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Transforming Input Into Output: How Downward Networking Mediates the Effect of External Networking on Organizational Performance

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ABSTRACT

One of the core assumptions of the open systems perspective is that management facilitates the technical flows that transform resources and demands into output, which ultimately affects the organization's performance. This article sheds light on the managerial throughput hypothesis by testing the mediating role of downward networking on the relationship between externally oriented managerial networking and organizational performance. The testing of the conceptual framework uses data on 547 Dutch primary schools. When put to this empirical test, the managerial throughput hypothesis is corroborated for most of the identified constructs of externally oriented networking.

Explaining the relationship between public management and public sector performance lies at the heart of current public management research (Boyne, Meier, O'Toole, & Walker, 2006; Walker & Andrews, 2013). Much of the research derives from three broad theoretical perspectives on public sector management: "economic theories of service production, organizational contingency theories, and resource-based theories on production capabilities" (Walker & Andrews, 2013, p. 5). The three theoretical perspectives have their roots in open systems theory (Scott, 2003, p. 108), which specifies interactions with the environment as a factor for organizational success distinct from internal factors (Aldrich, 1979).

In open systems theory, organizations regulate technical flows between input, throughput, and output processes that are connected to the organizational environment (Katz & Kahn, 1978; Scott, 2003). Like all organizations, public organizations depend heavily on their external environment for survival. Inter-actions with the interdependent environment provide public organizations with the necessary information and resources to achieve their goals. Examples of these resources are people, knowledge, money, services, and technology (Pfeffer

& Salancik, 2003). The input of these resources is jointly transformed within the organization. This throughput process is characterized by adjusting the structures and processes of the organization's internal components (Hassard, 1995; Katz & Kahn, 1978; Scott, 2003), as well as strategic human resource management in order to steer employee behavior (Wright & McMahan, 1992; Wright & Snell, 1991). The result of this transformation is the organizational output: the products and services that follow from recurring and patterned activities that regulate the (technical) flows between input and output.

This article studies the throughput process from a public management perspective. In order to successfully transform inputs into outputs, the technical flows between input, throughput, and output must be coordinated and integrated by the managerial system (Amagoh, 2008; Montuori, 2000; Scott, 2003). Public management research derives from this core assumption. External resources (input) are obtained through external management activities and (re) allocated and disseminated within the organization through internal management practices (throughput) in order to provide high-quality public services (output). The research objective of this study is to advance our understanding of how public managers regulate the input-throughput-output process.

Attempting to analyze all input-throughput-related managerial activities would be an impossible task. The approach here is to focus on public managers' relations with various organizations and actors in the interdependent environment of their organization, that is, managerial networking (e.g., O'Toole & Meier, 1999, 2011). Networking with actors from the external environment (input flows) is distinguished from networking interactions with actors from the internal environment of the organization (throughput flows). Recent studies have shown that managerial networking has a multidimensional nature (e.g., Torenvlied, Akkerman, Meier, & O'Toole, 2013; Zhu, Robinson, & Torenvlied, 2015). The mechanism is that for specific purposes managers work together with distinct types of actors within (the environment of) their organization. Building upon the categorization of Moore (1995), these dimensions are conceptualized as outward, upward, sideward (external) networking, and downward (internal) networking (O'Toole, Meier, & Nicholson-Crotty, 2005; Van den Bekerom, Torenvlied, & Akkerman, 2016, 2017).

In terms of the framework of open system theory, extant studies of managerial networking have predominantly focused on the relation between inputs and outputs—that is, how public managers manipulate the input from the interdependent environment of their organization to enhance organizational performance. Indeed, these studies clearly demonstrate that managerial networking has a positive effect on a wide range of perceptual and objective performance indicators (e.g., Goerdel, 2006; Meier, O'Toole, & Hicklin, 2010; Meier, O'Toole, Boyne, & Walker, 2007; Nicholson-Crotty & O'Toole, 2004; O'Toole & Meier, 2011; Ryu, 2014; Walker, Andrews, Boyne, Meier, & O'Toole, 2010). This line of research, however, neglects how the constituting

process of managerial throughput mediates between input and output. Thus, a crucial next step in current research on public management and performance is to study the managerial throughput hypothesis; that is, the mediating relation of managerial *throughput* activities between the *input* from the environment (regulated and facilitated by external management) and organizational *output* (in terms of public service delivery).

This article presents the results of a first study that sheds more light on the managerial throughput hypothesis of organizational performance. As indicated above, the focus is on a specific aspect of internal management of the throughput process—downward managerial networking (Van den Bekerom et al., 2016, 2017). Downward managerial networking is defined as a public manager's regular involvement, and consultation with subordinates (e.g., professionals, street-level bureaucrats, team members), regarding a broad range of organizational issues. It is argued that downward managerial networking is essential for the overall absorptive capacity of an organization in terms of the alignment of organizational goals and instructional methods for subordinates. The organizational throughput process, of course, may be facilitated by managerial factors that do not entail explicit interaction, such as managerial capacity and hiring strategies. In addition, the structure of a public organization can facilitate managerial throughput activities through communication systems and formal arrangements. Nonetheless, contact with those at lower levels of the organization about a broad set of organizational issues is a necessary precondition for meaningful internal management (O'Toole et al., 2005).

The introduction and testing of the managerial throughput hypothesis in this article contributes to current research in public management and performance in two ways. In the first place, it takes seriously the implications of Scott's (2003) open systems framework in the field of public management by examining whether downward managerial networking mediates the effect of external managerial networking on organizational performance. Second, it further builds on recent advances in the study of public management and performance by distinguishing between multiple dimensions of managerial networking. Empirically, the hypothesis is tested using data obtained from a field survey held in 2010 among Dutch public school principals, combined with objective, independently measured data on school performance.

