

Organizational Environment: Effects of Network Ambition on Agency Performance

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Abstract

The literature on network management in the public sector reports positive effects of network activity on agency performance. However, current studies show no differences between specific types of network contacts in the environment of an agency. The present paper adopts an explorative design to study the different types of environmental actors in the networks of nine colleges for nursing studies in the Netherlands. A typology of environmental ties is introduced and applied to the nine cases. It appears that contacts to different types of actors reflect different levels of ambition in the network management of the colleges. Network ties for program development are positively associated with diploma rate and negatively associated with drop-out rates among freshmen. More profound professional network ties positively affect graduates' hourly wages and negatively affects their unemployment.

Key words: Public management, networks, performance

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1. Introduction

The network activity of public agencies is found to promote their performance. Network activity is defined as the frequency of contacts with different types of actors (Meier and O'Toole 2003: 692; O'Toole and Meier 2004: 479). Public agencies headed by managers who more actively establish (frequent) contacts with relevant stakeholders in their environment, do much better than less active agencies. For example, O'Toole & Meier (2004) report that the 'Texas public school district data' consistently reveal significant positive effects of the network activity of directors of Texas school districts on various indicators of performance of their district. School districts with directors who maintain more frequent contacts with a wider range of organizations in their network have higher pass rates and lower dropout rates. Such effects of managerial network activity on performance are also reported for firms. Firms that maintain more frequent relations with more organizations in their environment have higher survival rates, economic output, and innovativeness (Smith-Doerr and Powell 2005; Zaheer, McEvily, and Perrone 1998).

The theoretical underpinning for the association between network activity and agency performance is still quite general. The proposition is that managers with more, and more frequent network relations are better able to: (a) buffer instabilities in political, economic, and technical demands, and (b) compensate for informational uncertainties in its environment (Meier and O'Toole 2003; O'Toole and Meier 1999; 2004). Although network activity imposes important transaction costs upon public managers, it pays off in terms of access to vital resources and information from other organizations. How this trade-off works out in public management practice is not yet well-understood. It could be the case that public managers concentrate on specific, crucial types of actors in their environment in order to keep transaction costs manageable. Alternatively, it could be the case that the public managers of successful agencies are more generally concerned with network management, and perform so well because they maintain frequent relations with all kinds of organizations. Thus, it is a highly relevant issue to explore which relations managers maintain with what types of organizations in their environment, and what effects these different types of relations have on agency performance.

The aim of the present paper is to explore what type of network contact matters most for which performance indicator. We formulate two research questions. The first, *descriptive* question is to which actors in the agency's environment do public managers allocate their scarce time and resources? Do they mainly concentrate on the inter-organizational agency network? Or do they (instead or in addition) concentrate on organizations and stakeholders in a wider environment, beyond the inter-organizational agency network? The second, *explanatory* question is what network relations in the agency's environment yield in terms of agency performance? How do different types of network relations affect which indicators of agency performance?

The research questions are explored in a study of network ties and performance of nine colleges for nursing studies in the Netherlands. These colleges are part of the Dutch system of universities for applied sciences. Colleges maintain contacts with other colleges in the inter-organizational network of nursing studies, but also with various organizations in their own environment. Examples are: hospitals, medical research centers, or local government. We first reconstruct the inter-organizational network of colleges for nursing studies. Subsequently, we identify different *types of contact* which

the nine colleges for nursing studies maintain with their environment—beyond the network of colleges. What are the different stakeholders and organizations in the environment of colleges for nursing studies? Why do colleges interact with these stakeholders and organizations? Finally, we study the effects of different types of interactions between colleges for nursing studies and their environment on college performance. Do different types of network activity affect specific performance indicators, or does the network activity of a college in general affect several indicators of its performance.

2. Network ties, environmental challenges, and performance

Although it is common wisdom that ‘public management networks matter’, little is yet known about the specific relations that public managers maintain with organizations in the environment of their agency, and how these relations affect their performance. A seminal work in this field is the model of Meier and O’Toole, which relates different types of management activities of agencies to their performance (Meier and O’Toole 2003; O’Toole and Meier 2004). In the Meier-O’Toole model, agency performance is determined by the agency’s past performance, its environment, and network management. An agency’s environment provides structural opportunities (e.g. funding possibilities for schools) and poses constraints (e.g. a high proportion of students from poor families). In the model, the agency’s ability to yield a surplus value from environmental forces is a function of ‘network management’. Two types of network management are distinguished: (a) management that exploits resources in the agency’s environment, and (b) management that buffers environmental shocks, such as political, economic, and technical demands (O’Toole 1997). In various studies of Texas school districts, district superintendents are asked to indicate how frequently they interact with different categories of actors in their environment, such as: school board members, the Texas education agency, other superintendents, state legislators, or local business leaders (Meier and O’Toole 2003: 692).

