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Do network management and trust matter for network outcomes? A meta-analysis and research agenda

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ABSTRACT

Collaborative and network governance assume that network management and trust matter for network outcomes. We test this assumption by conducting a meta-analysis of public administration studies investigating the correlation between network management and network outcomes (*50 effect sizes*), and trust and network outcomes (*28 effect sizes*). While both matter for achieving network outcomes across countries, trust matters most. Trust is particularly important for achieving process outcomes and multiple network management strategies combined are more effective than separate single strategies. A research agenda centred on complex modelling, comparative research and using mixed, multisource, experimental and longitudinal data is stipulated in conclusion.

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KEYWORDS Network management; network trust; network outcomes; network performance; meta-analysis

Introduction: trust and management in networks

Networks, network governance and collaborative governance have become 'business as usual' in public administration theory, research and practice (Emerson and Nabatchi 2015; Klijn and Koppenjan 2012). The last 20–25 years we have seen a surge in research and conceptualization of the core idea that policy is formed and implemented in a multi-actor setting of interdependent actors. Over the years, a perspective, or as one wishes a paradigm, has evolved around a few core assumptions, including (see Agranoff and McGuire 2001; Ansell and Gash 2008; Gage and Mandell 1990; Hanf and Scharpf 1978; Kapucu and Hu 2020; Kickert, Klijn, and Koppenjan 1997):

- For solving policy problems, governments are dependent on a wide range of other actors' resources (Scharpf 1978; Benson 1982; Ansell and Gash 2008).
- These sets of actors interact frequently with each other and thus networks emerge around policy problems or policy issues (Provan and Milward 1995; Kickert, Klijn, and Koppenjan 1997).

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- The characteristics of these networks (e.g. more or less trust in relations, more or less frequent interactions) have influence on the interactions that take place within them (Provan and Kenis 2008; Berry at al., 2004; Kapucu and Hu 2020).
- In most policy problems, decision and implementation processes are complex because actors are dependent on each other's' resources but also have different interests and perceptions of the problem (Ansell and Gash 2008; Klijn and Koppenjan 2016).
- Policy outcomes are realized through the collective interactions (which are usually a combination of conflict and collaboration) of actors in the network (Scharpf 1978, 1997; Koliba et all, 2018).

Initial theory-building and research predominantly (but not only) drew on case studies and qualitative empirical research methods (Berry et al. 2004; Klijn 2008). In the last 10–15 years, however, more quantitative research has also been published in public administration in relation to networks (e.g. Cristofoli, Maccio, and Pedrazzi 2013; Klijn, Steijn, and Edelenbos 2010, Kelman et al., 2013; Willem and Lucidarme 2014), which aimed at testing earlier developed theoretical claims in larger samples across or within different country settings.

Research problem: the influence of network management and trust on network outcomes

In looking for explanations for (successful) outcomes of networks, various factors have been explored. But two of the most prominently mentioned factors in both theoretical contributions as well as in empirical research are network management and network trust (e.g. Kapucu and Demirhan 2019; Klijn, Metselaar, and Warsen 2023; Markovic 2017; Warsen et al. 2018). The core aim of this meta-analysis is to integrate the findings of quantitative public administration studies on network management, trust and outcomes to answer the following question: *Do network management and trust matter for network outcomes*? Additionally, sources of variation in the overall relationships are examined through meta-regression analysis, which includes looking at the role of conceptualization (i.e. *how* network management and outcomes are conceptualized) and context (i.e. *where* the study was conducted).

Our research question is embedded in a range of literature from collaborative and network governance. Since Myrna Mandell introduced the term network management in 1990 (see Mandell 1990), network and collaborative theories in general have paid much attention to the concept and emphasized the importance of active management of networks and collaborative processes (see Ansell and Gash 2008; Kapucu and Hu 2020; Kickert, Klijn, and Koppenjan 1997; McGuire and Agranoff 2011). Network management can roughly be defined as '*all deliberate activities aimed at facilitating and guiding the interactions and/or change the features of networks with the intent to further the collaboration with the network process*' (Klijn and Koppenjan 2016, 11). In the literature, some ambiguity remains about the term network management especially in relation to network governance and related terms (Ansell and Gash 2008; Emerson and Nabatchi 2015; O'Leary et al. 2009; Sørensen and Torfing 2007). To clarify, some authors use network (or collaborative) governance to indicate managerial activities in networks. In this article, network governance is seen as a broader term than network management and refers to all attempts of actors in networks to influence interactions

in networks and the resulting processes in the network. Thus, to phrase it shortly, all network management is network governance but not all network governance is network management as network governance also includes individual strategic actions of actors aimed at own strategic goals rather than at the interactions of actors in the network as a whole.

One of the basic assumptions and claims of network governance and collaborative governance theory is that without network management it is difficult for networks to achieve beneficial outcomes (Emerson and Nabatchi 2015; Kickert, Klijn, and Koppenjan 1997; Mandell 1990; McGuire and Agranoff 2011; Scharpf 1978). This is rooted in assumptions that collaborative and network governance processes are complex due to the presence of a wide variety of actors, perceptions and strategies, and likely not result in good outcomes without active managerial effort. It is thus not surprising that based on these theoretical assumptions most quantitative studies tend to hypothesize a positive relationship between network management and network outcomes (e.g. Cristofoli, Maccio, and Pedrazzi 2013; Klijn, Steijn, and Edelenbos 2010). Trust is another core characteristic of networks that is supposed to be crucial in explaining the outcomes of networks. As such, trust is mentioned in virtually every conceptualization of collaborative and network governance (see Ansell and Gash 2008; Emerson and Nabatchi 2015; Huxham and Vangen 2005; Kapucu and Hu 2020). The core idea is that a higher level of trust between actors in networks allows for more information exchange and less uncertainty – and thus better outcomes.

Meta analysis as research method to assess impact of network management and trust

As indicated before, while the number of quantitative studies on the subject is growing, the evidence remains limited to single studies without an integration of findings across these studies. A need emerges to identify what can be said across all of these studies, and what that implies in terms of a future research agenda aimed at further advancing the field. The meta-analysis and meta-regression performed in this article can help to address that need (George et al. 2023). A meta-analysis exclusively focuses on quantitative studies and combines effect sizes from these single studies into overall effect sizes across studies. Firstly, we identify *quantitative* studies on network management, network trust and network outcomes published in journals classified in the public administration category of Web of Science's (W-o-S) Social Sciences Citations Index (SSCI). Next, we integrate the findings of these studies to identify the overall impact of network management and network trust on network outcomes across all of these studies. Finally, a meta-regression analysis is conducted to identify whether the relationship between network management, trust and outcomes varies based on *conceptual* (i.e. whether network management combines multiple strategies or constitutes a single strategy, and whether network outcomes measure process and/or content outcomes) and *contextual* (i.e. the country in which data are collected) moderators. The recommendations for meta-analysis in public management and policy developed by Ringquist (2013) and implemented by other recent meta-analyses on management approaches in public administration (e.g. George, Walker, and Monster 2019; George et al. 2021) are used throughout the article.