Theoretical framework

Throughput in public organizations

The perspective of organizations as open systems emphasizes the importance of an organization's policy center, control center, operations, and the flows among them (Scott, 2003, p. 86; Swinth, 1974). Figure 1 presents these flows as an abbreviated version of Scott's model of organizations as cybernetic systems (2003, p. 86). The first of such technical flows in a public service
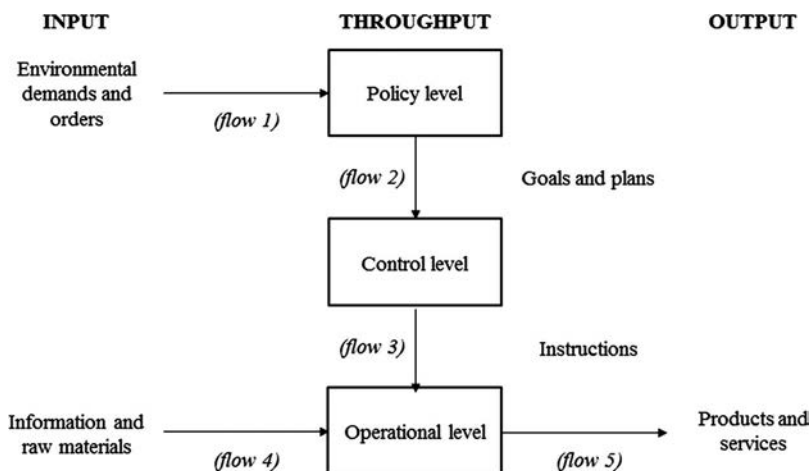
Figure 1. An organization's technical flows *Source*: Adapted from Scott, 2003, Figures 4-2, p. 86.

organization comprises the goals and performance standards set for the organization by a policy center, in response to demands, preferences, and orders from the organizational environment. The second flow is the transmission, by the policy center, of the goals and performance standards to a control center within the organization. A third technical flow consists of information between the control center and the operational level—often comprised of (street-level) professionals and case workers. A fourth flow of resources and information enables managers to exploit the environment to obtain raw (input) materials. The third and fourth flows enable the operational level to establish a fifth flow: the transformation of input from the environment, such as raw materials, (monetary) resources, and people, into products and services.

In the context of primary schools, and many other (smaller) public service organizations, functions at the policy level and the control level are often combined into the responsibilities of a high-ranking manager. School principals combine the two functions. They set goals and performance standards and communicate instructions to their teaching and support staff. From Figure 1, it follows that information and raw materials are directly conveyed to the operational level. However, more often than not, resources such as school funding are managed and allocated by the school principal and turned into output through the alignment of instructional practices for teachers and support staff. Thus, school principals are boundary spanners between the school environment and their school. For example, school principals must be aware of (changing) benchmark levels for arithmetic and language as set by government agencies. School principals have to translate these (changing) demands into specific goals, targets, and instructions for their school staff. They also need to facilitate information exchange between themselves and their staff at the operational level. The discussion in the next section

elaborates on how the concept of managerial networking pertains to the different flows of Scott's (2003) open systems model.

Managerial networking

Managerial networking is defined as the relational behavior of managers. Managerial networking combines the *scope* and *intensity* of relations with actors and organizations in both the internal and external environments of the organization. Externally oriented managerial networking is conceptualized as the contact frequency of relations that (high-ranking) managers maintain with actors and organizations in the environment of the focal organization (Torenvlied & Akkerman, 2014, p. 845). Externally oriented management activities aim to exploit the environment, reduce uncertainties, and buffer environmental shocks (Geletkanycz, Brian, Boyd, & Finkelstein, 2001; O'Toole & Meier, 1999, 2011; Pfeffer & Salancik, 2003). In terms of technical flows, externally oriented managerial networking enables managers to set clear goals and performance standards for the organization in response to environmental demands and orders (flow 1) and to exploit necessary resources from the environment (flow 4).

Recent advances in networking studies in public management show that public managers differentiate their contact behaviors when interacting with different types of stakeholder groups (Torenvlied et al., 2013; Zhu et al., 2015). In line with these studies, the present discussion distinguishes three fundamental *external* networking orientations of school managers, termed upward, outward, and sideward networking, and one *internal* networking orientation, termed downward networking (cf. Moore, 1995; O'Toole et al., 2005; Van den Bekerom et al., 2016, 2017). Upward networking captures managers' networking activities with political principals and superiors. Outward-oriented managerial networking refers to managers' interactions with various types of actors and organizations in the external environment of their organizations, such as suppliers, stakeholders, and regulatory agencies. Sideward networking refers to managers' networking activities with coproducers.

Internally oriented managerial networking is conceptualized as downward networking; that is, public managers' regular involvement, and consultation with subordinates, about a broad set of organizational issues—not merely matters under the subordinates' immediate jurisdiction and specialization (O'Toole, Torenvlied, Akkerman, & Meier, 2013). In order to enable the transformation of raw materials into products and services (flow 5), managers communicate with subordinates about organizational goals and performance standards (flow 2), as well as instructional practices (flow 3). The intensity of downward networking is expected to affect the likelihood that external demands and resources will be absorbed within the organization in the throughput process that transforms the input from the organizational environment into organizational output.

Scott's (2003) open systems model views an organization as a system wherein managers hierarchically steer employee behavior. The transformation from goals and resources into products and services, however, is not generally a simple top-down process. Simon's (1997) influential work, for example, spawned great interest in human resource management, by emphasizing the importance of employee participation in decision-making, and its effect on work motivation, productivity, and performance (O'Toole et al., 2013; Rainey, 2009). Employee participation is important because the fundamental nature of public organizations—in terms of goal ambiguity, value pluralism, and dynamic policy processes (Chun & Rainey, 2006; Perry & Porter, 1982; Rainey, 2009)—combined with a high degree of autonomy of professionals (Lipsky, 2010) reduces the ability of public managers to hierarchically steer employee behavior. Public managers thus often operate as peers, offering support and training to subordinates, rather than as distant bosses (Brehm & Gates, 1997). Thus, *social interactions* are emphasized in flows 2 and 3 of the open systems model proposed by Scott (2003).

