

Serpents in the Sand:

Managerial Networking and Nonlinear Influences on Organizational Performance

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In recent years, the research literature on public management has begun to focus on the link between management and public organizational performance (for instance, Boyne and Walker 2005; Ingraham and Lynn 2004; Lynn and Heinrich 2000). For the most part, researchers have emphasized the critical question, "Does management matter?" Systematic work has clearly demonstrated that this question must be answered in the affirmative (Rainey 2003). Public management not only matters; it can be a critical determinant of an organization's or program's ability to achieve its goals. Indeed, it is increasingly obvious that multiple aspects of management can be related to performance results (see, for example, Meier et al. 2005; Meier, O'Toole, and Goerdel 2006).

Validating this management-matters proposition is unquestionably important, for theoretical and practical reasons, but it is not sufficient. Additional queries quickly follow as corollaries – for instance, how *much* does management matter (for some early estimation on this issue, see Meier and O'Toole 2006a). And under what conditions? Plenty of work, therefore, remains. While this broad point is generally recognized, some critical additional questions have thus far been virtually ignored. One of these, a more nuanced but no less central matter, constitutes the focus of this paper: what is the *nature* of the relationship between management and performance? In particular, what is the *functional form* of the link between management and performance?

One possibility, of course, is that the two are linked in a straightforward linear fashion: additional increments from management, or various types of management, may add some regular and fairly constant amount of outputs or outcomes. Alternative possibilities, however, are

myriad. The relationship might be curvilinear. Or there may be diminishing returns. Or there may be some critical managerial contribution, past which point performance accelerates more rapidly. Or the relationship might be exceedingly complex, in which case plotting a management-versus-performance curve might encompass twists and turns of confusing sorts. Sketching the possibilities de novo would produce graphic patterns reminiscent of so many serpents lying in the sand – some stretched out lazily and signaling simple forms, others arching and wiggling across the sand.

What form of relationship should we expect? The case-study literature strongly suggests that the answers are likely to be nonlinear – the management-and-performance “serpents” are unlikely to resemble pointers or measuring sticks – but we cannot be sure. Studying the question systematically requires a quantitative approach, and the work is best accomplished by working from a theoretical perspective that can generate reasonable and testable hypotheses.

Fortunately, a number of researchers have recently devoted attention to quantitative work on management and performance, and one theoretical perspective in particular offers some leverage in beginning to develop coherent ideas about functional form. The O’Toole-Meier model of management (1999) was developed to offer a theoretically-based, empirically-testable set of ideas that encompass links between both internal management and also external management (or networking), on the one hand, and performance, on the other. In particular, O’Toole and Meier have formalized ideas that explicitly include notions of interactions between management and certain other variables, like environmental influences, and that also either imply or allow for a consideration of nonlinear relationships between management and performance itself. These researchers have shown myriad empirical links between management and performance; less recognized thus far is that their model suggests or invites an exploration of

testable ideas about functional form between management and performance.

In the initial formulation, O'Toole and Meier explicitly suggested some nonlinearities (O'Toole and Meier 1999). They focused in particular on management externally into the interdependent environment and specified nonlinearities with respect to resources and constraints in the organization's setting, but a careful examination of their model and its features suggests that other nonlinearities may also be expected. These have to do with, for instance, opportunity costs and potential tradeoffs across different managerial tasks; the potential for diminishing returns from management; and the role that even internal resources, particularly those related to personnel, can play in providing a partial support or substitute for explicit top-managerial effort. Thus far, a number of empirical studies have been developed with a grounding in this model, but little attention has been given to the functional form of this management-performance relationship (in contrast to the attention given to interactions with resources; see, for instance, Meier and O'Toole 2003; O'Toole and Meier 2003).

This paper focuses on one particular managerial responsibility, that of interacting externally in support of the public organization and its tasks, to explore the nature of the functional form between this aspect of management and organizational performance. To date, much of the discussion in the research literature regarding the concept of managerial networking considers the possibility that various networking activities by managers – such as buffering the organization from negative environmental shocks, exploiting opportunities in the environment, and establishing collaborative relationships with long-term partners in the environment – may pay off in performance dividends. This work has validated measures of managerial networking and has also demonstrated unambiguously positive performance results of managerial networking. What remains unknown, however, is whether the relationship is best understood as

a linear one. Investigating the functional form of the relationship between networking and performance may offer critical insights and also suggest theoretically and practically important implications.

This paper explores the possible nonlinear effects of managerial networking on organizational performance. First, we introduce the O’Toole-Meier formal model of public management. Second, we present an argument that the linear functional form used for networking might have diminishing marginal returns and thus be better estimated as a nonlinear relationship. Third, we sketch additional hypothesized contingencies that seem likely to influence the functional form. Then we utilize a multi-year data set with several hundred public organizations to test these ideas. Finally, we discuss the implications of our findings for the theory and practice of public management.

A Model of Public Management

Upon reviewing the case-study literature, O’Toole and Meier provide a parsimonious model of public management. The general model suggests that outcomes of public programs at any time t (or, O_t) are shaped by public management – actually, several discrete managerial functions (each designated with an M below) – along with other influences:

$$O_t = \beta_1(S+M_1)O_{t-1} + \beta_2(X_t/S)(M_3/M_4) + \epsilon_t \quad [1]$$

where

O is some measure of outcome,

S is a measure of stability, denoting structural, procedural, and other elements that support unperturbed production,

M denotes management, which can be divided into three parts

M_1 management's contribution to organizational stability through additions to

hierarchy/structure as well as regular operations,

M_3 management's efforts to exploit the environment,

M_4 management's effort to buffer environmental shocks,

X is a vector of environmental forces,

ϵ is an error term,

the other subscripts denote time periods, and

β_1 and β_2 are estimable parameters.

The two terms related to managing the environment can be combined where $M_2 = M_3/M_4$.