2.1 The plausibility of differentiation between ties

An important empirical result of the study of the Texas school district superintendents is that superintendents’ network activity highly correlates across all categories of environmental actors. Meier and O’Toole (2003: 692) report that empirically, network activity is captured by one single common factor rather than by multiple dimensions of managerial network activity. Hence, the Texas school studies distinguish the less active superintendents from the more active school district superintendents. This result has two implications. The first implication is that in their network management strategy, these public managers do not discriminate between different types of environmental actors. The second implication follows from the fact that network activity affects performance. Apparently, all different ties to specific types of actors in the agency’s environment are equally beneficial to agency performance. For example, it does not make a difference whether a district superintendent invests her time and resources in maintaining frequent relations with school boards, with state legislators, or with parents.

Both implications of Meier and O'Toole's (2001; 2003) studies are not very plausible. If some trade-off exists between paying transaction costs for maintaining relations with actors in the agency's environment, and receiving a surplus value from these relations in terms of better performance—then public managers are likely to make conscious investments in specific types of environmental actors. Hence, any theoretical framework for public network management needs to build on the goals and ambitions of public managers.

We assume that public managers maintain relations with specific types of organizations in their environment because they aim to achieve specific goals. In the case of colleges for nursing studies, we can easily imagine that interactions with specific organizations advances a college's direct fulfillment of program needs. For example, nursing schools have a strong incentive to maintain relations with hospitals and care-providing institutions in order to realize internships, which are mutually beneficiary for the college and these institutions. But, colleges for nursing studies may also wish to advance more strategic goals in the local arena of health care. For such strategic goals, it is useful to maintain contacts with political actors and local interest groups.

In order to theoretically link agency interactions with specific environmental actors to specific performance indicators we should assume that some relation exists between the goal attainment of public managers and specific aspects of college performance. The literature on public management networks proposes several mechanisms that explain associations between network activity of public managers and agency performance. The most important mechanism is the exchange of resources, which takes place through network ties and is stimulated by the strength and closure of these contacts. Agencies linked through with strong and closed ties build inter-organizational trust, so that transaction costs are reduced (Agranoff and McGuire 1998, Provan and Sebastian 1998; Schalk, Torenvlied and Allen forthcoming). The weakness of this general explanation is that it does not provide the conditions under which some ties are more beneficiary to the agency than other ties.

An alternative mechanism which explains associations between network activity of public managers and agency performance is the reduction of uncertainties in changing environments. (Kraatz 1998). The environment of agencies changes constantly, due to government regulation, demographic developments, alterations in consumer preferences and other exogenous factors (Kraatz 1998). Network ties not only reduce uncertainty, but also help the agency in adapting its strategies in the face of environmental challenges. O'Toole and Meier (2001) link changes in agency strategy to performance. They argue that an awareness of the environment, and an adaptation of the agency to environmental changes and challenges, enable the agency to maintain a fit between demands and operational processes. However true this proposition may be, it could also be qualified for different types of ties with environmental actors. For example, network relations that aim to support the day-to-day business routines of the agency (e.g. relations with suppliers), must be directed towards environmental challenges in the short-run. Network relations that aim to support the strategic position of the agency (e.g. relations with politicians), must be directed towards environmental challenges in the long-run.

2.2 A typology of ties

We propose two dimensions of environmental challenges that determine how effective specific agency ties are—and thus how specific different types of ties are related to specific aspects of agency performance. The *first dimension* is the *timeframe* at which environmental challenges have an impact on agency goals. Ties with organizations in the agency's environment could help adapting agency routines and processes to immediate, day-to-day challenges in the environment, such as changing weather conditions, fluctuating prices, or the availability of resources. But, ties with other organizations in the environment could help adapting the agency to long-term changes, such as government regulation or demographic trends. The *second dimension* of environmental challenges is formed by their *scope*. The scope of environmental challenges refers to the breadth of the impact of changes in the environment on the agency's functioning. If the scope is limited, it only affects the agency's direct environment, such as its clients or suppliers. If the scope is profound, it may affect the agency's position and reputation.

We specified these dimensions for colleges of higher education, which are subject of analysis in the present paper. For these colleges, figure 1 illustrates which ties would support agency responses to the different types of environmental challenges. First, *operational* ties aim to support the day-to-day routine operation of running the current educational program. Examples of operational ties include contacts with hospitals about internship and contacts with pre-entry schools about the level of prior education or the acquisition of students. Operational ties aim at short term environmental challenges that (may) affect the primary process of a college. Second, *program development* ties aim at supporting the further development of the educational program, by facilitating adjustments of the curriculum to environmental changes and the introduction of educational innovations. Examples include contacts between the college and other colleges, or contacts with professional organizations that support curriculum development, student and staff exchange. This type of ties still aims at supporting the primary process of the colleges, i.e. teaching, in the face of medium term challenges in the environment.