The next section elaborates on how school principals facilitate the different flows of resources and information in the context of their school.

Externally oriented managerial networking in an educational context

Research in the field of education suggests that external management has become increasingly important for educational goal achievement (Barrett-Baxendale & Burton, 2009; Spillane, Hopkins, & Sweet, 2015). The contemporary school principal "is required to be a skilled risk manager, entrepreneur and change manager with an internal- as well as outward-looking focus and an increased capacity for strategic engagement with multiple external agents" (Barr & Saltmarsh, 2014, p. 493). Research shows that (middle) managers in bureaucracies who score high on boundary-spanning activities exercise stronger influence on their internal work environments than those who do not (Pappas, Flaherty, & Wooldridge, 2004).

In the context of primary schools, networking upward captures school principals' networking activities with their superiors. In the Netherlands, executive oversight and administrative power over the school (e.g., its internal organization, personnel and employment policies, and financial management) —and ultimately over the school's performance—are assigned to the school board (Turkenburg, 2008). Although school boards have final accountability, most of them delegate much authority and discretion to school principals, the public managers who are central to the present study.

Networking outward refers to managers' interactions with various types of external stakeholders. In the context of Dutch primary schools, these stakeholders mainly include regulatory agencies, local and national government administrations, and lobbying organizations. Governmental organizations

are involved in the assignment of accountability to schools with respect to pupil achievement, educational climate, and financial management. The Inspectorate of Education, for example, assesses all schools on the same final attainment levels. Most prominent is a standardized Cito test that provides information about both pupils' progress and the school's performance. Schools that fail to comply with performance standards are subjected to an intensive supervision regime and an annual evaluation (which is made public). Schools that continue to fail ultimately risk losing their funding. In addition, school principals maintain contacts with non-governmental organizations at the national level, such as interest groups that lobby with regard to (personnel) policies and regulations. At the municipal level, local governments outline the local conditions for the provision of education by deciding about the allocation of resources for school improvements. They have control over school buildings, and administer rules and regulations for public spaces and public safety. Although some standard contacts exist between schools and the local administration, school principals also participate in lobbying activities to yield local political support—for example, for housing and safety issues.

Finally, *networking sideward* refers to managers' networking activities with coproducers. Dutch primary school principals need cooperation from peers, such as other school principals, the participatory council, and the parent committee, to properly implement their organizational and educational goals, strategies, and programs (Torenvlied et al., 2013). Education is a coproduced public service, and in order to implement their goals, principals need active involvement by parents in the education of their children, as well as cooperation from teachers and from other schools under the jurisdiction of the same board. In addition, each school has a mandatory advisory body composed of parents and staff members who codetermine important educational and management issues together with school management and the school board.

Downward-oriented managerial networking in an educational context

In both the United States and Europe, the institutional environment of primary schools has changed substantially over the past decades. New Public Management–inspired reforms have emphasized school autonomy and student choice, in combination with clearly defined performance indicators set by policymakers (Verger & Curran, 2014). The emphasis on accountability and arm's-length control by politicians has made standardized and test-based student evaluations commonplace for public schools, alongside a focus on enrollment, dropout, and pass rates (Fuhrman, Goertz, & Weinbaum, 2007; Maroy, 2009).

For school principals, it has thus become critically important to align organizational activities at the operational level (in the context of primary schools, the level of actual teaching) with externally imposed rules, regulations, and

procedures. Hence, school principals must implement all the instructional aspects of teaching uniformly, aimed at enabling students successfully to pass standardized tests. The education literature argues that in such an institutional environment, in which the instructional aspects of teaching prevail, school leaders tend to respond by more actively involving teachers in instructional matters (Mintrop & Sunderman, 2009; Spillane & Kim, 2012).

Indeed, empirical networking studies find that school principals occupy a central position in the instructional advice networks within their schools (Frank, 2009; Spillane & Kim, 2012). Spillane and Kim (2012) report, in a longitudinal study of elementary school staff members in a U.S. school district, that the teaching staff reports higher levels of perceived alignment of school programs with external standards when a formal leader is highly visible. Thus, the school principal's primary focus in downward networking is to communicate two aspects of the educational production function to their subordinates: organizational goals (flow 3) and instructional practices (flow 4).[1]

Education research suggests that more intense principal–teacher interactions create more opportunities for sharing, clarifying, and adapting one another's perceptions and interpretations. In particular, shared norms, trust, and teacher motivation are positively associated with school performance, for instance, in terms of student achievement (Favero, Meier, & O'Toole, 2014; McLaughlin & Talbert, 2001), although the evidence is not entirely uniform. For example, Dumay (2009), in a study of 817 teachers and 2,595 students in Belgian primary schools, only finds partial support for the effect of shared norms for certain low socioeconomic student groups. Overall, though, the degree of active involvement of principals with subordinates seems to positively affect school performance.

The mediating effect of downward networking in an educational context

Each orientation of external managerial networking affects a specific demand for downward networking. In the preceding sections it was argued that downward networking by the school principal positively affects school performance through the alignment of organizational goals (flow 2) and instructional practices for teachers and support staff (flow 3). These two aspects of principal–teacher interactions in the school benefit from upward, sideward, and outward networking. A theoretical argument is developed below to explicate how, in the school context, downward-oriented networking mediates between externally oriented networking (upward, sideward, and outward) and school performance.

First of all, the perceived need by school principals to communicate organizational goals is closely connected to Scott's notion that organizations need to set clear goals and performance standards for themselves in response to environmental demands and orders (flow 1). In the context of Dutch primary

schools, these demands pertain primarily to the policy regulations that schools have to comply with, in particular those related to performance and other output indicators. School principals who interact more with the external organizations that set these standards, such as national and local government organizations, as well as with the school boards that set the general framework for implementing them, are likely to be more aware of what is expected of them (Sanders, 2014). Thus, networking outward and upward is likely to affect performance mainly by enabling principals to correctly, and in a timely manner, channel (changes in) policy standards to their subordinates.