Thus M_2 incorporates all efforts to manage externally in the environment, in contrast to managing the organization, M_1 :

$$O_t = \beta_1(S+M_1)O_{t-1} + \beta_2(X_t/S)(M_2) + \epsilon_t \quad [2]$$

The model is clearly autoregressive (that is to say, inertial), nonlinear, and contingent. Several aspects of it have been explored in earlier empirical studies.

Managerial Networking and Performance: A Nonlinear Relationship

Most of the empirical work conducted thus far necessarily tests a simpler version of the model, with the terms included additively to form a linear function. The results of these investigations have demonstrated overwhelming support for the positive effect of networking (M_2) on performance. More networking is almost always correlated with an increase in performance, when controlling for resources and constraints in the environment as well as selected other managerial influences. This finding has held throughout a number of model specifications and across a battery of performance indicators (for instance, Meier and O'Toole 2001, 2003; Nicholson-Crotty and O'Toole 2004; O'Toole and Meier 2003). Networking seems to be the gift that just keeps on giving. With the extant evidence, one could conclude – rather

implausibly, granted – that managers who want to increase performance should devote as much time as possible to externally-oriented networking.

But does this inference make sense? Are there times and circumstances when it is probably better to network less, perhaps in the interest of fulfilling another managerial requisite? Is it possible for managers to devote too much time to managing the external environment – to the detriment of the organization’s performance? Could the benefits of networking be contingent on the characteristics or talents of individual managers? Could organizational characteristics affect this relationship? We first explore the reasons to anticipate a possible nonlinear relationship and then outline a number of contingencies that might affect this relationship.

Resources, Time, and the Managerial Balancing Act

There are reasons to expect that high levels of networking may have diminishing or perhaps even negative effects on organizational performance. Most of the literature on the benefits of networking focuses on how managers form relationships with other organizations and stakeholders to secure benefits, fend off disruptions, and identify opportunities. Managers often network with others in an effort to attract and acquire more resources for the organization. The environment and the relevant network actors, however, do not have infinite resources. While managerial networking should result in considerable payoffs much of the time, there could be a limit to these payoffs – meaning that at some point there is nothing, or at least less, to gain from more external interactions.

A related point has to do with opportunity costs. Managers must perform functions internally within their institution, not just outside. At some point, the time spent on extracting the last bit of resources or buffering the agency from potential disturbances could have been

better spent elsewhere. The formal model sketched above implies some sort of balancing among managerial responsibilities without specifying how and when the tradeoffs actually appear. More precisely, the model does not specify the relationship between M_1 (core internal functions) and M_2 (external, or networking, management). Although there is no reason to believe that these two functions are necessarily a zero-sum effort – with a full tradeoff at the margin between the two – managers who spend most of their time on one component to some neglect of the other may generate performance setbacks, or at least suboptimal results.

Regardless of whether the limits on the benefits of networking come from increasing difficulty in tapping opportunities/fending off perturbations from the environment, or from tradeoffs among the multiple functions of management,¹ the consequence should be the same: at higher levels of managerial networking, still more networking could be expected to produce little in the way of positive performance payoffs for the organization. This relationship can be tested with Hypothesis One:

Hypothesis One: The relationship between networking and performance is nonlinear, with diminishing returns at the higher levels.

Contingencies

Although we expect that, in the aggregate, higher levels of networking will have diminishing effects, some managers and certain public organizations may be able to ensure that time spent networking continues to result in steady performance dividends, even at higher levels of networking. Drawing on the two explanations for why the relationship may be nonlinear, we can speculate on what types of managers and organizations may be able to avoid diminishing

¹Or, most likely of all: from both.

returns. In particular, we look to other developments in the literature on networking and performance to generate hypotheses on how this relationship could be contingent on a number of factors.

Indeed, O'Toole and Meier themselves point indirectly to this possibility with respect to two aspects of public management and public organizations. First, they note that each of the management terms in the model implicitly includes a "quality" or skill component, along with the "quantity" or effort aspect (see Meier and O'Toole 2006a). The original model does not specify the relationship between these two elements, but it seems reasonable to expect that one influences the functional form of the other. The most straightforward way of interpreting the relationship would be that management quality mitigates the otherwise-expected diminishing returns hypothesized above. Second, the model clearly suggests that aspects of "management" in the narrow and aspects of personnel/staffing perform some overlapping functions. Note the treatment that O'Toole and Meier have given to personnel stability, which is initially framed in terms of the S, or stabilizing, vector but is then conceptualized as also having to do with management (see in particular O'Toole and Meier 2003). Each, accordingly, should be considered for generating nonlinear relationships for managerial networking.

Managerial Quality. If the explanations for the general, hypothesized nonlinear relationship sketched above are correct, a highly skilled manager might be able to avoid any negative returns to networking by being just active enough and often enough in the organization's environment to gather the crucial benefits feasibly available. The best managers should be the most efficient with their time – the ones who avoid spending too much time in the networked setting, presumably at the expense of other managerial possibilities that contribute to performance.

Other studies have demonstrated that managers vary considerably in quality, and the abilities of the individual manager can have a strong impact on their behavior and their organization's performance (Meier and O'Toole 2002). For the best managers, therefore, we may find that this nonlinear effect disappears, a relationship we will test with:

Hypothesis Two: The relationship between networking and performance is positive and linear, when controlling for managerial quality.

Internal Management. The second explanation for why increased networking may not always be positively related to performance centers on the tradeoffs made by top managers when choosing to apportion time and effort between internal or external management. Organizations obviously need a certain amount of the former to function properly – what Woodrow Wilson (1887) referred to, in a household analogy, as the “management of the fires and the ovens.” Neglecting these managerial requirements can be expected to result in poor performance. Managers must find the right balance in splitting their time so that internal needs are not neglected and external opportunities are sufficiently exploited. Organizations may differ, however, in the extent to which these tradeoffs bind tightly. Some managers may be able to hire and use administrative staff to take care of straightforward but important internal managerial functions, thus freeing up the top manager to spend more time externally. If a manager has an executive staff that can coordinate some of those internal management functions (M_1), significant tradeoffs may be obviated:

Hypothesis Three: The relationship between networking and performance is nonlinear for those organizations with fewer administrative staff.