Third, *professional ties* aim to give advice to and receive information from professional organizations in the field. These ties are used to exchange information on standards and methods used by the professional field into the curriculum. Providing the professional fields with advice also contributes to the colleges' reputation and position in the professional field. Professional ties are investments to adapt to medium term environmental changes and uncertainties. Fourth, *scientific ties* aim at doing (scientific) research with universities and research institutes or professional organizations, and will contribute to the primary process of colleges when research findings are incorporated in the curriculum.² Since scientific research is time consuming and its results only influence in the professional field gradually, scientific ties typically aim at the adapting to long term environmental changes. Finally, *political ties* aim at supporting the further development of (local) policy-making and implementation. Examples for nursing studies include contacts with representatives from local administration in the field of educational policy or health care policy. It is plausible that political ties support an agency in making

² It could contribute to a college's reputation and position as well in an environment in which engagement in science is highly valued.

adjustments to long term environmental challenges. Since political ties give access to political decision making (Lauman, Knoke and Kim, 1986), it may even enable colleges to influence the decisions that environmental changes that affect their position.

Table 1 about here

2.3 Performances and network ties

Organizational performance is a multifaceted concept, especially in the public sector, where organizational goals are multidimensional (Boyne, 2003; Provan and Milward, 2001; (Andrews, Boyne, and Walker, 2006). It is therefore plausible that the different ties we identified contribute to specific organizational goals. Our typology suggests that operational and program development ties contribute to an organization's short and medium term primary process, whereas professional ties enhance a school's medium term position and reputation. Scientific ties enhance college performance on long-term goals that concern its primary process. Finally, political ties help the college to improve or maintain its long-term position and reputation. In this study we elaborate on four different performance indicators, that all refer to different organizational goals, and are therefore expected to benefit from specific (combinations of) ties.

Primary process. A college's first goal is running the primary processes that leads to the production of graduates. College performance on 'graduates production' depends on several factors, such as the quality of the program offered, its staff, the management of the educational process and the quality of the students. All these factors refer to the college's ability to manage in the short run its daily operations, and improve the quality of program and teaching staff, or the acquisition of high quality students. Since diploma rates are a sound proxy for the production of graduates, we specified the following hypotheses:

Hypothesis 1. Operational ties positively affect diploma rate.

Hypothesis 2. Program development ties positively affect diploma rate.

Because professional ties enhance the exchange of standards and methods, these ties contribute to improvements in the curriculum, and hence the number of graduates delivered to the labor market.

Hypothesis 3. Professional ties positively affect diploma rate.

We do not expect scientific and political ties to affect diploma rates, since both type of ties are expected to contribute to long term challenges. The second goal of a college is the reduction of dropouts. Although a certain dropout rate may seem unavoidable, high dropout rates under freshmen endangers diploma rates and hence reduce the returns of educational investments in students. Dropout rates are influenced by, among others: (1) the quality of the information a school provides to potential students, that is its ability to raise realistic expectations among potential students about the program that match the actual program, avoiding that students make the wrong choice to enroll in the program, (2) program quality and program management. These factors refer to short-term and

medium-term environmental challenges in the primary process and will benefit from operational and program development ties. We specified the following hypotheses:

Hypothesis 4. Operational ties negatively affect dropout rate.

Hypothesis 5. Program development ties negatively affect dropout rate.

Since professional ties enhance the exchange of standards and methods, these ties are expected to improve the curriculum, which will reduce the dropout rate.

Hypothesis 6. Professional ties negatively affect dropout rate.

Position and reputation. Reputation is an important factor for a school's long term ability to compete for students and to acquire funds. Although a series of factors will contribute to a school's ability to attract students and funds, a school perceived successfulness is certainly one of them. The reputation of delivering competent graduates will affect the success of their graduates, for example with respect to their popularity on the labor market, as indicated by: (a) employment, (b) hourly wages, and (c) evaluation of the program after entrance of the professional field (graduate satisfaction). For these long-term goals, contacts with professional organizations in the environment help to provide the information about professional demands necessary for preparing students for their future jobs. Therefore we expect that professional ties positively affect to a school's reputation in particular. We specified the following hypotheses:

Hypothesis 7. Professional ties positively affect the wages of graduates.

Hypothesis 8. Professional ties positively affect employment of students.

Hypothesis 9. Professional ties positively affect graduate satisfaction.

Since operational and program development ties are aimed at short en medium term challenges in the school's primary process, we do not expect a positive effect of operational and program development ties on the employment and wages of students and their satisfaction with the program.