Moreover, the mediation effect of networking outward and upward through principals' channeling to subordinates is not a simple top-down process. Stronger downward networking means that a public manager is more aware of tacit employee preferences and can translate these more accurately into demands for external stakeholders and policymakers, and thus influence policy effectively (Paulsen, 2014).

If students are to perform well in school, they need the support of community stakeholders, as education does not stop after class (Epstein, 2001). This type of support is obtained through sideward networking. Support from these stakeholders aligns well with Scott's notion of exploiting resources and information from the organizational environment (flow 4), as these coproducers tend to directly impact actual instructional practices. Parents especially are perceived as crucial to student learning outcomes (Andrews & Brewer, 2014; Desforges & Abouchaar, 2003), both by influencing instructional methods and by creating a positive learning environment outside of class. Not surprisingly, then, parent participation in school policy and management is a central policy aspect of most Dutch primary schools. For example, as discussed above, primary schools are obligated to have a parent advisory body. However, school principals differ in terms of the intensity of parent involvement, and of community involvement more generally. Barr and Saltmarsh (2014) conducted a qualitative focus group study among 174 parents of children in Australian schools and found that parents attribute the quality of a school's culture and reputation primarily to the principal's attitude toward parent involvement. Barr and Saltmarsh (2014) also indicated that a sense of community was primarily fostered "from the top" (p. 42). Teachers, in a similar vein, appreciate parent involvement. Gordon and Seashore Louis (2009), for example, find that teachers' perceptions of greater parent involvement are positively associated with students' math achievement. At the same time, direct parent involvement with individual teachers can have detrimental effects, as teachers often express the wish to be "shielded" from complaining or demanding parents (DiPaola & Tschannen-Moran, 2005). Thus, school principals can mitigate and channel parent influence through their brokerage role; they "take the heat," and at the same time inform teaching staff about client needs as communicated by parent and other community organizations.

Influence on school policy also comes from direct peers, that is, other primary schools. A number of studies explicitly consider interschool networks (Akkerman, Torenvlied, & Schalk, 2012; Muijs, Ainscow, Chapman, & West, 2011; Schalk, Torenvlied, & Allen, 2010; Spillane et al., 2015). These studies emphasize the constructive role of peer-to-peer feedback on instructional methods, although collaboration can also be focused on goal setting (cf. Sartory, Jungermann, & Järvinen, 2016). Muijs et al. (2011), for example, studied the drivers of successful collaborative partnerships between UK primary schools and found that intensive involvement in actual joint projects and joint "development of teaching and learning approaches" were particularly crucial (p. 576). Apart from actual joint projects, the content of communication with staff thus arguably pertains most strongly to "lessons learned" in other schools, both best practices and failures, where the brokering role of the principal between other schools and teaching staff is concerned.

In all, all three external networking orientations are expected to positively and indirectly affect school performance through downward networking. For sideward networking, this happens primarily through communication about instructional methods and issues (flow 3), while goal setting and goal alignment are the key drivers for upward and outward networking (flow 2). Thus the following hypothesis is formulated:

Managerial throughput hypothesis: School principals' intensity of (a) outward-, (b) upward-, and (c) sideward-oriented managerial networking positively affects organizational performance through increased downward networking.

Although the predictions have the same direction for all three types of external networking, note that the assumptions underlying the effects are quite different. These underlying assumptions help in understanding the potential differences in effect sizes found in the analysis. Moreover, apart from the mediation effects, one would also expect the direct effects of externally oriented managerial networking on performance that have been found in previous studies (e.g., Goerdel, 2006; Meier, O'Toole, & Hicklin, 2010; Meier et al., 2007; Nicholson-Crotty & O'Toole, 2004; O'Toole & Meier, 2011; Ryu 2014; Walker et al., 2010). That is, obtaining information and resources from these partners may have a positive effect on performance through other means than downward networking. Hence, the empirical model also includes these effects. Figure 2 summarizes the conceptual model.

Research design

Data collection

The hypotheses were tested using a data set of 547 school principals, after a listwise deletion of respondents who had missing values on the variables used
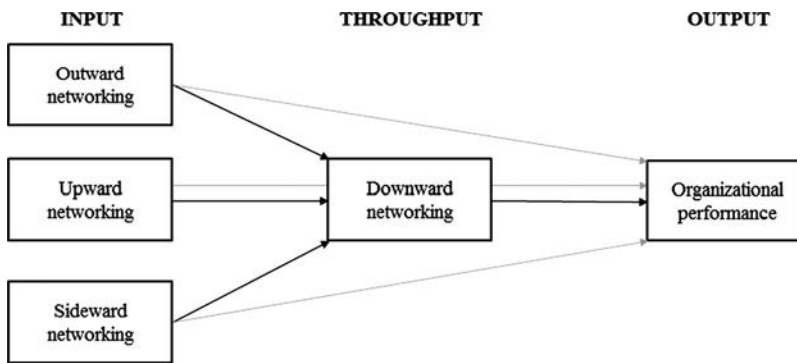
Figure 2. Conceptual model: how managerial networking facilitates the educational production function.

in the analyses.[2] The data set was constructed by integrating three data sets of primary schools. The first data set contains information from a nationwide Internet survey of principals of Dutch primary schools in January 2010. The survey focused on internal and external managerial activities in the previous calendar year (the Dutch school year starts in late August and ends in early July). Principals of all 6,896 Dutch primary schools were invited, both by mail and by e-mail, to participate in the survey. A reminder was sent after two weeks. After six weeks, the response rate was 19.55% ($n = 1,348$). This rate is comparable to response rates reported by other studies of Dutch school principals, and is substantial given the work pressure on school principals and the prevalence of survey research in this sector.[3]

The second data set is a data set from the Dutch Inspectorate of Education that provides information about indicators of school performance. The third data set, obtained from the Dienst Uitvoering Onderwijs (DUO, Education Executive Agency), provides information about pupil characteristics and school boards.