This meta-analysis on network management, trust and network outcomes contributes to public administration theory, research and practice in following ways. First,

and most important, the meta-analysis seeks to offer empirical credence to network theory's assumption that network management and trust indeed matter for network outcomes. Because these are, as mentioned earlier, core assumptions of collaborative and network governance, this empirical credence is very important. Additionally, by testing several conceptual and contextual moderators, this study demonstrates whether network theory's rather universalistic assumption concerning the impact of network management and trust needs to be nuanced based on conceptualization and context, which is both an important theoretical and empirical contribution. Second, our study demonstrates how meta-analytical techniques can be used to identify the effectiveness of management approaches in public administration, thus contributing to the call for more evidence-based insights in our field (e.g. Hall and Van Ryzin 2019; Perry 2012) and the social sciences in general (e.g. D. M. Rousseau 2006; Sanderson 2002). Moreover, this is the first quantitative integration of research studies on network management, network trust and network outcomes in public administration that we know of, and our findings result in a research agenda centred around *conceptual*, *contextual* and *methodological* research avenues that can further advance scholarship on networks in general. Finally, network management and trust-building techniques are widely used by public managers, policymakers and other public professionals across the globe, this meta-analysis provides insights into whether it is worthwhile, based on empirical evidence, to engage with network management and trust-building techniques as a means of achieving network outcomes.

In what follows, network management, network trust and network outcomes are discussed as well as the relationship between them. Next, meta-analytical methods and procedures are described before presenting the actual results. We conclude with implications for theory and practice, as well as an agenda for future research.

Theory and literature review: network management, network trust and network outcomes

Both collaborative governance and network governance literature emphasize that governance processes take place in networks of interdependent actors, with both governmental actors and profit and non-profit actors (and societal groups) (see Emerson and Nabatchi 2015; Hanf and Scharpf 1978; Kapucu and Hu 2020). In the section below, we draw on both theories to build our theoretical argumentation for this study. And although the two perspectives – network governance and collaborative governance – certainly show some differences, their basic assumptions and theoretical explanations are very similar and both research themes and ideas show significant overlap (see Wang and Ran 2023). The five main theoretical assumptions that are formulated in the introduction of this article are also shared by both perspectives.

There are many definitions of governance networks. We follow Klijn and Koppenjan's (2016, 11) definition of governance networks as being '*more or less stable patterns of social relations between mutual dependent actors, which cluster around a policy problem, a policy programme, and/or a set of resources and which emerge, are sustained, and are changed through a series of interactions*'.

Since actors are dependent on each other's resources they have to interact with each other which results in patterns of interactions and thus networks (Hanf and Scharpf 1978; Provan and Kenis 2008). Processes in networks fundamentally move between cooperation – because of the necessity to cooperate due to resource dependency – and

conflict – because of different interests and perceptions. This makes interactions in networks complex, as emphasized in the introduction, with different involved actors pursuing their own strategies and unexpected flows of interactions (Hanf and Scharpf 1978; Klijn and Koppenjan 2016; Koliba, Meek, and Zia 2018). The assumption is that these features make it more difficult to achieve the desired outcomes (and solve social problems) in governance networks, as they require effort to bridge or connect with different perceptions and strategies, and cope with the complexity that accompanies unexpected events. Because of these features, authors argue that network management is necessary to achieve good network outcomes (e.g. Gage and Mandell 1990; Kapucu and Hu 2020; McGuire and Agranoff 2011). At the same time, the importance of trust is emphasized. Information has to be exchanged to reach satisfactory outcomes and less contractual vehicles are available to enforce agreements between actors (Nooteboom 2002; Williams 2012). We discuss both topics, network management and trust in the sections below (and their relation to outcomes) but first address the topic of network outcomes, our dependent variable.

Network outcomes, pitfalls, conceptualization and measurement

Network outcomes are a complex concept because contrary to situations where you evaluate policy aims or the objectives of one actor you do not have a yardstick to measure network outcomes. In networks, various actors are present (both public and non-public) and it is not immediately clear which goals to pick to measure outcomes (see Emerson and Nabatchi 2015; Huxham and Vangen 2005). Especially since these goals may be contradictory in networks. Another problem is that networks imply interaction between actors and only in that interaction information about possible solutions, which is dispersed among various actors, is evolving. So it is likely actors will change their perceptions on the problem and solution but also change the goals they want to achieve (Huxham and Vangen 2005; Klijn and Koppenjan 2016). The negative wording, strongly voiced from a classical rationalistic perspective, for this would be 'goal displacement'. The same development worded from a network perspective might be called learning (Huxham and Vangen, 2005; Klijn and Koppenjan 2016; see Fischer (2003) for a connected idea like frame reflection, also frequently mentioned in network and collaborative governance literature). After all, actors only experience solution possibilities in interactions. Thus, picking goals actors formulated at the start (ex-ante) may not be the best way to evaluate network outcomes.

Provan and Milward (2001) suggest measuring network outcomes at various levels:

Organizational level (benefits for the involved organization)
Network level (especially sustainability of the network, growth in terms of interactions etc.)
Societal level (benefit for broader society, like improved health)

The downside of Provan and Milward's (2001) measurement is that a significant number of their measurements, like growth of network in terms of interactions or number of actors, are not really about performance in the sense of outcomes of services or policy but more about endurance of the network itself. Our preference for this meta-analysis is to stay as close to something which tries to measure what is being achieved

as policy or service results in the network rather than how the network grows or sustains.

Another solution that authors suggest, when it is very hard to turn to 'objective' measures of performance, is to look at whether actors are satisfied, thus whether actors perceive the outcomes as good and desirable (Huxham and Vangen 2005; Kickert, Klijn, and Koppenjan 1997). In this case, outcomes are measured at actor level but aggregated to a network level (Klijn, Steijn, and Edelenbos 2010; Sandstrom and Carlsson 2008). Another suggested solution is to analyse whether enrichment can be found – that is if solutions for experienced problems become better and incorporate earlier criticism (see Klijn and Koppenjan 2016). This of course implies that learning processes have taken place, and goals and ideas have been adapted to find new solutions. In network theory, most authors seem to agree that outcome measurement is related to the way actors succeed in achieving joint solutions that are of interest to a large number of actors in the network (Emerson and Nabatchi 2015; Klijn and Koppenjan 2016; Provan and Milward 2001). If we look at how outcomes are measured in quantitative research on the subject, we can typically distinguish between two types of outcomes included in our analysis. Namely, process outcomes, which measure network actors' perception of the process (e.g. quality of the process, learning from others, fairness of the process), and content outcomes, which measure network actors' perception of what was actually achieved in the process (e.g. effectiveness of the network, offering better services, solving complex problems) (Klijn, Steijn, and Edelenbos 2010).