Hypothesis Four: The relationship between networking and performance is positive and linear for those organizations with more administrative staff.

Personnel Stability. Other organizations may have needs that demand more attention to internal matters. In the O’Toole-Meier model of management, a key determinant of performance is stability, with stability and internal management linked to higher performance. In the original model (O’Toole and Meier 1999), higher levels of stability could allow for lower levels of M_1 , as more stability brings the expertise and experience to allow for the organization to function on its own, at least in part. One form of stability that could reduce the amount of time that managers need to devote to internal management is personnel stability (O’Toole and Meier 2003). Organizations with higher levels of turnover would need more attention from managers, particularly with regard to hiring and training, but also because the relative lack of experienced personnel may require more internal management surrounding the activities related to core production. This logic would lead to the expectation that those organizations that enjoy higher levels of stability would require less internal management and would allow for managers to spend more time on external management/networking:

Hypothesis Five: The relationship between networking and performance is nonlinear for those organizations with low levels of personnel stability.

Hypothesis Six: The relationship between networking and performance is positive and linear for those organizations with high levels of personnel stability.

Specification, Data, and Measurement

Our analysis uses a derivation of the O’Toole-Meier model of management. We already know that, in practice, this model is highly nonlinear with several interaction terms. Most tests of the model, however, have simplified it by specifying less complex relationships – the ones under consideration at the time – and testing these hypothesized links a bit at a time. Because our interest here focuses on whether the networking measure (M_2 , or M_3/M_4) has a nonlinear

impact on performance, we begin our current analysis by omitting the inertial term and starting from a linear and very simple model in which performance is a function of the vector of environmental forces and also managerial networking:

$$O_t = \beta_1(X_t) + \beta_2(M_2) + \epsilon_t \quad [3]$$

Our argument about the diminishing marginal returns of networking can be tested by simply adding a squared value of networking to the equation with the expectation that the slope for the linear term (β_2) will be positive and the slope for the squared term (β_3) negative:

$$O_t = \beta_1(X_t) + \beta_2(M_2) + \beta_3(M_2)^2 + \epsilon_t \quad [4]$$

Data

The empirical approach being used places heavy demands on a data set, especially when alternative functional forms are incorporated into the modeling strategy. Our task is facilitated by using the Texas school district data set, an empirical source with a significant number of well-developed managerial concepts that has been used by a number of public management scholars (Hicklin 2004; Fernandez 2005; Goerdel 2005; Gonzalez Juenke 2005; Hill 2005; Pitts 2005). The data set includes considerable information regarding the more than 1000 school districts in the state of Texas that represent approximately one of every 14 school districts in the U.S. The districts range widely on a variety of dimensions, including student composition (race, ethnicity, etc.), resources, setting (urban, rural, suburban), and performance.² Our analysis includes data

²School districts in the United States are generally independent local governments with their own taxing powers; all districts in the sample are organized in this way. The state of Texas, the locus from which this sample is drawn, operates a relatively decentralized system, with most authority residing with the local school districts. Each district determines its own curriculum and makes all its own personnel decisions. “Independent” in this context means that the school district is not subordinate to another unit such as a city. Independent districts have their own elected board, have the ability to tax and set budgets, and acquire bonding authority by a vote of the residents.

from a survey administered in 2000 to the top managers – “superintendents” – in each unit to ask questions about their approaches, goals, and behavior with regard to managing the organization. That survey had a 55% response rate; and respondents were no different from nonrespondents on key variables such as enrollment, enrollment growth, students’ race, ethnicity and poverty, or test scores. To these survey responses, we added eight years of data (1995-2002) from the Texas Education Agency; the additional information covered such matters as organizational performance, resources, student composition and other relevant factors. Because this analysis involves a pooled time-series approach, we included dummy variables for the individual years to deal with serial correlation. We then assessed the degree of heteroscedasticity with pooled diagnostics and found the levels well within acceptable limits.

Outcomes. Although virtually all programs have multiple goals and thus are subject to multiple performance indicators, some objectives are defined by the political environment as more important than are others (O’Toole and Meier 2004). Of the many performance indicators in Texas public education, the most noticeable by far is the overall student pass rate on the Texas Assessment of Academic Skills (TAAS).³ The TAAS is a standardized, criterion-based test that all students in grades 3 through 8 and 11 were required to take. The grade 11 exam is a high-stakes test, and students must pass it to receive a regular diploma from the state of Texas. TAAS scores are used to rank districts, and the examination results are without question the most visible indicator of performance used to assess the quality of schools. Our measure of performance is the percentage of students in a district who passed all (reading, writing, and mathematics) sections of the TAAS.

³The TAAS was replaced in 2003 by the Texas Assessment of Knowledge and Skills (TAKS).

Managerial networking. This measure of M_2 is intended to get at the behavior of school district top managers as they interact with the important parties in the district's environment. Because school districts operate within a network of other organizations and actors who influence their students, resources, programs, goals, and reputation, the extent to which a superintendent manages in the school district's interdependent environment is related to school district performance (Meier and O'Toole 2001; 2003).

To measure the behavioral networking activity of school superintendents, Meier and O'Toole (2001) selected four sets of actors from the organization's environment: local business leaders, other school superintendents, state legislators, the Texas Education Agency. In their mail survey, they asked each superintendent how often s/he interacted with each actor, on a six-point scale ranging from daily to never. Assuming that superintendents with a networking managerial approach should interact more frequently with all four actors than would a superintendent with an approach focused on internal management, a composite managerial networking scale was created via factor analysis. All four items loaded positively on the first factor, producing an eigenvalue of 1.82; no other factors were statistically significant. Factor scores from this analysis were then used as a measure of managerial networking, with higher scores indicating a greater networking orientation.⁴

Managerial quality (M_q). Quality is a notoriously difficult concept to measure. Meier and O'Toole (2002) validated a measure based on the residual from a model explaining salaries

⁴In early work, Meier and O'Toole used a five-node factor (for instance, Meier and O'Toole 2001). The fifth node, school boards that oversee the district operations, can reasonably be interpreted as a principal-agent dyad rather than a more typical networking partner (see O'Toole, Meier, and Nicholson-Crotty 2005). Accordingly, we use the four-node factor here. As Meier and O'Toole have shown (2005), these measures are highly correlated; also, adding additional nodes does not much change the measure.

of district superintendents. The salary-setting process in Texas school districts approximates a competitive labor market with full information, and the local boards involved in salary setting are best positioned to monitor managerial skill. As a result, management skills should be positively rewarded by the market. To isolate this quality component, they predict logged superintendent salaries with 11 variables measuring job size, human-capital factors, personal characteristics, and prior school-district outputs similar to common salary models in the literature (see Ehrenberg, Chaykowski and Ehrenberg 1988).⁵ We replicated that analysis for the years 2000-2002 and created a measure for 1995-2002.