Measures

School performance
The dependent variable in the present study is the average score of the school's pupils on a standardized test for 2009 and 2010, which they take in the second half of the eighth and final grade of primary education. Roughly 75% of all primary schools participate on voluntary basis in the Cito test (named after the independent institute that develops, supplies, and administers the scores). The Cito test score is based on three subtests: language (100 questions), arithmetic (60 questions), and study competence (40 questions). Pupils' scores on these 200 questions are transformed on a scale between 501 and 550. Schools are allowed to exempt specific well-defined categories of pupils from the test: pupils with severe language problems who have lived

in the Netherlands for less than four years, pupils with an indication for special education, and pupils with an indication for vocational secondary education. Despite this room for discretion, the Cito test score is considered to be authoritative by the Dutch Inspectorate of Education, as well as by most teachers and parents. Pupils' referrals to specific levels of secondary education are based to a large extent on their Cito test scores.

Networking orientations

Managerial networking is conceptualized as outward, upward, sideward, and downward networking. The discussion here follows O'Toole and Meier's (2011) measurement of managerial networking as captured by the frequency of interactions with actors in the organization's environment. The school principals were asked about their frequency of interaction with 41 different types of organizations and actors, using the categories daily, weekly, monthly, several times per year, yearly, and never.

The test for internal consistency of the four managerial networking orientations uses Mokken scale analysis (MSA), which is a nonparametric variant of item-response theory (Mokken, 1971).[4] All scales have a homogeneity index H_i between 0.30 and 0.50 and an item homogeneity index $H_{ij} > 0.30$, which is acceptable (Van Schuur, 2003). For all T dimensions, a sum scale standardized with respect to the number of items in the scale was computed. The Appendix summarizes all the networking scales in the analysis and presents the included items and homogeneity indices. The items are organized along a degree of difficulty (i.e., intensity of the latent variable).

Outward networking

Three variables are used to tap outward networking: networking with national government actors, networking with local government actors, and networking with interest groups. Networking with national government agencies includes the following organizations: (a) DUO, the semi-autonomous Education Executive Agency responsible for budgeting and finance, (b) Ministry of Education, Culture, and Science, the national government department responsible for formulating educational policies and programs, (c) test suppliers, the corporations that develop standardized tests for primary education, (d) Inspectorate of Education, the autonomous agency responsible for monitoring school performance and auditing the schools on a wide variety of performance indicators.

Local government actors and organizations are: (a) members of city council, the representatives in the local political arena, (b) aldermen, the chief administrators in local government, and (c) the municipal department of education, the main local government department responsible for implementing education policies in the local domain.

Interest groups in the labor relations domain are: (a) labor unions for the teaching and support staff, (b) employer organizations that represent the

interests of school principals, and (c) the Primary Education Council, the employers' organization for school boards in primary education.

Upward networking

Upward networking is measured by a single-item variable that captures the school principals' self-reported interaction frequency with the school board.

Sideward networking

Sideward networking is tapped by three contact-frequency items: (a) parent committee, (b) participatory council, and (c) principals of schools that are part of your school board.

Downward networking

Downward networking is captured by 10 items concerning the school principal's contact frequency with the staff about several issues: (a) school identity and external communication, (b) school housing and maintenance, (c) financial affairs, (d) personnel and employment policy, (e) quality of education, (f) pupil results and performance monitoring, (g) pupil care, (h) educational quality, (i) external relations, (j) scheduling and other practicalities.[5] The same response options were used as in the conventional measurement of managerial networking.

Controls

A select number of control variables are used. The first controls for the increased challenges associated with educating disadvantaged pupils. Percentage of disadvantaged pupils taps the percentage of pupils who carry a "pupil weight," indicating that the pupil needs additional support and resources.[6] Percentage of disadvantaged pupils is controlled for $t = 2009$ and $t = 2010$. Denomination measures whether a school is nondenominational school (=1) or denominational (=0). A measure is also included that controls for confounding effects that may arise from a crucial potential difference between school principals: work engagement and experience. Work engagement is measured use the Utrecht Work Engagement Scale-9 (UWES-9) (Schaufeli, Bakker, & Salanova, 2006). Nine items capture vigor, meaningfulness, enthusiasm, and well-being, among others. Experience is captured by the number of years the school principal has worked as head of this specific school. The size of the school board is also controlled, measured as the number of schools that are governed by the school board. Finally, in line with early Texas school district studies, an autoregressive model is tested by including, as a lagged dependent variable, Cito test scores 2008.

Table 1 presents the descriptive statistics and correlations between the variables in the analysis. Because Cito test scores and percentage of disadvantaged pupils are nested within schools over time, the mean values of these variables

Table 1. Descriptive statistics and correlations for all variables in the analysis ($n = 547$).

Variable	M	SD	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12
1 Cito test scores	535.346	4.091	518.10	545.00	1.000											
2 Downward networking	2.403	0.553	0.80	4.20	0.072*	1.000										
3 Outward networking—national government	2.445	0.601	1.00	4.50	0.008	0.233*	1.000									
4 Outward networking—local government	2.125	0.717	1.00	4.67	-0.013	0.188*	0.258*	1.000								
5 Outward networking—interest groups	1.924	0.774	1.00	4.67	-.003	0.136*	0.484*	0.253*	1.000							
6 Upward networking	3.794	1.348	1.00	6.00	0.014	0.189*	0.138*	0.196*	0.171*	1.000						
7 Sideward networking	4.052	0.674	1.33	6.00	-0.061*	0.229*	0.120*	0.159*	0.052	0.083*	1.000					
8 Work engagement	4.243	0.862	1.44	6.00	0.030*	0.017	0.018	0.072*	0.132*	0.084*	0.075*	1.000				
9 Work experience	7.967	8.147	0.00	40.50	0.093*	0.018	0.030*	0.100*	-0.049*	-0.044*	0.023	-0.087*	1.000			
10 % Disadvantaged pupils	13.647	14.500	0.00	78.31	-0.612*	-0.068*	-0.044*	0.066*	-0.070*	0.046*	0.033*	0.058*	-0.090*	1.000		
11 Denomination (nondenominational = 1)	0.287	0.453	0.00	1.00	-0.149*	0.054*	-0.008	0.079*	-0.131*	-0.057*	0.210*	-0.045*	0.010	0.134*	1.000	
12 Number of school boards	16.005	12.780	1.00	64.00	-0.154*	0.025	-0.042*	-0.008	-0.095*	0.127*	0.210*	0.103*	-0.032*	0.178*	0.133*	1.000
13 Lagged Cito test scores	535.021	4.403	519.30	545.40	0.621*	-0.013	0.017	-0.056*	0.020	-0.076*	-0.078*	0.005	0.066*	-0.502*	-0.146*	-0.122*