3. Data and Method

The object of study in the present paper are nine colleges for nursing studies (in Dutch: HBO-V). These colleges typically prepare students for a bachelors degree—although recently masters programs are being developed. All colleges offer a specific, four-year program to train bachelor students for various professions. The *nursing studies* program is offered by 17 colleges in the Netherlands, which train nurses for various functions in hospitals, for assisting general practitioners, and for the broader health care sector. Graduates from the program comply with strict and fully prescribed professional standards, which aim to license its graduates. College funding is based primarily on total student enrollment, but in addition includes a 'dynamic demand factor' which incorporates performance measures such as dropout rates in the previous year, and enrollment in the present year (Kaiser, Vossensteyn, and Koelman 2001). Thus, colleges have a mild incentive to compete for students and resources. However, all colleges for nursing studies have strong common interests, for example to effectively lobby, exchange information, and to develop joint programs. Colleges maintain relations with many organizations in their environment. These relations do not only include those from the

inter-college network for nursing studies, but also contact in the (often local) environment of each specific college.

Environmental contacts. The network of colleges is characterized by colleges' contacts with different types of organizations, represented by the professional relationships of their directors and management team with organizations. The data on the network ties of directors and managers of the colleges were collected using questionnaires and an extensive analysis of documents and reports. The questionnaire was sent to all colleges and the response rate was 53%. The survey was sent out in Spring 2008.

Respondents were asked to list the different relations which they maintained over the last three years. They had to indicate which specific organization, the frequency of each contact, and the content of each contact with the organization. Relations were defined in the questionnaire as undirected relations. The type of relation was later categorized into the five types of contacts: operational, program development, professional, scientific, and political. The categorization of the contacts of directors and managers into these categories was based on the description respondents reported about the content of the contact and the organization with which the contact was maintained. For example, a tie with a hospital was labeled as operational when the subject of the contact was the coordination of internships. When a contact with the university hospital was described for further professionalizing the educational program, the contact was labeled as 'program development'. The membership of staff in organizations of advisory boards were labeled as 'professional ties'.

In addition, we analyzed the annual reports of the individual schools in the five programs, reports from the HBO-raad, accreditation reports and minutes of meetings for indications of membership to collaborative bodies or alliances and joint projects (for an overview of the methodology used see Marsden 2005; Torenvlied and Van Schuur 1994). We cross-validated the information of all these sources to rule out potential retrospective biases (Torenvlied 2000).

The inter-college network. In addition to the external network we also measured the network of relations between all colleges for nursing studies, which is the inter-college network. In addition to the 'national program committee' of the HBO-raad,³ different affiliations exist for the college networks. In the first place, some colleges meet in subcommittees of the 'national program committee' for specific projects—the number and intensity of which varies across networks. For example, colleges of nursing studies established an AIDS/HIV prevention program for nursing students with internships abroad, a project group for the standardization of master programs, and a platform to promote cooperation with respect to internships. In the second place, networks managers meet in additional affiliations for collaboration and cooperation to discuss operational issues, which may even grow in additional lobby networks alternative to the 'national program committee' of the HBO-raad. In some of the inter-college networks cooperation

³ The main task of the national program committees is the determination of competences for their graduates and advising on the standards of accreditation of the programs. However, the committees are autonomous in their agenda and free in cooperating on every matter they perceive useful. The range of issues discussed in the national program committee differs between the networks. For example, the network of colleges for nursing studies frequently discuss their performance, such as dropout rates, enrolment, diploma rates, or program insufficiencies. The frequency with which the national program committee meets varies across the five networks between six and eight times a year.

platforms between specific colleges emerge, and joint masters programs between colleges were developed. To obtain information about the formal internal network we interviewed key informants. Data on the different affiliations of the inter-college networks were collected using structured interviews with key-informants as well as an extensive analysis of documents and reports. The informants were asked which affiliations existed in which at least two of the schools cooperated at the managerial level on either policy formulation or joint program development. We established the formal internal affiliation network for all of the 17 colleges (Schalk, Torenvlied and Allen forthcoming).

Performance indicators. We apply two indicators for the performance of the colleges for nursing studies. Data are available from the publicly accessible management information system of the universities of applied sciences. We used the data for the year 2005-2006, which matches the measurement of the environmental college networks and the inter-organizational college network. The first performance indicator, *diploma rate*, is defined as the number of graduates in 2005-2006 divided by the enrolment in the college for 2001-2002. The student *dropout rate* is defined as the number of freshmen who dropped out the program in 2005-2006 as a proportion of the total freshmen student enrolment for the same year. High dropout rates are indicators for bad performance because colleges are assumed to motivate their students.⁴

4. Results

We apply an explorative strategy for analysis of the data, because we have information about different networks ties about nine colleges for nursing studies. Thus, the present analysis is a multiple case, replication design in terms of Yin's (1989) classification of case study designs. The aim is not to quantitatively test strict hypotheses, but explore to what extent we observe different types of interactions between colleges and their environment, and patterns between these interactions and college performance.