Network management: strategies and impact on network outcomes

There is broad consensus in the literature about network governance, collaborative governance and interactive governance that the type of leadership and/or management required in networks differs significantly from the classical image we have of leadership. Ansell and Gash (2008) speak about 'facilitating leadership' by which they emphasize that the important job of a leader is to mediate between actors and empower the process of collaboration. We see similar phrasings in most literature on networks, collaborative governance, interactive governance or other terms used. Because of the characteristics of networks – interdependency of actors – and because solving problems implies a need for resources from many actors – network management is considered crucial to achieve coordination of actions and bringing together of the necessary resources (see also Huxham and Vangen 2005; Kickert, Klijn, and Koppenjan 1997; Mandell 1990; McGuire and Agranoff 2011).

Network management strategies could be initiated by one actor but also by more than one actor (Kickert, Klijn, and Koppenjan 1997; Mandell 1990; O'Toole 1988). These could be public actors but also private or non-profit actors. A network perspective explicitly leaves the option open that others than public actors perform an important role in solving societal problems by engaging in joint action. Various management strategies are mentioned in the literature. In general, a distinction is made between process-oriented strategies and institutional-oriented strategies (Klijn and Koppenjan 2016; Mandell 1990; Sørensen and Torfing 2007). Process-oriented strategies try to facilitate the interaction between actors in policy games. Characteristic of these strategies is that although they are indirect in the sense that they try to facilitate interactions and actions of other actors, they consider the structure of the network (the

rules, position of actors, resource division) as given. They aim at influencing actors and interactions (hands on strategies see Sørensen and Torfing 2007). If management strategies are aimed at changing the institutional characteristics of the network (for instance changing actors' positions, adapting entry rules or other more drastic ways to intervene in the structure of the network) they are called institutional design strategies (Klijn and Koppenjan 2016; hands off strategies called by other authors see; Sørensen and Torfing 2007). In this article, we focus on process management strategies when we indicate network management because such strategies are core to the day-to-day management of network managers and are typically what is measured in quantitative studies on network management.

If we look at process management strategies, a wide variety of strategies are mentioned by various authors (see Gage and Mandell 1990; Kapucu and Hu 2020; McGuire and Agranoff 2011; O'Toole 1988). Strategies mentioned are for instance mediating conflicts, mobilizing actors, exploring ideas, changing perceptions (or bring them together) etc. Although various authors mention different strategies in general, there is quite some overlap in strategies mentioned. Table 1 provides an overview and classification of the types of strategies that have been identified by authors (see Klijn, Steijn, and Edelenbos 2010). We discuss the different types of strategies in the section below.

One of the first crucial things authors emphasize is that in a network several actors with distinct organizational backgrounds are active who need to be ***connected***. 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 and Edelenbos 2014). The network management literature also emphasizes that the network manager needs to identify and activate the required actors for an initiative and foster conditions where they are interested and willing to invest their resources (Hanf and Scharpf 1978; Kapucu and Hu 2020).

Strategies for ***exploring content*** are important to clarify goals and perceptions of actors when the collaborative process has started and try to reach convergence in these perceptions (Klijn and Koppenjan 2016). But they are also very important to create (packages of) goals and solutions that are able to keep the actors interested in the process, and build coalitions of support among involved actors (Klijn and Koppenjan

Table 1. Overview of network management strategies.

Types of strategies	Process agreements	Exploring content	Arranging	Connecting
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 moments, etc.	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.).	Selective (de) activation of actors, resource mobilizing, initiating new series of interactions, coalition building, mediation, appointment of process managers, removing obstacles to co-operation, creating incentives for co-operation.

Adapted from Klijn et al. (2010).

2016; McGuire and Agranoff 2011). Collecting and creating adequate knowledge and information is important, but also to stimulate variation in the discussion about solutions.

Collaborative processes must also be ***arranged*** and for that, managerial strategies of arranging are used, such as setting (temporary) structures for consultation, interaction, and deliberation, like project organization, and communication lines (Rogers and Whetten 1982). Well known is Provan and Kenis' (2008) distinction between three types of 'arranging' of networks: participant governed, lead organization governed or governed by a network administrative organization (NAO)). An important condition is the control of (excessive) transaction costs as these may hinder the process (Williamson 1996), but at the same time, the arrangements have to be acceptable to the actors involved (Klijn and Koppenjan 2016). Another important strategy mentioned in the literature are strategies of ***process agreements***. These agreements draft temporary sets of rules for interaction that structure the interactions and protect each actor's core values (Klijn and Koppenjan 2016). The rules can be seen as ground rules for behaviour and interaction in the network that the actors in the network (explicitly) agreed on.

As mentioned above, most of the literature on networks assumes that network management is crucial in achieving satisfactory outcomes for involved actors. The first argument is related to what is called earlier the difference in perceptions of actors in the network. As a result, it is not easy to come to a common understanding of the problem or at least achieve some sort of an agreement on a package deal where actors see their perceptions and interests satisfied (see Ansell and Gash 2008; Emerson and Nabatchi 2015). Thus, managerial action (especially what is called earlier exploring) has to bring perceptions together or at least achieve something like a compromise or a package deal to work out and realize solutions (Klijn and Koppenjan 2016). Related to this argument is that differences in perceptions can cause conflicts. Conflicts are an inherent characteristic of networks with actors who have different perceptions and interests (Huxham and Vangen 2005). But to achieve successful decision-making and performance in networks conflicts have to be managed and kept in line (Emerson and Nabatchi 2015; Kapucu and Hu 2020). Process rules of course help to mitigate conflicts as do connecting strategies of managers. However, due to the large number of actors present in networks, interactions are also complex and numerous. There is a need to order these interactions and provide platforms where they can take place (Mandell 1990; Provan and Kenis 2008; Rogers and Whetten 1982). The arranging strategy mentioned above tries to provide this feature but of course process rules and connecting strategies are also important to guide these interactions and create fruitful decision-making. Last but not least, networks are characterized by a complex dynamic. Because decision-making processes take some time and conditions are changing and actors adapt their strategies, there are constantly new developments and unexpected events. These cannot be addressed by formal arrangements like contracts or organizational arrangements (see for this argument also the large amount of literature about relational contracts, for an example: Brown, Potoski, and van Slyke 2016).

So, improvisation and dealing with complexity are crucial to achieve outcomes and connecting and exploring strategies that constantly deal with new developments and explore new ideas are necessary (Emerson and Nabatchi 2015; McGuire and Agranoff 2011). In other words, all four strategies underlying

network management are argued to play a crucial role in making the network perform better by bringing perceptions together and seeking for compromise, managing conflicts, providing platforms for interaction, and engaging with new developments and ideas. This also suggests that using multiple different network management strategies at the same time generates better outcomes than using a single strategy alone (see Klijn, Steijn, and Edelenbos 2010). Hence, in our analysis, we include measurements of single network management strategies as well as measurements of several network management strategies combined, as both measurements can be observed in the literature, and by doing so we can also explore whether multiple strategies together are indeed more effective than single ones.