Note: *$p < 0.05$.

are used to compute the correlations with all other variables. The results show that there is a very weak positive correlation between Cito test scores and downward networking. There are weak correlations between downward networking and the other networking variables. There are very weak correlations between performance management and the networking scales. Other weak to moderate correlations exist between the outward, upward, and sideward networking variables.

Common method bias

Concerns about common method bias arise whenever self-reported measures are used (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). There are several techniques for *post hoc* statistical control of common method bias, but several scholars have argued that these techniques are ineffective (e.g., Conway & Lance, 2010; Favero & Bullock, 2014; Richardson, Simmering, & Sturman, 2009).[7] In the present study, several proactive safeguards have been built in to reduce the likelihood of common method bias. First, school performance is measured using objective school performance data that were measured independently from the survey (Favero & Bullock, 2014; Meier & O'Toole, 2013). In addition, there is no substantive overlap between the items that are used to measure the different constructs (Conway & Lance, 2010). Moreover, the separate sections of the survey were clearly labeled (Brannick, Chan, Conway, Lance, & Spector, 2010), and it was made very clear to the respondents that their anonymity would be protected (Podsakoff et al., 2003).

Analytical strategy

In the conceptual model (see Figure 2), the path between outward, upward, and sideward and organizational performance is mediated by downward networking. These indirect effects were tested using Preacher and Hayes's (2004) approach for testing mediation. An indirect effect is the sum over all paths from the independent variable to the dependent variable of the product of the associated unstandardized path coefficients (Sobel, 1982). For example, it is the product of the path coefficient between upward networking and downward networking, and the coefficient between downward networking and Cito test scores.

According to MacKinnon, Fairchild, and Fritz (2007), there are two essential steps in establishing mediation. The first step is to show that there the independent variable has a significant effect on the mediator variable. The second step is to show that the mediator significantly affects the outcome variable. Once the regression coefficients are calculated, the indirect effect needs to be tested for significance. Following Preacher and Hayes (2004), bootstrapping (5,000 iterations) is used to test the significance of the indirect

effect. The formula for an indirect effect is presented below (Preacher & Hayes, 2004):

$$m = a_0 + a_1 x$$
$$y = b_0 + b_1 m + b_2 x$$

where m is the mediator variable, x is the independent variable, y is the dependent variable, and a_0 to a_1 as well as b_0 to b_2 are estimable parameters. This model is just-identified—meaning that there are as many knowns as unknowns in the equation.

Mediation analysis was used to test the hypotheses. This study models direct paths to all endogenous variables (Williams, Vandenberg, & Edwards, 2009). Because the model is just-identified (i.e., a model with zero degrees of freedom) parameters can be estimated, but it is not possible to test the model's goodness of fit (Kline, 2011). As explained above, due to the use of MSA, the model is tested using composite scores of the measurement scales as single indicators of their corresponding latent variable. Finally, because the variables Cito test scores and percentage of disadvantaged pupils are nested within schools the errors are allowed to be correlated within clusters (schools).

Results

Table 2 provides the parameter estimates for the mediation model as unstandardized and standardized regression weights. Consistent with expectations, the mediator variable downward networking is found to have a significant and positive effect on the dependent variable Cito test scores. Both outward networking with national government actors and outward networking with local government actors, as well as sideward networking have no direct effect on Cito test scores. Outward networking with interest groups, on the other hand, has a significant negative effect on Cito test scores, and upward networking with the school board positively predicts school performance. The control variables work engagement and lagged Cito test scores both significantly and positively explain differences between schools in Cito test scores, and percentage of disadvantaged pupils has a negative effect. The error term for Cito test scores indicates that 41.3% of the variance in Cito test scores can be attributed to explanatory variables in the model.

As for the mediator variable downward networking, the results show that outward networking with national government actors, outward networking with local government actors, upward networking with the school board, and sideward networking with coproducers all significantly and positively affect downward networking. The effect of outward networking with interest groups on downward networking is insignificant. The control variable

Table 2. Mediation model of Cito test scores: direct effects (unstandardized and standardized coefficients; $n = 547$).

	b	SE	beta
Dep. Var. = Cito test scores			
Downward networking	0.350+	0.209	0.047
Outward networking—national government	−0.072	0.216	−0.010
Outward networking—local government	0.179	0.166	0.031
Outward networking—interest groups	−0.344+	0.186	−0.064
Upward networking	0.175+	0.094	0.057
Sideward networking	−0.120	0.165	−0.019
Work engagement	0.245+	0.133	0.051
Work experience	0.013	0.014	0.025
% Disadvantaged pupils	−0.097***	0.010	−0.348
Denomination (nondenominational = 1)	−0.297	0.248	−0.032
Number of school boards	−0.013	0.009	−0.041
Lagged Cito test scores	0.349***	0.032	0.371
Year = 2010	0.526**	0.164	0.064
Constant	535.013***	0.152	130.162
Dep. Var. = Downward networking			
Outward networking—national government	0.152**	0.046	0.166
Outward networking—local government	0.071*	0.032	0.094
Outward networking—interest groups	−0.003	0.034	−0.005
Upward networking	0.056**	0.017	0.137
Sideward networking	0.150***	0.037	0.182
Work engagement	−0.005	0.026	−0.008
Work experience	−0.000	0.003	−0.005
% Disadvantaged pupils	−0.003*	0.002	−0.096
Denomination (nondenominational = 1)	0.033	0.053	0.028
Number of school boards	−0.000	0.002	−0.014
Lagged Cito test scores	−0.004	0.006	−0.032
Year = 2010	0.000	0.002	0.000
Constant	−0.001	0.026	−0.002
e.Cito test scores			0.587
e.team involvement			0.869

