenure and network time: How experience affects bureaucratic dynamics. *Journal of Public Administration Research and Theory*, *15*(1), 113–131.

Kickert, W. J. M., Klijn, E.-H., & Koppenjan, J. F. M. (Eds.). (1997). *Managing complex networks: Strategies for the public sector*. Sage.

Klijn, E.-H., Edelenbos, J., & Steijn, B. (2010). Trust in governance networks: Its impact and outcomes. *Administration and Society*, *42*(2), 193–221.

Klijn, E.-H., & Koppenjan, J. F. M. (2016). *Governance networks in the public sector*. Routledge.

Klijn, E.-H., Steijn, B., & Edelenbos, J. (2010). The impact of network management on outcomes in governance networks. *Public Administration*, *88*(4), 1063–1082.

Klijn, E.-H., Ysa, T., Sierra, V., Berman, E., Edelenbos, J., & Chen, D. (2015). The influence of network management and complexity on network performance in Taiwan, Spain and The Netherlands. *Public Management Review*, *17*(5), 736–764.

Koppenjan, J. F. M. (2007). Consensus and conflict in policy networks: Too much or too little. In E. Sørensen, & J.

Torfing (Eds.), *Theories of democratic network governance*. Palgrave Macmillan.

Labianca, G., Brass, D., & Gray, B. (1998). Social networks and perceptions of intergroup conflict: The role of negative relationships and third parties. *The Academy of Management Journal*, *41*(1), 55–67.

Levina, N., & Vaast, E. (2005). The emergence of boundary-spanning competence in practice: Implications for implementation and the use of information systems. *MIS Quarterly*, *29*(2), 335–363.

Lewis, J. (2011). The future of network governance: Strength in diversity and synthesis. *Public Administration*, *89*(4), 1221–1234.

Maccio, L., & Cristofoli, D. (2018). How to support the endurance of long-term networks: The pivotal role of the network manager. *Public Administration*, *95*, 1060–1076.

Mandell, M. P. (1990). Network management: Strategic behavior in the public sector. In R. W. Gage, & M. P. Mandell (Eds.), *Strategies for managing intergovernmental policies and networks*. Praeger.

Mandell, M. P. (Ed.). (2001). *Getting results through collaboration: Networks and network structures for public policy and management*. Quorum Books.

Markovic, J. (2017). Contingencies and organizing principles in public networks. *Public Management Review*, *19*(3), 361–380.

McGuire, M., & Agranoff, R. (2011). The limitations of public management networks. *Public Administration*, *89* (2), 265–284.

Meier, K. J., & O'Toole, L. J. (2007). Modelling public management: Empirical analysis of the management-performance nexus. *Public Administration Review*, *9*(4), 503–527.

O'Toole, L. J. (1988). Strategies for intergovernmental management: Implementing programs in interorganizational networks. *Journal of Public Administration*, *11*(4), 417–441.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioural research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879–903.

Provan, K. G., & Kenis, P. (2008). Modes of network governance: Structure, management, and effectiveness. *Journal of Public Administration Research and Theory*, *18* (2), 229–252.

Provan, K. G., & Milward, H. B. (1995). A preliminary theory of interorganizational network effectiveness: A comparative study of four community mental health systems. *Administrative Science Quarterly*, *40*, 1–33.

Provan, K. G., & Milward, H. B. (2001). Do networks really work? A framework for evaluating public-sector organizational networks. *Public Administration Review*, *61*(4), 414–423.

Rodríguez, C., Langley, A., Béland, F., & Denis, J. L. (2007). Governance, power, and mandated collaboration in an interorganizational network. *Administration & Society*, *39* (2), 150–193.

Rogers, D. L., & Whetten, D. A. (Eds.). (1982). *Interorganizational co-ordination: Theory, research, and implementation*. Iowa State University Press.

Sandstrom, A., & Carlsson, L. (2008). The performance of policy networks: The relation between network structure and network performance. *Policy Studies Journal*, *36*(4), 497–524.

Scharpf, F. W. (1978). Interorganizational policy studies: Issues, concepts and perspectives. In K. I. Hanf, & F. W. Scharpf (Eds.), *Interorganizational policy making: Limits to co-ordination and central control*. Sage.

Sheehan, K. B. (2001). Email survey response rates: A review. *Journal of Computer-Mediated Communication*, *6*(2), 1. January 2001, JCMC621, https://doi.org/10.1111/j.1083-6101.2001.tb00117.x.

Sørensen, E., & Torfing, J. (Eds.). (2007). *Theories of democratic network governance*. Palgrave Macmillan.

Van Meerkerk, I., & Edelenbos, J. (2014). The effects of boundary-spanners on trust and performance of urban governance networks: Findings from survey research on urban development projects in The Netherlands. *Policy Sciences*, *47*(1), 3–24.

Van Meerkerk, I., Edelenbos, J., & Klijn, E.-H. (2015). Connective management and governance network performance: The mediating role of throughput legitimacy. Findings from survey research on complex water projects in The Netherlands. *Environment and Planning C: Government and Policy*, *33*(4), 746–764.

Willem, A., & Lucidarme, S. (2014). Pitfalls and challenges for trust in collaborative networks. *Public Administration Review*, *16*(5), 733–760.

Williams, P. (2012). *Collaboration in public policy and practice: Perspectives on boundary Spanners*. Policy Press.

Williamson, O. E. (1996). *The mechanisms of governance*. Oxford University Press.

Ysa, T., Sierra, V., & Esteve, M. (2014). Determinants of network outcomes: The impact of management strategies. *Public Administration*, *92*(3), 636–655.