The resulting model explains 81 percent of the variance in salaries, thus comparing favorably to other models in the literature (and explaining three percent more than did the original Meier and O'Toole estimation). The objective was to remove as many "non-quality" factors as possible from the superintendent's salary. The remaining residuals were then standardized (converted to a mean of 0 and a standard deviation of 1) for use in the subsequent analysis as a rough indicator of management quality. This measure is clearly a messy one, since the residual contains all factors not included in the model. The impact of this measurement error, however, attenuates any relationships between a quality measure and other variables such as organizational outputs.

⁵District characteristics included as predictors are the district's total budget, tax rate, and average revenue per student; these district characteristics are logged. Four human-capital characteristics are included: experience as a superintendent, tenure in the current job, age, and possession of a doctorate. Personal characteristics included are whether the superintendent is female, black, or Latino. The adjustment for prior year's test scores is also included because we think managerial quality is affected by prior performance, and quality then affects future performance. Over time, in other words, there is reciprocal correlation. The adjustment for this endogeneity is handled via an instrumental variables technique. Six student characteristics and district resources are used as instruments; the purged measure of prior performance is then included in the model.

Administrative Capacity and Personnel Stability. Two sets of hypotheses specify that the nonlinear relationship between networking and performance are conditioned by other variables—administrative capacity and personnel stability. Administrative capacity can be measured in a straightforward manner; it is simply the percent of employees who are classified as central office staff. This measure includes assistant superintendents and staff positions such as the business manager, the human resources function, and others but excludes staff assigned at the school level (principals, counselors, etc.). Personnel stability is defined as one minus the turnover rate for teachers.

Environmental Factors. Any assessment of public program performance must control for both task difficulty and program resources (the “X” term in the model). For school districts, neither of these types of elements is under the substantial control of the districts themselves, and therefore they can be considered key parts of the vector of environmental forces. Fortunately, a well-developed literature on educational production functions (Hanushek 1996; Hedges and Greenwald 1996) can be used for guidance. Eight variables, all commonly used, are included in our analysis – three measures of task difficulty and five measures of resources.

Schools and school districts clearly vary in how difficult it is to educate their students. Some districts have homogeneous student populations from upper middle-class backgrounds. Students such as these are quite likely to do well in school regardless of what the school does (see Burtless 1996). Other districts with a large number of poor students and a highly diverse student body will find it more difficult to attain high levels of performance because the schools will have to make up for a less supportive home environment and deal with more complex and more varied learning problems (Jencks and Phillips 1998). Our three measures of task difficulty are the percentages of students who are black, Latino, and poor. The last-mentioned variable is

measured by the percentage who are eligible for free or reduced-price school lunch. All three measures should be negatively related to performance.

While the linkage between resources and performance in schools has been controversial (see Hanushek 1996; Hedges and Greenwald 1996), a growing literature of well-designed longitudinal studies confirms that like other organizations, schools with more resources generally fare better (Wenglinsky 1997). Five measures of resources are included. The average teacher salary, per student instructional spending, and class size are directly tied to monetary resources. The average years of teaching experience and the percentage of teachers who are not certified are related to the human resources of the school district. Class size and noncertified teachers should be negatively related to student performance; teacher experience and teacher salaries should be positively related to performance. The appropriate sign for percent state aid is not clear.

Findings

We begin with a linear estimation (that is, of equation [3] as presented earlier). Table 1 provides the regression results for this specification of managerial networking along with the series of control variables. Because managerial networking is a factor score, it has a standard deviation of one; therefore, a one standard deviation change in managerial networking is associated with a .883 percentage point increase in TAAS exam pass rates. Over the full range of this variable, this effect size translates into an maximum possible impact of approximately 4.7 percentage points on a district's pass rate. While this is may not seem to be a massive impact, it is both statistically and substantively significant. For the most part, the control variables perform as expected. TAAS scores are negatively correlated with the percentage of black students, the percentage of Latino students, the percentage of low income students, class size,

non certified teachers and state funding. There is a positive relationship with teachers' salaries, and teacher experience is uncorrelated with performance.

[Table 1 about here]

Table 2 displays the results for the nonlinear estimation of managerial networking (that is, for equation [4]). As predicted, the linear term is positive and significant and the squared term is negative and significant. This pattern represents a classic case of diminishing returns. One can calculate the slope for managerial networking for any value by simply taking the first derivative of the equation and substituting in values. Since the variable's range was rescaled to be positive and runs from 0 to +5.3, the slope is steepest at low levels of networking. At a networking value of 0 (least amount of contact with other nodes), a one-unit change in networking is associated with a 1.97 percent increase in the TAAS pass rate. The impact gradually declines until a networking value of 4.25, where the slope is zero (that is, additional networking above this value does not contribute anything further to performance). In the aggregate, therefore, and as Hypothesis One states, the relationship between managerial networking and performance is clearly nonlinear. Figure 1 depicts the patterns for the linear and also the more accurate nonlinear estimations graphically. For the latter, the "serpentine" relationship arches gracefully.