Notes: Errors are allowed to be correlated within clusters (schools).
+$p < 0.10$.
*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

percentage of disadvantaged pupils has a significant and negative effect on downward networking. The model explains 13.1% of the variance in downward networking.

Table 2 presents the size of the direct relationships between all the independent variables (outward, upward, and sideward networking), the mediator variable (downward networking), and the dependent variable (Cito test score). However, Table 2 does not provide information about the size of the indirect effects between outward, upward, and sideward networking on average Cito test score through downward networking. In order to calculate these indirect effects through downward networking, bootstrapping ($n = 5,000$) was used. This technique makes it possible to test whether indirect effects are significant (Lockwood & MacKinnon, 1998; Preacher & Hayes, 2004).

Table 3. Bootstrapping indirect effects of managerial networking on Cito test scores via team involvement ($n = 547$).

	B	Bootstrap SE	LL BCA	UL BCA
Outward networking—national government	**0.053**	0.038	0.001	0.125
Outward networking—local government	0.025	0.021	−0.0007	0.064
Outward networking—interest groups	−0.001	0.014	−0.028	0.020
Upward networking	**0.020**	0.014	0.0003	0.046
Sideward networking	**0.052**	0.035	0.0004	0.116

Notes: $n = 5,000$ bootstrapping resamples; LL BCA and UL BCA = lower level and upper level of the bias corrected and accelerated confidence interval for $\alpha = 0.10$; all equations control for work engagement, work experience, percentage of disadvantaged pupils, denomination, number of schools per board, lagged Cito test scores, and year; errors are allowed to be correlated within clusters (schools).

Table 3 is based on the bootstrap analysis and presents the indirect effects of outward, upward, and sideward networking through downward networking on Cito test scores. The confidence intervals for the variables outward networking with national government actors, upward networking, and sideward networking do not include zero, meaning that these indirect effects are statistically significant. The indirect effect of both outward networking with national government actors and upward networking, as well as sideward networking are positive. In other words, the mediator variable downward networking is presumed to transmit the causal effects of the networking variables onto school performance. Note that the direct effects of networking with national government agencies and sideward networking on Cito test scores are opposite in sign to the effect of downward networking on Cito test scores—something that MacKinnon et al. (2007) refer to as inconsistent mediation. Hence, the mediator variable downward networking acts like a suppressor variable for outward networking with national government agencies as well as sideward networking. For outward networking with local government actors and outward networking with interest groups, the indirect effects through downward networking are insignificant. Thus, the managerial throughput hypothesis is corroborated for upward and sideward networking, and partly corroborated for outward networking. Overall, the findings indicate that school principals' intensity of outward-, upward-, and sideward-oriented managerial networking positively affects organizational performance through increased downward networking.

Conclusion and discussion

For many years, studies of managerial networking have been focusing on the question of how public managers manipulate the input from the environment of their organization to enhance organizational performance. These studies focus on the direct effects of managerial networking on organizational performance, but neglect the organizational throughput processes that transform

input resources (people, knowledge, money, services, and technology) into organizational performance. Although these studies clearly demonstrate that managerial networking has positive effects on a wide range of perceptual and objective performance indicators (e.g., Goerdel, 2006; Meir, O'Toole, & Hicklin, 2010; Meier et al., 2007; Nicholson-Crotty & O'Toole, 2004; O'Toole & Meier, 2011; Ryu, 2014; Walker et al., 2010), its effect on internal organizational processes remains largely obscure.

The present article claims that managerial networking affects organizational performance not only directly—through the management of inputs (how organizations tap resources from their interdependent environment and buffer against shocks) —but also indirectly. Thus, it studies the question of how the effects of externally oriented managerial networking on organizational performance are mediated through internally oriented managerial networking. The reason is that inputs to the organization from its environment are jointly transformed and processed within the organization by managing processes within and between the organization's internal components.

Thus a novel managerial throughput hypothesis to managerial networking is presented. The managerial throughput hypothesis builds upon recent advances in the study of managerial networking. Recent studies have shown that managerial networking has a multidimensional nature (Torenvlied et al., 2013; Van den Bekerom et al., 2016; Zhu et al., 2015). The mechanism is that managers work together for specific purposes with distinct types of actors within (the environment of) their organization. Building upon the categorization of Moore (1995), these dimensions are conceptualized as outward, upward, and sideward (external) networking, and downward (internal) networking (O'Toole et al., 2005; Van den Bekerom et al., 2016, 2017). Downward managerial networking was defined as a public manager's regular involvement, and consultation with subordinates (e.g., professionals, street-level bureaucrats, team members), regarding a broad range of organizational issues.

Empirically, the managerial throughput hypothesis was tested using data obtained from a field survey held in 2010 among Dutch public school principals ($n = 547$), combined with objective, independently measured data on school performance. The mediation model that was tested includes both the direct effects of outward-, "upward-, and sideward-oriented managerial networking on school performance and their indirect effects through downward networking. When put to this empirical test, the managerial throughput hypothesis is corroborated for most of the identified constructs of externally oriented networking.