4.1 Types of environmental contacts

Table 2 provides insight in the types of environmental contacts maintained by the nine colleges for nursing studies in the dataset. The table shows that all nine colleges maintain operational contacts, and that for four colleges these are the only type of ties maintained with organizations. Five schools have program development contacts in addition to the operational contacts. These contacts aim at the further development of the study program. Professional contacts are less common among the colleges for nursing studies: not many colleges have staff involved in professional committees. Scientific and political contacts are even less reported by the colleges. Only one college, HAN, reports contacts that involve all different types of contacts.

Table 2 about here

From table 2 we can infer that a cumulative scale exists, which reflects the level of ambition of a college in managing the environment—in any case this pattern is clearly

⁴ Some colleges may apply binding recommendations regarding the continuation of studies in the first year. This could be an alternative explanation for high dropout rates.

visible for the operational, program development, and professional types of ties. Thus, we are able to group the colleges into three categories: (1) a group of colleges which maintains operational contacts only; (2) a group of colleges which maintains operational contacts and program development contacts, but no professional contacts; (3) a group of colleges which maintains all three types of contacts. This result could explain why Meier and O'Toole (2003: 692) do not find that network activity discriminates between different categories of actors: network activity reflects increasing ambition levels, rather than separate, orthogonal dimensions of organizations in the environment.

We further analyze the data with respect to these three groups of colleges. One of the questions to explore in the present paper is whether there exists some congruence between a college's network activity in the own environment, and its network activity in the inter-college network. Inter-college relations are different from the relations with each college's (local) environment. Network activity in the inter-college network is defined as the number of other colleges for nursing studies which a college meets in various formal affiliations of the program domain, such as for example joint programs, projects, or lobby groups. This activity is captured by the network measure of 'degree centrality'. The environmental contacts are defined in terms of the three groups of colleges, with increasing levels of ambition in managing the own environment.

Figure 1 about here

Figure 1 provides insight in the mean 'degree centrality' of the three types of colleges in the inter-organizational college network. A high level of degree centrality implies that the college has access to many colleges, and a low level implies that the college has access to only a few other colleges, or may even be isolated. From figure 1 we can infer that those colleges that most actively manage their environment, are also the colleges most central in the inter-organizational college network. The number of environmental contacts positively correlates with internal centrality (Spearman's $\rho = 7.27$; $p < .05$). Thus, we have an indication that network activity is a property of a college for nursing studies directed both towards the inter-organizational college network and towards the environment. This result is in line with Meier and O'Toole's (2003: 692) finding that network activity does not discriminate between different categories of actors.

4.2 Environmental contacts and performance

Our hypotheses are formulated at two different levels of performance: the level of colleges (dropout rate and diploma rate) and the level of graduates (employment, wages and graduate satisfaction). This has important implication for the analysis. For the college level performance indicators we explore differences between the three categories of colleges and their performance in a similar vein as the analysis on internal coordination and external resources. Are the more ambitious colleges in terms of network management also the better performing ones? The student level performance indicators will be tested with more advanced hierarchical statistical techniques. Using college level aggregates would mask individual differences within colleges and thereby creates the risk of ecological fallacy (Torenvlied & Akkerman, 2009)

We start with two college level performance indicators: (1) diploma rate and (2) a drop out rate (hypotheses 1 to 6). Diploma rates are an indicator for the quality of the educational program offered, because these rates show how well-structured the program is for students. Graduates from all colleges for nursing studies must comply to common (high) standards of professional norms, and graduates receive their diploma only if they build these professional competences. Given the fixed and relatively high standards, colleges with high diploma rates are either more efficient in teaching the qualifications than colleges with low diploma rates, or attract students with less abilities.⁵

Figure 2 about here

Figure 2 displays the mean diploma rate of the three types of colleges. The figure clearly shows that those colleges that maintain operational ties only—the colleges with relatively low levels of ambition in managing their environment—have a 10 percent lower diploma rate the average college for nursing studies. The average diploma rate of colleges for nursing studies clearly increases with their ambition level. Colleges for nursing studies with both program development contacts and professional contacts have a diploma rate of 80 percent, which is 10 percent above the overall mean, and even 20 percent higher than colleges that maintain operational ties only. Clearly, colleges that have the limited ambition to maintain contacts only directed towards the short-run operation of day-to-day routines fare worse than colleges with higher ambition levels—aiming at long-run program development, or contacts with professional organizations in the field.

Figure 3 about here

The second performance indicator we explore is the drop-out rate among freshmen. The drop-out rate among freshmen provides insight in the quality of the first year's program, and in the friction between students' expectations and the educational program offered. Figure 3 displays the mean drop-out rate for each of the three types of colleges. Colleges that maintain only operational ties with actors in their environment, have a drop-out rate among freshmen which is 2 percent higher than average. Colleges with additional ties to environmental actors in program development have lower drop-out rates among freshmen, but rates that are still higher than the overall mean. Remarkably, the colleges with the most ambitious network management (maintaining all three types of contacts) have a much smaller drop-out rate. Thus, the level of ambition in network management is also associated with better performance in terms of freshmen drop-out.