[Table 2 and Figure 1 about here]

Managerial Quality

We then test Hypothesis Two – that when one controls for quality, the nonlinear relationship is expected to disappear. Table 3 presents the findings for the test of this hypothesis. Here it is apparent that the squared term is not significant, although it remains negative. The size of the networking coefficient itself is similar to that in the previous model,

meaning that even when we control for quality, networking is still a significant predictor of performance; managerial networking and managerial quality contribute distinguishable and positive impacts on performance.⁶ However, we no longer see the diminishing returns.

[Table 3 about here]

Why, exactly, does the nonlinear relationship disappear when we control for quality, as Figure 2 shows? Are better managers able to network more effectively (so that they always see returns), or are they able to network more efficiently (they avoid networking to the point where they see diminishing returns)? A simple look at the data can help to answer this question. Whereas the networking variable for the entire sample ranges from 0 to 5.3, the range of networking for the best managers (those managers in the top 5% on the quality measure) only reaches a maximum value of 4.32. This fact lends some support to the idea that better managers are more efficient or at least more perceptive, with the ability to gauge when additional time spent in the networked environment may not garner substantial payoffs.

[Figure 2 about here]

Organizational Differences

To evaluate Hypotheses Three and Four, on the impact of central staff size on the management-performance relationship, we split the sample into two groups to test for how the presence of administrative human resources centrally can affect the relationship between networking and performance. We are interested in whether managers who have a larger central administrative staff, relatively speaking, are able to spend more time networking without seeing the diminishing returns that are present for the sample as a whole. Again, the basic logic is that

⁶The two measures are also essentially uncorrelated with each other.

when top managers can take advantage of internal help to share in some of the responsibilities, the superintendent is thereby freed up to spend more time on external management that also can reap performance dividends.

Table 4 presents the findings for Hypotheses Three and Four. The two groups into which the sample is split are: those organizations with a leaner administrative staff (operationalized as the percent of administrators in the district who work in the central district office) and those with a more bulky central administrative staff. The data for this variable are reported in whole numbers, with a range of 0 to 19, a mean of 1.88, and most respondents reporting either one or two percent. Because the mean is near two, we split the sample so that the districts with less than 2% (either 0 or 1%) are in the “low central staff” category, and those district with 3% or more are included in the “high central staff” group. We have analyzed each subset via multiple regression to see whether the nonlinearities related to central staff and the management-performance question are as hypothesized.

[Table 4 about here]

Our results mostly support Hypotheses Three and Four. The relationship between networking and performance is nonlinear⁷ for superintendents of those districts with fewer administrators in the central office (and thus capable of a lower level of “substitute” or supportive M_1 to assist the top manager), but for districts with more central administrators (and thus a higher M_1 capacity), the relationship between networking and performance is positive, linear, and substantively larger. Figure Three offers a picture of the differences in these relationships, with the former “serpent in the sand” displaying a rather marked curvature, while

⁷The squared term is significant only at the .10 level.

the latter slithers straight ahead.

[Figure 3 about here]

This set of findings offers some real evidence that the effect of networking on performance may be contingent on the administrative capacity inside the organization, not merely the effort and skill of the networking top manager. Impacts of public management, in turn, are functions of the activities and skills of multiple managers; and the behavior of one person (or in this case, the effectiveness of the behavior of one person) may be affected by the presence and activity of other managers in the organizations – in part through processes of adaptation, delegation, and backstopping.

Personnel Stability

Just as some internal management functions could be absorbed by central staff, it should also be the case that a stable cadre of employees – whether within or without management ranks – may also be able to support or substitute for some of the internal management responsibilities. A classic point noted with regard to public management has long been that the careful selection and socialization of public servants can reduce the “centrifugal forces” that can place extraordinary demands on an agency’s leadership (Kaufman 1960). As a part of that insight, organizations with lower levels of turnover may enjoy continuity that could reduce the need for continual direction and oversight from management. As the need for overt and active internal management declines, managers may be able to spend more time and effort in anticipating and responding to demands and opportunities found in the interdependent environment. Staff stability has a mean of 84.3 percent with a standard deviation of 8.2%. We designated highly stable organizations as those more than one-half standard deviation above the mean (or above 88.4%) and low stability organizations as those more than one-half standard deviation below the

mean (or below 80.2%).

Table 5 presents the findings for the tests of hypotheses five and six. Again, we have split the sample based upon the variable of interest – personnel stability – and have estimated the impacts of managerial networking on performance for each segment. Unlike for the other analyses reported thus far, here we find only partial support. For those districts with lower personnel stability, we find a strong nonlinear relationship – one exhibiting substantial diminishing returns – as was hypothesized. In those districts with high levels of personnel stability (little turnover), however, networking does not have a statistically significant effect. We have no a priori reason to expect this lack of relationship, and a null finding for both networking variables (that is, for M_2 and its square) in this latter subsample makes it difficult to compare impacts across these different types of organizations. Instead of graphing the networking-performance relationship for organizations with low stability and organizations with high stability, therefore, we display in Figure 4 the relationship for organizations with low stability against the full sample. The serpentine arch in the former is clearly more pronounced than in the latter.

[Table 5 and Figure 4 about here]

As seen by the different estimations and their graphic representations, lower stability in the organization increases the rate at which the returns of networking are seen to diminish. From this finding, we can speculate that managers in public organizations with higher levels of turnover who engage in substantial networking activity might be better off by redirecting some of their energy toward internal management – and presumably toward reducing the turnover rate itself. Of course, networking often does enhance performance. Still, identifying the circumstances under which sharply diminishing returns can be expected can be important both

theoretically and practically.

Conclusion

Just how is public management related to public program performance? While the clear answer from the research literature is “positively,” that response is insufficient and ambiguous. The functional form must also be explored. The O’Toole-Meier formal model explicitly asserts a number of nonlinear relationships, and it implies the possibility of more – in particular, the notion of a nonlinear link between management and performance. Similarly, other work in the field can be seen as encouraging consideration of the same possibility.