Trust in networks: what it is and impact on outcomes

If we follow the argument of the previous section it is not only difficult to achieve decision-making but also to exchange information, hold other actors to promises and reduce uncertainty. Trust is then often mentioned in network and collaborative governance literature as at least partly 'solving' this problem (see Ansell and Gash 2008; Klijn, Steijn, and Edelenbos 2010; Provan, Huang, and Milward 2009). Trust in networks can roughly be defined as: '*the actors' more or less stable, positive perception of the intentions of other actors, that is, the expectation that other actors will refrain from opportunistic behavior*' (see Klijn, Steijn, and Edelenbos 2010; D. Rousseau et al. 1998). Thus, trust is an intention, which influences behaviour and can be seen as a characteristic of networks (networks can be characterized by high or low levels of trust). Importantly, we focus on trust between parties or people in a network, so not on trust *within* an organization, for instance between top management and team members. Such interorganizational trust typically includes (e.g. Klijn, Steijn, and Edelenbos 2010, Peters et al. 2017; Jacobsen 2013; Warsen et al. 2018):

Giving network partners the benefit of the doubt.
Having trust in the goodwill of network partners.
Having trust that others abide to an agreement made with network partners.
Experiencing an absence of opportunistic behaviour in the network.
Considering network partners as reliable.

Some authors focus more on interpersonal trust between people representing the different organizations in a network (e.g. Willem and Lucidarme 2014; Siddiki et al., 2017), which is similar to the above-mentioned focus points but with statements centred on individuals as opposed to partners or organizations.

There are several reasons why authors argue that trust in networks facilitates processes and outcomes (see Ansell and Gash 2008; Huxham and Vangen 2005; Klijn, Steijn, and Edelenbos 2010; Koliba, Meek, and Zia 2018). First of all, trust and especially trustworthy behaviour reduce uncertainty as actors' behaviour becomes more predictable (less opportunistic). And if high levels of trust are present in networks less costly contracts are needed, which saves transaction costs (D. Rousseau et al. 1998). One may also argue that a higher level of trust enhances investments in relations and networks, and thus makes them more stable and perform better (Nooteboom 2002; see for empirical evidence; Provan, Huang, and Milward 2009). The most

important argument is that higher levels of trust enable more information sharing and innovation since the chances that other actors use that information and innovations for their own benefit at expense of others are less (see Kapucu and Hu 2020; Nooteboom 2002).

Methods

Data

Data were collected through a systematic search of the literature guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al. 2021). Below we discuss inclusion/exclusion criteria. First, we defined the scope of the search, namely quantitative public administration articles that focus on network management and/or network trust in relation to network outcomes. Second, we conducted a title search using Web of Science. We limited the search to English-language articles published in journals classified by the Social Sciences Citation Index as these journals are international in nature and use strict peer-review processes to enhance the quality of their articles (Walker and Andrews 2015). In addition, we limited the search to the Web of Science category 'Public Administration' as we are primarily interested in drawing conclusions from this discipline.

Our title search conducted on 22 June 2022 focused on keywords 'network* OR collaborat* OR partner* AND manage* OR trust'. This would allow us to capture both several variations on the term network (e.g. collaboration and partnership) as well as ensure a focus on either some form of network management and/or some form of trust. This resulted in 290 articles. Third, by analysing the abstracts of these articles, we identified 45 articles that met our scope. Fourth, we read the 45 articles in full to identify their eligibility, and ended up with 15 relevant articles on network trust and network outcomes, and 18 relevant articles on network management and network outcomes. Fifth, we sent our list of articles to 10 experts in the field of collaborative and network governance, who have published widely on the subject, to ask whether we may have missed any relevant articles. While some suggestions popped up, these were not included because they were either qualitative, based on Qualitative Comparative Analysis (QCA) or had another operationalization of network management as defined or were already included. Before submitting this article, we checked whether there had been any new articles published that ought to be included and consulted experts again. Two articles were added specifically focused on network management – thus expanding our list of articles to 20 for network management and network outcomes. Figure 1 shows the flow diagram followed to identify the final literature set as well as the inclusion/exclusion criteria in schematic format.

Finally, all included articles were coded meaning that two datafiles were created – one file including the effect sizes between network management and network outcomes, and one including the effect sizes between network trust and network outcomes. Multiple effect sizes per study could be included, and we ended up with 50 effect sizes focused on network management and network outcomes, and 28 effect sizes focused on network trust and network outcomes. In Appendix 1, we include all the articles integrated in the meta-analysis, as well as their study characteristics as coded for the meta-analysis and full reference.

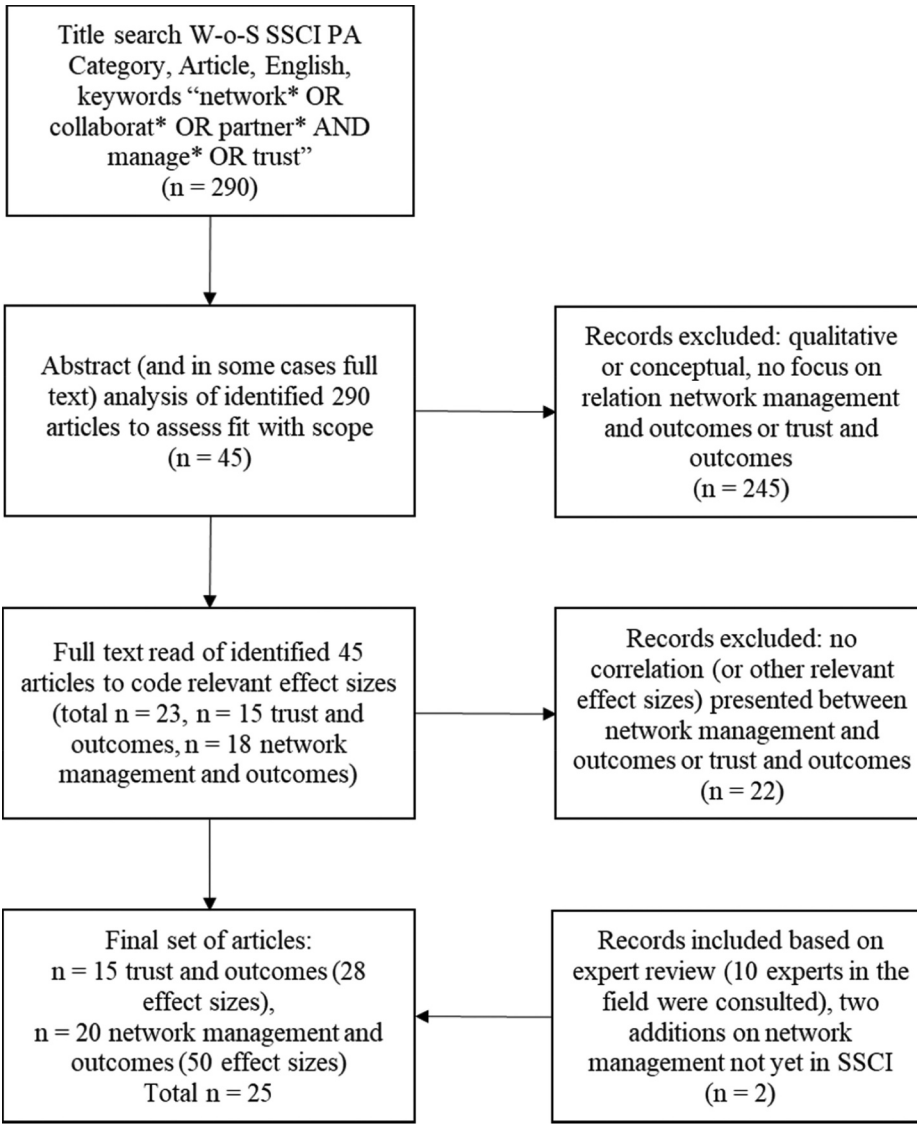

Figure 1. Flow diagram of the study selection.