4.3 A spurious relation through college size?

One could argue, quite reasonably, that both network management ambition and performance are better realized in larger colleges. Large colleges have more overhead available, are able to work more cost-effectively, and can share some of the costly burdens of network management among a larger staff. Larger colleges are possibly better able to provide the highly specialized training necessary for nursing studies than smaller

⁵ We are not able to test the latter proposition, because we have no data available at the individual level of students, such as for example a proxy for student achievements in pre-education.

colleges. Larger colleges have more facilities to offer, such as libraries, ICT, and clinical facilities. However, the relation between college size and college performance is not straightforward: often smaller colleges are better able to provide tailor-made education. Hence, there is a sound possibility that the bivariate results in the analyses are driven by college size, and will disappear when we take into account college enrolment. Because our analyses are explorative, and because we aim at developing hypotheses rather than testing them, we cannot use a statistical tool to control for these effects. A much better strategy for analysis is to make a ‘cross-case display’ in terms of a scatterplot, and visually inspect what patterns exist (Miles and Huberman 1994: 198-9).

Figure 4a about here

Figures 4a and 4bc show the ‘cross-case displays’ of the association between student enrollment and the three performance indicators: diploma rate, drop-out rate and graduate satisfaction. In addition, each case is displayed by a marker, which indicates the type of environmental contacts the college maintains. The less ambitious colleges are black, while the most ambitious colleges are white. Figure 4a shows that there is indeed a weak positive association between student enrollment and diploma rate. Smaller colleges deliver fewer diplomas per student than the larger ones. Remarkably, the white markers indicate that the larger colleges are also more ambitious networking colleges, but with considerable variation in diploma rate. The black markers show that the smaller colleges are the least ambitious networking colleges, with a low mean diploma rate due to one college. Thus, although college size is both related to the types of network contacts which the college maintains and its diploma rate, it does not fully explain away the relation between network ambition and performance for this indicator.

Figure 4b about here

Figure 4b shows the existence of a clear negative association between student enrollment and drop-out rate among freshmen: the drop-out rate decreases with college size. For this performance indicator we observe much less variation between the ambitious colleges, who all perform best. There is much more variation in drop-out rate for the less ambitious colleges. Some do well (actually, one of the least ambitious networking colleges performs best), but other colleges have relatively high drop-out rates among freshmen. Thus, although the association between the type of ties with environmental actors and performance is stringer for drop-out rate than for diploma rate, again college size does not fully cover this relationship.

4.4 Student level performance indicators

Table 3 shows the results of multilevel regression for the three performance indicators in hypotheses 7 to 9. Professional ties appear to have no effect on the subjective performance indicator, graduate satisfaction. However, the presence of professional ties does affect the two objective performance indicators. Both the hourly wage and employment is higher for students who graduated from a college that maintains

professional ties. The is effect is statistically significant for both performance indicators ($p < .05$ and $p < .01$ respectively).

Table 3 about here

4.5 A spurious relation through individual graduate characteristics?

The effects of professional ties we found could be spurious, and effected by individual characteristics of graduates. Since schools differ in student population, it is necessary to control for individual level characteristics. For example, when gender affects hourly wage, a school with an exclusive female population will perform less on this indicator not because of its external network management, but because of its population. Therefore we tested a third model for the three performance indicators in which we included several individual graduate characteristics.

For the full model with graduate satisfaction we controlled for hourly wage of the graduate. We expected that graduates evaluate their program more positive when the returns of their education are higher. Table 3 shows that this is indeed the case: graduates that have higher hourly wages evaluate their program more positive. This effect is statistically significant. Further, we controlled for gender, ethnicity and GPA. A first observation is that these control variables have not changed the effect of the presence of professional ties on graduate satisfaction: professional ties do not affect the satisfaction of graduates. Moreover, gender, ethnicity and GPA do not affect graduate satisfaction.

However, these graduate level control variables appear to be significant for hourly wages. Women earn less than men. This finding is congruent with findings with research in wage differences (Fields and Wolff 1995, Brown 1997, Grodsky and Pager 2001). Grade point average positively correlates with hourly wage: better students earn more. After controlling for these individual characteristics, the positive effect of the presence of professional ties on hourly wages remains. This effect is weaker after introducing the individual characteristics but still statistically significant ($P < 0.10$).

Similar effects are found for graduate unemployment: the presence of professional ties lowers unemployment under graduates, even when we control for individual characteristics. Gender does not affect unemployment but ethnicity does: non-native graduates have a higher chance to be unemployed immediately after graduation, than their native peers. Higher GPA decreases the probability of being unemployed.