A complete answer cannot be discerned from one study for at least two reasons: multiple components of management would have to be analyzed, and also no single sample can be representative of all relevant public-management contexts. Still, the question of functional form is both important and amenable to analysis. We have focused on one management function – networking in the environment of the public organization to exploit opportunities and buffer against perturbations – and in one kind of setting – school districts on one large, diverse U.S. state. School districts are professionalized, highly decentralized organizations with a great deal of discretion vested at the street (classroom) level; consequently, the findings from this study should be applicable to other similarly structured public agencies.

In such settings, and for networking by top managers, the results reported here strongly confirm a specific hypothesis regarding nonlinearity: in general, managerial networking does indeed contribute positively to performance, but the returns diminish at higher levels of networking. This finding is consistent with the notions of O’Toole and Meier that managers apportion time and effort *across* managerial functions, presumably because multiple contributions are needed, and the distribution of managerial time and effort is likely driven in

part by managerial assessments of marginal returns to performance. It is also consistent with a conceptualization of public management as goal-directed activity aimed at coordinating people and resources to produce public value. Almost any model of the manager as an intendedly rational actor would imply a consideration of just such tradeoffs.

Even more interesting are the additional set of findings concerning the functional form of this relationship. How does managerial quality mediate the relationship? As the results displayed in Table 3 and Figure 2 attest, skillful managers are able to avoid diminishing returns; and additional evidence suggests that they do so, at least in part, by economizing on their investment in external interactions – thereby avoiding too much of a good thing. Quality management thus contributes directly (Meier and O’Toole 2002) and also via its influence on the shaping at least one important, externally-directed management activity.

These findings are also consistent with the argument supporting the model, but it is also helpful to note that they focus only on the behavior and influence of the top manager. The justification for the model, plus virtually the entire literature of the field, indicates that contributions of additional actors supporting the management function should also matter. While we do not test this proposition directly, we do so obliquely by examining the extent to which central staff capacity supportive of top management can reduce the internal-external tradeoff for school district superintendents. The findings (Table 4 and Figure 3) support the argument that central staff can buttress performance by supporting and contributing to internal management, thereby eliminating or at least substantially reducing the need for top managers to balance their internal and external responsibilities. By contrast, low central staff capacity can mean not only diminishing returns but, past a certain point, negative returns on performance from additions to external managerial effort. Bulking up with central staff, however, should not

be considered mere administrative padding; staff do entail fixed costs, and these need to be considered in managerial decisions. But when we incorporate a full set of controls regarding resources and constraints, our analyses show that significant staff capacity is supportive of performance, and some of this contribution is apparent in the way that *others*, particularly top managers, are able to add performance value. Substantial central staff capacity alters the pattern of the externally conjured “serpent in the sand.”

A similar notion, also implied in the work of O’Toole and Meier (2003), suggests that staff stability can provide a counterweight to the demands placed on management. Indeed, a part of their model indicates that stabilizing components can substitute for a managerial contribution.⁸ The findings summarized in Table 5 and Figure 4 provide partial support. What is clear in these results is that high turnover accentuates the discounting seen in the diminishing returns from the networking efforts of top managers.

Overall, these results confirm still further the notion that management matters. More importantly, they are also highly informative about the nonlinearities involved in translating managerial effort into program outcomes. Not surprisingly but importantly, it would seem that managers engage, or should engage, in a balancing act across their multiple functions; that doing so should encourage some marginal thinking on their part; that different top-managerial functions – internal and external – are not simply substitutable across their full possible range but that some management attention is needed for both; that skillful managers can avoid the diminishing returns associated with higher effort on the networking function; that administrative

⁸The model shows a set of stabilizing forces providing some substitute for internal management rather than for networking, but of course the latter can be indirectly affected by the former’s shift.

support to assist with internal operations can also reduce the need for top managers to economize on their networking at the margin; and that personnel instability can accelerate the rate at which managerial efforts externally produce diminishing returns.

These findings and their implications do not provide unequivocal answers to all the relevant questions regarding functional form. The results for low-turnover organizations, for one thing, require further empirical examination. The hypotheses supported here need to be examined in additional settings. The exploration of the performance impacts of internal management, or M_1 , has only barely begun; we have not yet analyzed most of the aspects of internal operations, and no work at all has been done to theorize about or estimate the precise functional form by which internal management might shape outcomes.

Finally, other tradeoffs may be apparent upon closer examination. In the current investigation, we have analyzed nonlinearities with respect to only one performance measure. It is well established, however, that organizations and managers can make decisions to emphasize one goal over others, at certain times and sometimes in response to close monitoring of the indicator of particular interest (see the coverage in Meier and O'Toole 2006b). To explore thoroughly the functional form by which management is linked to performance, it will be necessary to consider tradeoffs across performance criteria as well as those across managerial activities. For instance, the distributional consequences from managerial networking exhibit interesting albeit somewhat disquieting patterns (see O'Toole and Meier 2004). It could be the case that performance metrics less salient than the one examined here are likely to be subject to more drastic diminishing returns – dramatically arched serpents bending across the performance curve. Or the impacts of networking, which go disproportionately to the more advantaged clientele in the school districts under examination here, might be even more unevenly distributed

in low-networking settings; there the interactions that do occur may be more heavily weighted toward certain of the nodes that are more powerful politically. These comments are speculative, of course. The basic point is that additional questions of functional form have yet to be clarified, let alone examined systematically.

Most clear from the current investigation is that the specific ways by which management contributes to program results deserve extensive examination from multiple perspectives. Certainly, the key question of functional form has been lurking beneath the surface of the research literature – the “sand” – and deserves much more careful analysis. The serpents have made an appearance in this paper; they should rear their heads in future work as well.