As can be seen from Appendix 1, all of our included studies use cross-sectional, single source data bar one that use multiple source data (though still cross-sectional). This is unsurprising as the field has heavily relied on surveys to measure network management, trust and outcomes. Their publication dates range from 2009 to 2023 (confirming the idea that quantitative survey research about these topics increased the last two decades). In relation to types of network studies, a variety of fields can be observed implying our data represent diverse policy domains and network types (including, for example, security, health, urban regeneration and water governance). While we have studies from Asia, the Middle East, Europe and the US, it does stand out

that the majority of our articles come from the Netherlands (48%) and only two studies go beyond a single-country setting to offer a comparative perspective. Of the articles focusing on trust, most indeed centre on items of interorganizational trust as discussed earlier, with some including interpersonal trust (but again between partners in a network). Of the articles focusing on network management, we see a variety of focus points ranging from one single strategy to multiple strategies combined or separate. In terms of outcomes, most studies tend to focus on content outcomes with some also including process outcomes either combined with content or separately.

Meta-analytical procedure

Conducting a meta-analysis typically includes four steps: Identifying effect sizes, conducting the actual meta-analysis to identify a population effect size, conducting a meta-regression analysis to assess whether effect sizes are significantly influenced by a range of variables and, finally, assessing whether the results might be hampered by publication bias (Ringquist 2013).

Identifying effect sizes

As explained before, during the coding process each included study was assessed in order to identify effect sizes between network management, network trust and network outcomes. The effect size that this meta-analysis focuses on is the correlation coefficient, which is the preferred effect size for meta-analysis in our field due to their availability and easy interpretation (Ringquist 2013). Most studies in the network management database (14 studies) and the trust database (11 studies) reported correlation coefficients. Studies that did not report this metric, did report either unstandardized regression coefficients based on which we could calculate correlation coefficients or standardized regression coefficients. As a robustness check, we tested whether effect sizes differed significantly between the first or the latter group, and they did not. All included studies reported correlations or regression coefficients, and relied on Ordinary Least Squares (OLS) regression analysis or structural equation modelling (SEM).

Meta-analysis

Having turned the studies into a database with effect sizes, the next step is to actually conduct the meta-analysis and turn these effect sizes into an overall population effect size. A random-effects meta-analysis with Fisher's r-t-Z transformation was conducted. Random-effects are preferred when real-world data are used from actual real-life empirical settings, and Fisher's r-to-Z transformation is considered a convention within meta-analysis (Ringquist 2013). Fisher's r-to-Z transformation tackles three limitations of r-based effect sizes. Specifically, r contains a small downward bias, is bounded by −1 and + 1 implying that it is truncated and censored, and variance of r depends strongly on its value (Ringquist 2013).

Meta-regression

Our theoretical section focused on the direct association between network management, trust and network outcomes. However, this direct association might be moderated by *conceptual* and *contextual* variables. In a meta-regression analysis, we test the impact of one contextual and two conceptual variables. In relation to context, we

noticed that a large proportion of the articles we have included in the analysis come from the Netherlands. This raises questions of generalizability, so we assess whether there are differences between effect sizes coming from the Netherlands and those from other country contexts. Second, we test whether network management operationalizations using multiple network management strategies offer different effect sizes than those measuring a single strategy (as also indicated in our theory section, we expect multiple strategies to strengthen each other). We also test whether effect sizes differ when network outcomes focus on content outcomes, process outcomes or both. Of course, these moderators are selected based on expectations put forward in our theory section as well as the reality of the data we have. We are limited in the number of moderators to be tested due to the homogeneity in the sample for instance in terms of method (i.e. all cross-sectional and single source) and sample size.

We did random-effects meta-regression and used clustered robust standard errors at the study level. Indeed, our data are nested – i.e. effect sizes within studies – and we need to account for this nested reality (Ringquist 2013). In the model, the dependent variable is the Z-transformed effect size and the discussed moderators are the independent variables which are added as dummies (n-1).

Publication bias

Publication bias, also called the file-drawer problem, implies that because editors and reviewers prefer papers with significant findings, many papers with insignificant findings are not published (Rosenthal 1979). Hence, if these are not published, they cannot be included in the meta-analysis and our findings might thus only draw on papers with significant results – creating bias. There are both visual and statistical tests that can be performed to identify issues with publication bias. Following recommendations of Ringquist (2013), we produce a funnel plot of effect sizes and conduct the Egger test of small-study effects as means to test for publication bias in our data.

Results

Meta-analysis

Table 2 and Table 3 show the results of the meta-analysis. In both tables, the first row presents the meta-analysis results for all effect sizes. In the second row, we present the meta-analysis results when we calculate one average effect size per study (to control for studies grouping many effect sizes). Both the analyses demonstrate significant population effect sizes. Moreover, the population effect sizes are far from trivial, and can be

Table 2. Meta-analysis results on network management and network outcomes.

Effect sizes	Population effect size	95% CI	z-score (p-value)	I^2 (p-value)	Tau^2
50 (20 studies)	.352	[.273, .430]	8.781 (.000)	94.0% (.000)	.0741
20 (20 studies)	.389	[.269, .509]	6.345 (.000)	92.1% (.000)	.0634

Table 3. Meta-analysis results on network trust and network outcomes.

Effect sizes	Population effect size	95% CI	z-score (p-value)	I^2 (p-value)	Tau^2
28 (15 studies)	.435	[.327, .543]	7.904 (.000)	95.3% (.000)	.0779
15 (15 studies)	.477	[.293, .662]	5.066 (.000)	96.9% (.000)	.1266

classified at least as moderate for network management, and even close to strong for network trust. Interestingly, trust thus seems to have a stronger impact on network outcomes than network management. Moreover, findings are consistent also when one average effect size per study is included.

Meta-regression

Table 4 and Table 5 show the results of the meta-regression analyses. Importantly, while these tables show full models, two additional checks were conducted. We did subgroup analyses, calculating the population effect size for different groups. And we also ran regression models each time with one predictor (as our sample is small). Both checks resulted in similar findings, hence we only report the meta-regression results. Table 4 shows only one significant moderator, when network management includes multiple strategies, effect sizes are significantly bigger than when it only includes one strategy. Other than that, effect sizes do not significantly differ between regions or

Table 4. Meta-regression results on network management and network outcomes.