Thus, we find no support for hypothesis 9. Graduate satisfaction appears not be affected by the ties colleges have with professional organizations. However, graduate's hourly wage and employment increase when their colleges maintain ties with profession organizations, which supports hypotheses 7 and 8.

5. Conclusion

This paper explored the question whether public managers differentiate between different types of network contacts in the environment of the agency, and what effects these types of contacts have on agency performance. We developed a typology, based on the different aims of network contacts in the agency environment: contacts aiming at short-

term versus long-term challenges in the environment, and contacts aiming at different scopes of these challenges: shallow versus profound impacts on the agency. We applied this typology on the network management of nine colleges for nursing studies in the Netherlands, in order to explore its relevance and effects on performance.

Five different types of ‘ties’ follow from the two dimensions of environmental challenges: operational ties, program-development ties, professional ties, scientific ties, and political ties. The actual network strategies of the nine colleges reveals that colleges adopt strategies that differ in ambition. Whereas some colleges maintain only operational ties, other colleges adopt program-development ties in addition, and some colleges additionally maintain professional ties. Hence, we have evidence for the existence of a cumulative scale, which reflects network ambition rather than network activity. Furthermore, we found that not all ties contribute to all performances, but that specific ties affect specific performance indicators. Future research should analyze larger datasets in order to obtain more conclusive evidence for the existence of cumulative scales of network contacts, and for the existence of variation in the network ambitions of agencies.

The present study also found first indications that network ambitions correlate with performance. Colleges that are more ambitious—that is have contacts to more profound actors in their direct environment—perform better on diploma rates and drop-out rates. In addition, colleges that have more professional contacts perform better on hourly wages of graduates and graduates employment. These findings are promising for further research. All colleges maintained operational ties, aiming to address immediate challenges to their daily routines and practices. The hypotheses we developed and explored need to be tested on much larger datasets, to rule out spurious effects of other variables, and to obtain a better validation for the concept of network ambition. The present study may serve as a first, starting point for such an opportunity.

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Table 1: A typology of environmental ties for colleges of higher education

		Timeframe of the impact of environmental challenges		
		Short run	Medium term	Long run
Scope of environmental challenges	College primary process	Operational ties	Program Development ties	Scientific ties
	College position and reputation	X	Professional ties	Political ties

Table 2: Environmental contacts of the nine colleges for nursing studies

	Operational	Progr. Dev.	Professional	Scientific	Political
College 1	Yes	Yes	Yes	Yes	Yes
College 2	Yes	Yes	Yes	No	No
College 3	Yes	Yes	Yes	No	No
College 4	Yes	Yes	No	No	Yes
College 5	Yes	Yes	No	No	No
College 6	Yes	No	No	Yes	No
College 7	Yes	No	No	No	No
College 8	Yes	No	No	No	No
College 9	Yes	No	No	No	No

Table 3: Multilevel regressions of graduates' satisfaction[†] and graduates' hourly wage and employment for four cohorts (2002-2005)

	Graduates' satisfaction [†]			Graduates' hourly wage [°]			Graduates' unemployment immediately after graduation [†]		
	Empty model	Network model	Full model	Empty model	Network model	Full model	Empty model	Network model	Full model
<i>College level</i>									
Professional ties (0-1)		-.078 (.295)	-.144 (.343)		.597 (.279) [*]	.506 (.273) [*]		-.690 (.231) ^{**}	-.665 (.234) [*]
<i>Graduate level</i>									
Hourly wage of graduates			.078 (.023) ^{***}						
Gender (1= female)			-.067 (.227)			-1.693 (.308) ^{****}			.193 (.319)
Ethnicity (1 = non native)			.003 (.136)			-.139 (.193)			.303 (.158) [*]
Grade Point Average			.206 (.064) ^{***}			.223 (.723) ^{**}			-.183 (.085) [*]
Constant	0.651 (0.142) ^{***}	.679 (.179) ^{***}	-.751 (.640)	12.477 (.170)	12.244 (.177)	14.854 (.732) ^{***}	-2.069 (.157)	-1.791 (.141)	-1.860 (.713) ^{**}
σ^2 college level (n = 9)	.146 (.089)	.145 (.089)	0.197 (0.120)	.174 (.119)	.086 (.078)	.079 (.077)	.127 (.095)	.026 (.049)	.027 (.051)
σ^2 cohort level (n = 34)	.002 (.023)	.003 (.023)	.000 (.000)	.008 (.065)	.008 (.064)	.0134 (.067)	.060 (.090)	.058 (.862)	.058 (.087)
σ^2 graduate level (n = 1484)	3.26	3.26	3.26	9.746 (.396)	9.747 (.396)	9.451 (.384)	3.26	3.26	3.26
<i>Deviance</i> = -2log(likelihood)	479.19	479.17	379.41	1583.33	1582.43	1572.98	266.17	264.69	261.89

[†] Multilevel logistic regression using (maximum likelihood) Laplace estimation; [°] Multilevel linear regression ; * $p < .10$; ^{*} $p < .05$; ^{**} $p < .01$; ^{***} $p < .001$.