Upward networking with the school board has a positive direct effect on school performance. Outward networking with interest groups has a negative direct effect on school performance. The other dimensions of managerial networking do not significantly affect school performance in a direct way. Results are quite different, however, if indirect effects are included through downward

networking, thus including the organizational throughput process into the explanatory model. Downward networking has a positive direct effect on performance, as was reported earlier by O'Toole et al. (2013). However, the analysis shows that downward networking is also an important mediator for upward networking to affect school performance indirectly. Hence, upward networking with the school board affects school performance not only directly and positively, but also indirectly, through its positive effect on downward networking. Two other dimensions of externally oriented networking also have an indirect effect on school performance through downward networking. In the first place, outward networking toward national government organizations as actors in primary education positively affects school performance through downward networking. In the second place, sideward networking as coproduction with and between parents and teachers positively affects school performance indirectly through downward networking.

Important lessons can be drawn from these results. In terms of scientific relevance, the present article clearly demonstrates that the effects of boundary spanning through managerial networking cannot be understood from an exclusive focus on the organization's environment, as was standard practice for decades. Rather, boundary-spanning activities of managers also (and maybe primarily) affect the performance of public organizations through their impact on internal organizational processes. The results point at the importance of taking seriously an open systems perspective on organizational performance. Future studies should incorporate the different ways internal management facilitates technical flows that transform resources and demands from the organizational environment into performance (Scott, 2003; Weick, 1969).

The article also has important implications for school management. The education literature rightly points at the multiple functions of school leaders. School leaders must not only manage their schools as organizational entities in an environment, but must also stimulate their teaching and support staff to excel in implementing novel instructional methods that make a difference for individual students. The present study provides evidence that these different functions of the school leader are not separate but are largely intertwined—as school leaders transform and buffer environmental challenges and resources within their organizations. Hence, public managers should take their sense-making activities within the organization seriously when operating in a demanding organizational environment.

In order to test the generalizability of the findings presented in this article, more research into the managerial throughput hypothesis of managerial net-working is needed in other (educational and other public sector or national) contexts. New studies may also shed light on some mixed results of the present study and overcome some of its limitations. An important caveat of most studies of managerial networking, including the present one, is their cross-sectional nature, which leaves open the question of reverse causality.

For example, reverse causality could exist in the relation between outward networking with interest groups and school performance. It may be the case that if a school performs poorly due to poorly performing teachers, conflict situations with the teaching staff increase, which, in turn, increases the need for contact with labor unions. The present study attempted to address the problem of reverse causality by using longitudinal data on school performance, as well as controlling for past performance. To rule out as many alternative causal explanations for the throughput function of internal management, future quantitative research on public sector performance should use panel data for both management and organizational performance.

In addition, future research should dig deeper into the question of which structural characteristics of the public organization (e.g., its infrastructure for support, technology, and programs) facilitate the core technical flows that transform environmental resources and demands into outcome. Thus, future research should further tease out the effects of specific aspects of the internal throughput function in the production function of outputs in different public service contexts.

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Notes

1. When Scott's framework is strictly applied, sideward-oriented networking (with peer actors such as the parents' council or other primary schools) can be viewed as an internal organizational activity, because these organizations formally operate under the same school board and its regulations. The same holds for upward-oriented networking with the school board, if the school board is defined as the constituting organizing principle. However, Dutch primary schools operate relatively autonomously from their school boards. The school principal is pivotal in making sure that resources and information from the school

board find their way to the quintessential operational level in the primary school: the teacher level. Thus, outward-, sideward-, and upward-oriented managerial networking are conceptualized as externally oriented management activities by the school principal when throughput processes are concerned.

2. Other recently published studies that use the same data set, but focus on different topics, have a somewhat comparable research design (Torenvlied & Akkerman, 2012; Van den Bekerom et al., 2016, 2017).

3. For example, the Web-based survey of the Dutch Education Council (2008, p. 31) had a response of 15.6%.

4. For a discussion on why MSA is a more appropriate scaling technique to test for multiple dimensions of outward-oriented managerial networking with external organizations or actors, as compared to factor analysis, see Torenvlied et al. (2013).

5. In earlier work, downward networking was conceptualized as team involvement/HRM (O'Toole et al., 2013).

6. The percentage of disadvantaged students is based on "pupil weights" related to pupil conditions (e.g., both parents have only attended elementary school, the pupil lives in a foster home). These weights are used to calculate the additional funding for disadvantaged pupils.

7. As a *post hoc* check, a single-factor test is used to check whether variance in the data can be largely attributed to a single factor (DiStefano & Hess, 2005). Two confirmatory factor analyses (CFA) were performed: (a) a model where all management items (except contact with the school board) load on one factor, and (b) a model that tested whether the data fit the hypothesized measurement model (also excluding with the school board). The fit of both CFA models was tested using the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR) (Barrett, 2007; Kline, 2010). The five-factor model fits the data much better than the one-factor model (CFI = 0.870; TLI = 0.851; RMSEA = 0.057; SRMR = 0.050; and CFI = 0.534; TLI = 0.478; RMSEA = 0.106; SRMR = 0.100, respectively), which demonstrates the construct validity of the measures used in the analyses.

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Appendix

Homogeneity of Mokken-scales (Loevinger's H_i coefficients for the scale and H_{ij} coefficients for each item).

Downward networking	($H_i = .40$)
Scheduling and other practicalities	.31
School identity and external communication	.37
School housing and maintenance	.38
Financial affairs	.41
Personnel and employment policy	.40
External relations	.41
Educational quality	.40
Quality of education	.45
Pupil results and performance monitoring	.44
Pupil care	.44
Outward networking – national government	($H_i = .46$)
Inspectorate of Education	.35
Test suppliers	.41
Education Executive Agency (DUO)	.52
Ministry of Education	.52
Outward networking – local government	($H_i = .51$)
Municipal department of education	.47
Members of City Council	.50
Aldermen	.57
Outward networking – interest groups	($H_i = .42$)
Primary Education Council	.40
Labor unions	.41
Employer organizations	.45
Sideward networking	($H_i = .38$)
Principals same board	.33
Participatory council	.40
Parent committee	.40