Moderators	Coefficient (p-value)	Robust standard error	95% CI
Constant	.273 (.000)	.042	[.185, .360]
Region – Netherlands is reference			
Others	−.069 (.160)	.047	[−.169, .030]
Network management strategies – single is reference			
Multiple strategies	.186 (.005)	.059	[.063, .309]
Type of outcome – content is reference			
Process outcome	.045 (.209)	.035	[−.028, .119]
Both outcome	.152 (.368)	.165	[−.194, .498]
Number of observations		50 effect sizes	
F-value (p-value)		57.88 (.000)	
R^2		.7506	
Root MSE		.97947	

Note: Standard errors are clustered at the study level (N = 20).

Table 5. Meta-regression results on network trust and network outcomes.

Moderators	Coefficient (p-value)	Robust standard error	95% CI
Constant	.402 (.000)	.054	[.285, .518]
Region – Netherlands is reference			
Others	−.077 (.220)	.060	[−.206, .052]
Type of outcome – content is reference			
Process outcome	.176 (.010)	.059	[.049, .302]
Both outcome	.368 (.132)	.230	[−.125, .861]
Number of observations		28 effect sizes	
F-value (p-value)		70.37 (.000)	
R^2		.8450	
Root MSE		.97021	

Note: Standard errors are clustered at the study level (N = 15).

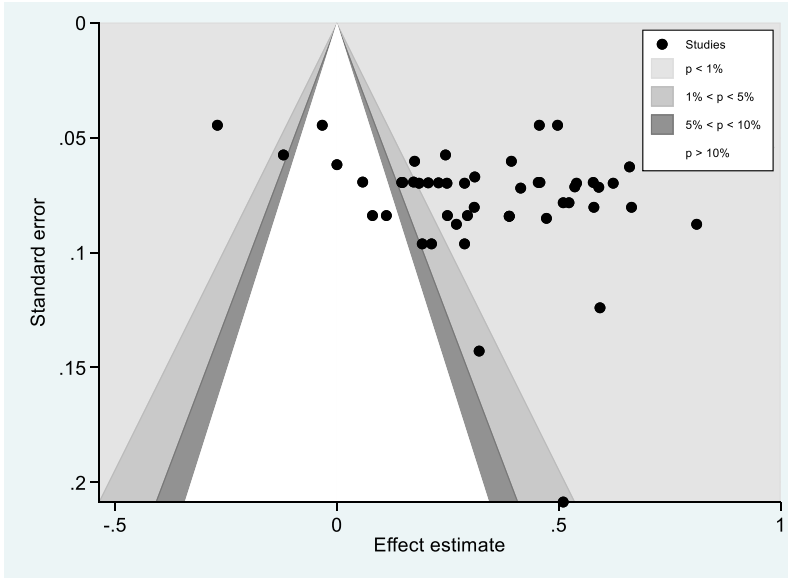

Figure 2. Funnel plot of effect sizes for network management.

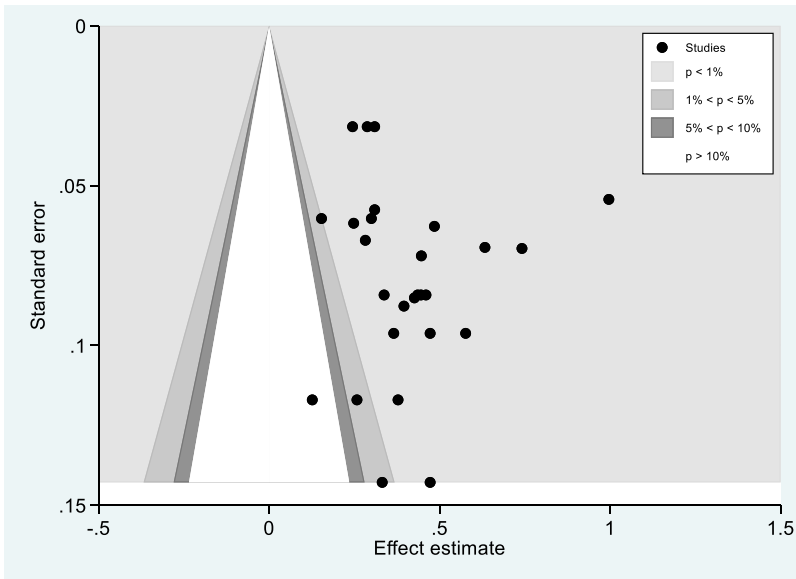

Figure 3. Funnel plot of effect sizes for network trust.

between types of outcomes being measured. Table 5 also indicates one significant moderator, namely that network trust is particularly important for achieving process outcomes, while its impact remains similar across regions. Both models are significant and also demonstrate significant constants.

Publication bias

Figure 2 and Figure 3 contain funnel plots as visual tests for publication bias. While we do see effect sizes in pretty much every quadrant of the plots, which argues against publication bias, it does show that there are very few negative effect sizes in our data (and none for trust). That in itself is not an indication of publication bias, but noteworthy to observe. The Egger's test for small-study effects provides credence to these visual observations with insignificant bias coefficients (2.629, $p = .268$ for network management; .745, $p = .729$ for network trust) and thus an acceptance of the null hypothesis that there are no small-study effects. Based on these visual and statistical tests, it is unlikely that our findings are strongly influenced by publication bias – although it can never be ruled out completely. We clearly see a lot of variance in effect sizes in our samples, though it is noteworthy that most effect sizes are positive and lie somewhere between .2 and .6.

Discussion and research agenda

Theories and research about collaborative and network governance have been an important development in public administration in the past decades (Kapucu and Hu 2020; Kickert, Klijn, and Koppenjan 1997; O'Toole 1997; Emerson and Nabatchi, 2015). More specifically, network management and network trust are generally considered key concepts in the literature (Kickert, Klijn, and Koppenjan 1997; Mandell 1990; McGuire and Agranoff 2011) and crucial for the achievement of satisfying results in networks for the involved actors (Kickert, Klijn, and Koppenjan 1997; McGuire and Agranoff 2011). Given the state of the art, and the growth of quantitative empirical studies, it is important to look at what the quantitative studies have delivered so far, and which conclusions can be drawn from them.

Findings of the meta-analysis

To answer these questions, we performed a meta-analysis of quantitative studies (identified through WoS-SSCI-PA category) on network management, trust and outcomes. We included studies that in one way or another tried to measure network outcomes. So, we did not include studies which used indicators like endurance of networks or used network characteristics (like the number of actors and density) as performance indicators. We also did not include studies that had individual performance indicators (like test scores of pupils see Meier and O'Toole 2007) as measure of network outcomes. The first and most important conclusion of our meta-analysis is that network management and network trust have a significant and positive impact on network outcomes across the board. In terms of strength, network management and trust's impact are not trivial or small but at least of moderate strength for network management and even close to strong for network trust – which clearly demonstrates their importance within public management's toolbox. We also found that network trust is especially important to achieve process outcomes in networks. While a large amount of studies come from The Netherlands, the impact of network management and trust is consistent across various countries. Therefore, one can conclude that network management and trust are not solely working in specific countries with a consensual political culture (like northern Europe) but also seem to work equally well in American, Asian and Southern European settings. We also find evidence for the argued synergy between network management strategies, where applying multiple

network management strategies is more effective than applying just one. With that being said, however, there are several conceptual and methodological innovations that could advance the field, which we will discuss further below.