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Table 1: Base Linear Model

Dependent Variable: Student Pass Rates on TAAS

<u>Independent Variables</u>	<u>Slope</u>	<u>T-Score</u>
Managerial Networking	0.883	7.54
% Black Students	-0.225	18.78
% Latino Students	-0.112	14.89
% Low Income	-0.120	11.51
Teacher Salaries	0.496	6.45
Class Size	-0.214	4.27
Noncertified Teachers	-0.168	6.87
Teacher Experience	0.054	0.80
State Aid	-0.026	4.21
Constant	74.560	32.96
R-squared	0.611	
F	271.93	
N	4182	

Table 2: Nonlinear Effects of Networking

Dependent Variable: Student Pass Rates on TAAS

Independent Variables	Slope	T-Score
Managerial Networking	1.970	4.21
Networking Squared	-0.232	2.40
% Black Students	-0.225	18.78
% Latino Students	-0.114	15.06
% Low Income	-0.118	11.30
Teacher Salaries	0.498	6.48
Class Size	-0.218	4.35
Noncertified Teachers	-0.171	6.95
Teacher Experience	0.044	0.65
State Aid	-0.026	4.28
Constant	73.628	32.09

R-squared	0.612
F	245.59
N	4182

(F-test for added variable yields F-statistic of 5.176 & prob>F =0.0165)

Table 3: Nonlinear Effects of Networking, Controlling for Quality

Dependent Variable: Student Pass Rates on TAAS

Independent Variables	Slope	T-Score
Managerial Networking	1.519	3.27
Networking Squared	-0.144	1.50
Managerial Quality	0.691	5.60
% Black Students	-0.228	18.88
% Latino Students	-0.109	14.26
% Low Income	-0.127	11.98
Teacher Salaries	0.402	5.10
Class Size	-0.262	5.12
Noncertified Teachers	-0.180	7.37
Teacher Experience	0.122	1.78
State Aid	-0.027	4.34
Constant	77.281	33.27
R-squared	0.624	
F	235.58	
N	4114	

(F-test for added variable yields F-statistic of 31.35 & Prob>F = 0.000)

**Table 4: Nonlinear Effects of Networking on Performance:
Impacts of the Relative Size of Central Administrative Staff**

Dependent Variable: Student Pass Rates on TAAS

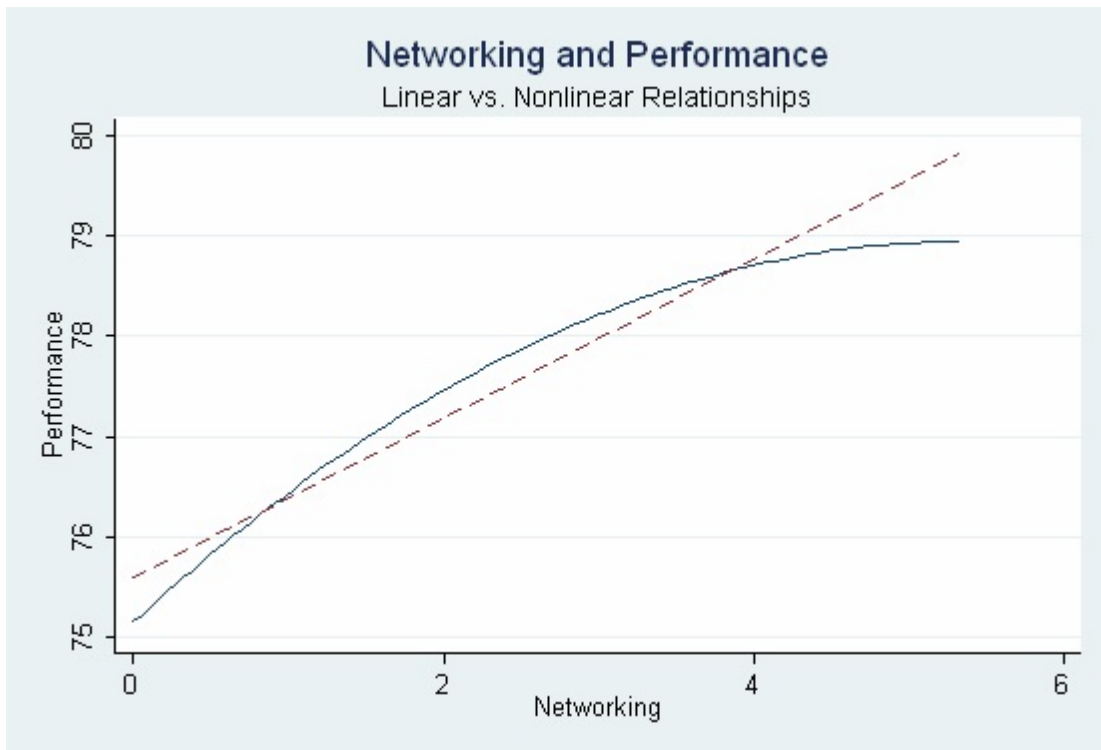
Independent Variables	Low M_1	High M_1
Managerial Networking	1.382 (2.38)	2.978 (2.03)
Networking Squared	-0.199 (1.70)	-0.412 (1.28)
% Black Students	-0.166 (12.06)	-0.336 (7.15)
% Latino Students	-0.075 (7.43)	-0.105 (5.57)
% Low Income	-0.191 (13.26)	-0.042 (1.82)
Teacher Salaries	0.552 (6.08)	0.611 (2.55)
Class Size	-0.415 (5.19)	0.176 (1.64)
Noncertified Teachers	-0.161 (4.56)	-0.096 (1.99)
Teacher Experience	0.147 (1.71)	-0.282 (1.53)
State Aid	0.003 (0.34)	-0.048 (3.32)
Constant	74.690 (25.71)	65.665 (9.92)
R-squared	0.69	0.43
F	203.27	18.12
N	2256	829