Limitations: country bias and lack of mixed, multisource, longitudinal and experimental data

There are several limitations in our analysis which result in a number of interesting research avenues. First of all, the studies are not evenly distributed around the world. There is a significant number of studies from the Netherlands, though we do have studies from Asia, the Middle East, the USA and other European countries as well. Hopefully, this meta-analysis encourages other scholars to engage with network management and trust, and assess whether these influence network outcomes in their own region. We had few studies coming from developing or transitioning countries, or non-democratic regimes for instance. To really be able to make universal claims on the importance of network management and network trust we need more evidence coming from different countries.

Another limitation is and will remain that network outcomes are very hard to measure. As mentioned in the theoretical section, since networks are composed of various actors with different views on policy problems and solutions, and network outcomes often have different dimensions, it is difficult to find uncontested indicators for network outcomes. Moreover, studies also use perceived outcomes or perceived performance as assessed by the respondents as measurement (precisely for the reason we just mentioned as in this way a variety of outcome appraisals are included in the analysis). Future research can draw on a variety of survey and other data to measure a variety of performance dimensions within the same study in order to identify which dimension is particularly impacted by network management and network trust. Moreover, we do not have longitudinal observations of network outcomes – all studies included in our sample are cross-sectional and single source (bar one). Longitudinal and multisource data may help to cope with some of the endogeneity, common source or method bias, validity and reliability issues surrounding contemporary network management and trust research, and so could experimental work (see reflection below).

Theoretical reflections

These limitations, but also our findings, bring us to some theoretical reflections. First of all, the studies demonstrate the variation and fragmentation in the field (Berry et al. 2004; Klijn and Koppenjan 2012). Network management, for instance, is measured in various ways. On the one hand, if it comes to network management various activities are mentioned in the research. All included in this analysis can be put in one of the categories (connecting, exploring, arranging and process design) mentioned in Table 1 in the theoretical section. In that sense, there is more consensus about what network management is than one would assume upon first glancing the articles. Ensuring contact, or mobilizing are regularly mentioned in many articles as indicators to measure network management activities (see Cristofoli, Maccio, and Pedrazzi 2013; Markovic 2017) and clearly belong to the category connecting (which seems to be used in most research on network management). But we also find indicators such as solving

conflict, providing information, framing problems and bringing together perceptions, which can be headed under the category exploring. A few studies also look at arranging (Cristofoli, Maccio, and Pedrazzi 2013; Klijn, Steijn, and Edelenbos 2010). Process rules seemed to be used only in some of the Dutch research (Klijn, Steijn, and Edelenbos 2010).

Thus, although the categories discussed in the theoretical section are useful to identify the activities mentioned in the articles, it remains difficult to analyse the possible impact of the various activities each separately. Several studies measured multiple managerial activities via the same scale and it is hard to distinguish the activities in the survey data. So the questions *which and when* network management strategies seem to be most effective are difficult to answer and thus remains a topic to explore further theoretically as well as empirically. Only one (Dutch) study specifies the type of activities. In that study exploring and connecting emerge as having the strongest relations with network performance (see Klijn, Steijn, and Edelenbos 2010). That seems to hint at the conclusion (also embraced by the authors) that agency (connecting and exploring) is more important than organizational strategies (arranging and process rules). This would fit the complex interactions and dynamics in networks. But as said it is not possible to expand this finding to most of the other studies. Yet, the fact that we do clearly find evidence for synergies between the network management strategies supports the idea that multiple network management strategies combined are likely to be more effective than using just one single strategy on its own.

The literature could build more on each other and certainly use proven scales to measure network management, trust and outcomes, more than is done at the moment. But a possible avenue of research is also to clarify the (causal) relation between trust and network outcomes. Is it information sharing that is likely to happen more in high trust networks that is generating the positive outcomes or is it lowering transaction costs and solidifying collaboration? Thus, empirically speaking, we need to open the black box here.

If we look at how network outcomes are measured in the articles we can see that outcomes on community level are hardly included. This is not surprising as it is very difficult to assess these effects at all and certainly in a survey. It is also very hard to connect these outcomes to the specific activities in the network, as there is a range of different activities performed by different actors. Then, of course, there is a lot of external influence that affects network outcomes like the actions in other networks, external policies and developments outside the network and societal trends that make isolating the effect of network management and trust particularly difficult. The largest part of the articles measured outcomes at the network level. Most outcome scores are based on perceived data where respondents in one way or another rate outcomes. We already mentioned the difficulties in measuring network outcomes. This may be solved by combining different research methods and connecting more qualitative data with quantitative data (i.e. mixed or multiple methods) (e.g. Willem and Lucidarme 2014) or by using multiple sources of data to measure independent and dependent variables (e.g. Kelman, Hong, and Turbitt 2013).

Following up on our remark about opening the black box for trust and outcomes, we also encourage more complex modelling to explain network outcomes. Specifically, literature about network management, network trust and network outcomes would benefit from the incorporation of more mediators and moderators in these often assumed direct relationships. Lots of propositions from collaborative and network

governance literature underlie the presumed relationships between network management, trust and outcomes. However, these propositions have often been assumed without being backed-up by empirical testing. Recent statistical advances including Partial Least Squares (PLS) SEM allow more complex model building even with relatively smaller sample sizes often observed in this literature (e.g. George 2021; Vandersmissen, George, and Voets 2022). These techniques allow researchers to build models with one or multiple mediators as well as moderators. Thus, helping to better unravel why exactly network management and trust are beneficial for network outcomes as well as the conditions under which these direct relationships might become stronger or weaker. As moderators, a whole range of contingencies in relation to the network and its members could be tested to see whether network management and trust become particularly important in specific types of networks. One can think of network characteristics (like the classical social network variables such as density or centrality, see for an example Dox, 2023) but also of other context variables like sector, number of actors or the much more difficult to measure types of (informal) rules of the network. Moreover, as mediators process and content outcomes can be replaced by more proximate and more distal outcomes, with the latter being linked to performance and public value, and the first being the mechanisms through which networks perform better (e.g. Huijbregts, George, and Bekkers 2022). Multilevel modelling, including cross-level interactions between the institutions surrounding the network (macro-level), the network and its members (meso-level), and micro-level activity could also be particularly useful avenues for theorizing (e.g. Bryson, George, and Seo 2022). Embracing complexity and complex model building is likely to rejuvenate theory on network management, trust and outcomes, and can also help bring in the role of context.

Future research and practical value

The biggest methodological concern in contemporary network management and trust research in our field is endogeneity, which hampers our capability to make causal claims on the actual effect of network management and network trust on network outcomes. This is a problem we share with much other public administration research – and actually with the social sciences more broadly (George and Pandey 2017). It is also the reason why we are careful to state that our meta-analysis demonstrates the effect of network management and trust on outcomes, indeed we need to be humble here and argue that we provide evidence for correlation, which of course fits theoretical propositions, though not causation. There are many ways to make stronger claims on causality, and we encourage network scholars to implement these into their own research.

First, longitudinal data could help assess the importance of time while simultaneously allowing some more advanced statistical techniques to be used that provide a stronger claim on causality (e.g. difference-in-differences analysis, pooled OLS analysis, time fixed effects regression analysis, multilevel analysis with longitudinal data, dynamic modelling, etc.) (Murdoch, MacCarthaigh, and Geys 2023). Examples of recent longitudinal studies adjacent to our field that can serve as an inspiration include Elston et al. (2023) who focus on collaborative public management using 11 years of performance data related to tax administration. Second, experimental data could be an even better avenue for

claims of causality. There are many ways in which experimental research could be engrained into the network literature. Survey experiments are ideal tools to measure attitudes and perceptions among individuals, and due to the clear social process underlying the assessment of network outcomes survey experiments can be used to assess which management strategies are favoured by actors in a network and under which conditions. While this tends to be more fictional, it could be an interesting way to identify preferences among network actors and thus establish causality in terms of what network actors believe themselves would work best. Laboratory experiments can also make sense if the context of a network can be simulated – especially when group decision-making experiments are used. Again, different aspects of network management and trust could be simulated and randomized and then linked to the performance of the team. Finally, field experiments could also prove useful – especially when one can collaborate with consultants or actual practitioners. These types of experiments are particularly hard to implement but could be linked to a training seminar or intervention from a consultant. Some examples of experimental research that could guide and inspire such efforts include Weißmüller et al'.s (2023) laboratory experiment related to public–private partnership and Lee and Esteve's (2023) survey experiment related to collaborative governance.

Apart from our study's contribution to theory and research, we also want to conclude by emphasizing the practical value of this study. Networks are omnipresent in contemporary public administration practice across the globe. We demonstrate that based on the available evidence, network management and trust can help achieve better network outcomes across contexts. Public managers, policymakers and other public professionals are more and more working in networks to tackle issues that go beyond their own organization. Sometimes such networks are voluntary and sometimes practitioners are forced to 'team-up'. Working in such a network is not always a walk in the park, with different interests and typically other types of managerial activities required compared to within the own organization. Traditional managerial approaches that may be very useful for the organization are likely not be very effective in a network. So what should practitioners focus on? We demonstrate that engaging with network management activities and building trust among network partners can help in building the capacity of their network so that it can perform better and deliver on important outcomes. We also demonstrate that especially building trust should be a priority, and that they should strive to combine multiple network strategies at once as opposed to only focusing on one activity.

Altogether, our conclusion is that we have come a good way since collaborative and network governance was introduced as concept and theoretical framework. The empirical results show the value of network management and trust also for the practice of public administration. Nevertheless, there is still a lot to do in collaborative and network governance research and we hope our meta-analysis provides some guidance to future research endeavours into this fascinating field.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendix 1: Included articles in the meta-analysis and their characteristics

Reference	# of effect sizes	Sample	Network management	Network trust	Network outcomes	Network type	Country setting	Data source	Cross-sectional
Brogaard (2019)	3	76	/	Multiple items, interorganizational trust	Content outcomes	PPPs in healthcare and elderly care	Denmark	Single	Cross
Dockx (2023)	1	133	Multiple strategies together	/	Both together	Multiple domains	Belgium	Single	Cross
Edelenbos & Klijn (2009)	1	26	Single NM strategy	/	Both together	Infrastructure projects	Netherlands	Single	Cross
Jacobsen (2013)	3	1007	/	Multiple items, interorganizational trust	Content outcomes	Multifunctional, regions clustering municipalities	Norway	Single	Cross
Kapucu and Demirhan (2019)	3	305	Multiple strategies seperate	Multiple items, interorganizational trust	Both together	Security setting	Turkey	Single	Cross
Kapucu et al (2013)	1	534	/	Multiple items, interorganizational trust	Both together	Emergency network	USA	Single	Cross
Klijn et al (2010a)	6	211 and 209	Multiple and single network strategies together and seperate	Multiple items, interorganizational trust	Both seperate	Environmental/spatial projects	Netherlands	Single	Cross
Klijn et al (2010b)	10	208 and 210	Multiple and single network strategies together and seperate	/	Both seperate	Environmental projects	Netherlands	Single	Cross
Klijn et al. (2015)	3	196, 225 and 257	Multiple strategies together	/	Content outcomes	Urban regeneration and water management projects	Taiwan, Spain and Netherlands	Single	Cross

(*Continued*)

(Continued).

Reference	# of effect sizes	Sample	Network management	Network trust	Network outcomes	Network type	Country setting	Data source	Cross-sectional
Klijn and Koppenjan (2016)	3	196, 225 and 257	/	Multiple items, interorganizational trust	Content outcomes	Urban regeneration and water management projects	Taiwan, Spain and Netherlands	Single	Cross
Klijn et al. (2023)	3	158	Multiple strategies together	/	Both seperate	Infrastructure and water governance	Netherlands	Single	Cross
Kort & Klijn (2011)	1	68	Multiple strategies together	/	Both together	Urban regeneration	Netherlands	Single	Cross
Markovic (2017)	2	265	Multiple strategies together	Single item, interorganizational trust	Both together	Health and social care networks	Switzerland	Single	Cross
McGuire & Silvia (2009)	4	505	Multiple strategies seperate	/	Content outcomes	Emergency	USA	Single	Cross
Nederhand & Klijn (2019)	2	144	/	Multiple items, interorganizational trust	Content outcomes	Multiple PPP projects	Netherlands	Single	Cross
Peters et al (2017)	4	278	Multiple strategies together	Multiple items, interorganizational trust	Content outcomes	Public health	Netherlands	Single	Cross
Siddiki et al (2017)	6	111	Single strategy	Multiple items, more interpersonal trust	Both seperate	Aquaculture partnerships	USA	Single	Cross
Steijn et al (2011)	2	198 and 199	Multiple strategies together	/	Both seperate	Environmental projects	Netherlands	Single	Cross
Uster et al (2019)	4	145	Multiple strategies seperate	/	Content outcomes	Youth development	Israel	Single	Cross
Van Meerkerk and Edelenbos (2014)	2	141	Single strategy	Multiple items, interorganizational trust	Content outcomes	Urban governance	Netherlands	Single	Cross

(*Continued*)

(Continued).

Reference	# of effect sizes	Sample	Network management	Network trust	Network outcomes	Network type	Country setting	Data source	Cross-sectional
Van Meerkerk & Edelenbos (2018)	2	133	Single strategy	Multiple items, interorganizational trust	Content outcomes	Urban governance	Netherlands	Single	Cross
Van Meerkerk et al (2015)	2	166	Single strategy	/	Both seperate	Complex water projects	Netherlands	Single	Cross
Warsen et al. (2018)	4	144	Multiple strategies together	Multiple items, interorganizational trust	Both seperate	Multiple PPP projects	Netherlands	Single	Cross
Willem and Lucidarme (2014)	3	52	Single strategy	Multiple items, cognition and affect-based trust	Content outcomes	Multiple domains	Belgium	Multiple	Cross
Ysa et al (2014)	3	342	Multiple strategies together, single strategy	Multiple items, interorganizational trust	Both together	Urban generation	Spain	Single	Cross

Full list of included articles

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