**Table 5: Nonlinear Effects of Networking:
Differences Related to Personnel Stability**

Dependent Variable: Student Pass Rates on TAAS

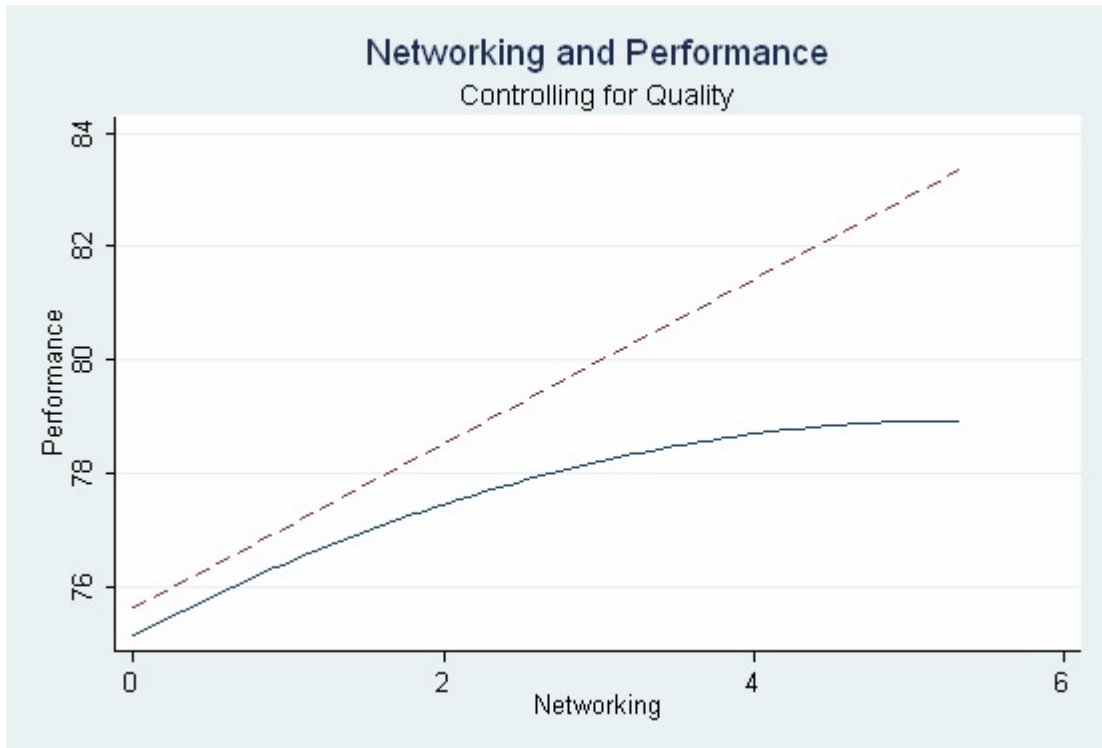
Independent Variables	Low Stability	High Stability
Managerial Networking	4.365 (4.27)	0.761 (0.91)
Networking Squared	-0.563 (2.61)	-0.008 (0.05)
% Black Students	-0.247 (9.83)	-0.227 (10.49)
% Latino Students	-0.118 (6.87)	-0.133 (10.06)
% Low Income	-0.093 (4.22)	-0.084 (4.67)
Teacher Salaries	0.155 (0.74)	0.624 (4.83)
Class Size	-0.993 (0.97)	-0.204 (2.44)
Noncertified Teachers	-0.049 (1.13)	-0.154 (2.65)
Teacher Experience	0.290 (1.75)	-0.577 (4.73)
State Aid	-0.042 (2.99)	-0.035 (3.45)
Constant	76.376 (6.02)	77.978 (19.71)
R-squared	0.556	0.604
F	41.47	63.62
N	927	1296

Figure 1: Linear and Nonlinear Relationship



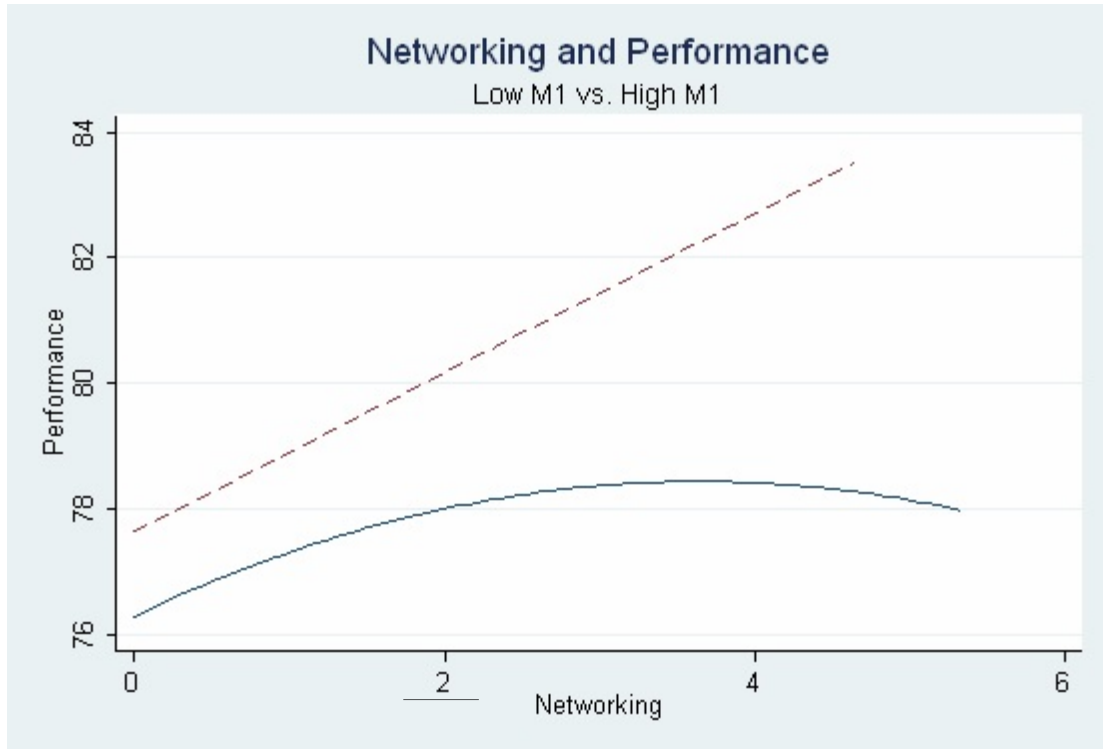
----- Linear Estimation
—— Nonlinear Estimation

Figure 2: Controlling for Quality



----- Controlling for Quality
—— Basic Nonlinear Model

Figure 3: Differences in M1



----- High M1
Low M1

Figure 4: Organizations with Less Stability