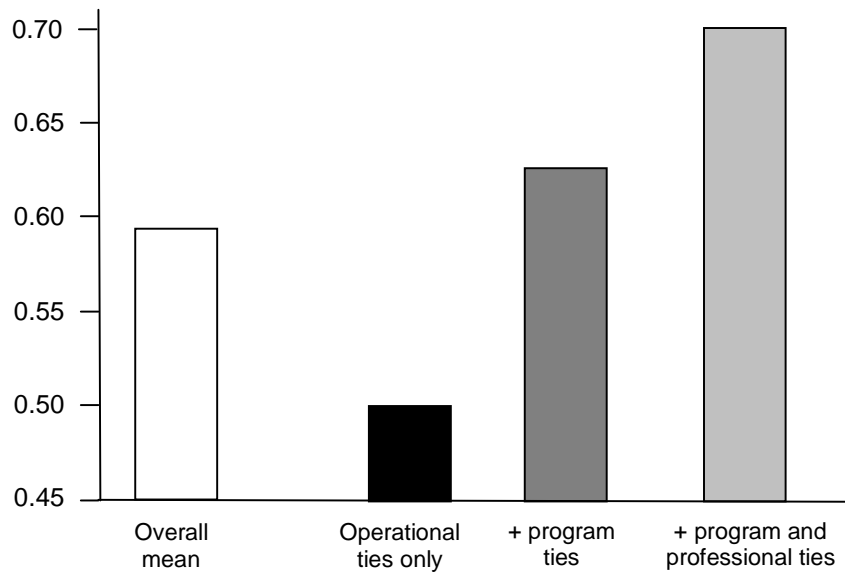


Figure 1: Mean degree centrality in the inter-organizational network for colleges with different types of environmental network ties

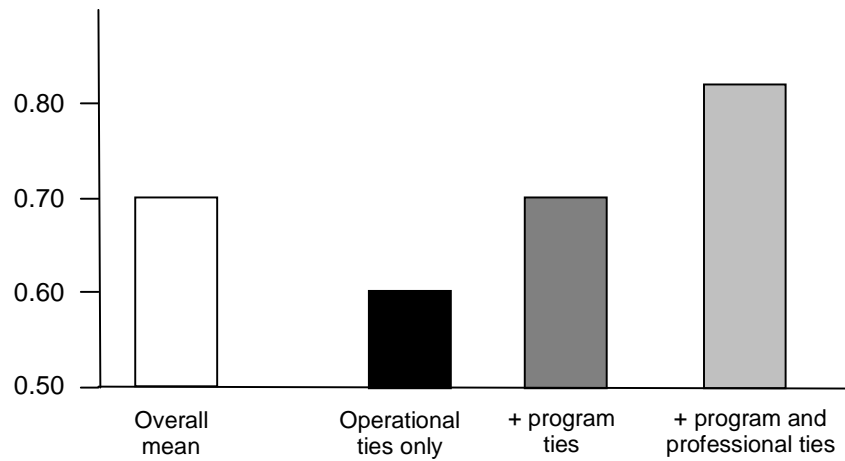


Figure 2: Mean diploma rate (2005-2006) for colleges with different types of environmental network ties

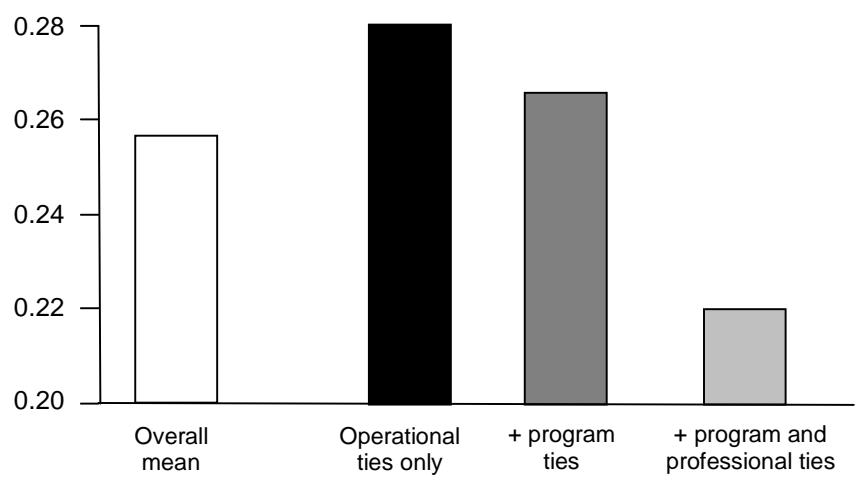


Figure 3: Mean drop-out rate (2005-2006) for colleges with different types of environmental network ties

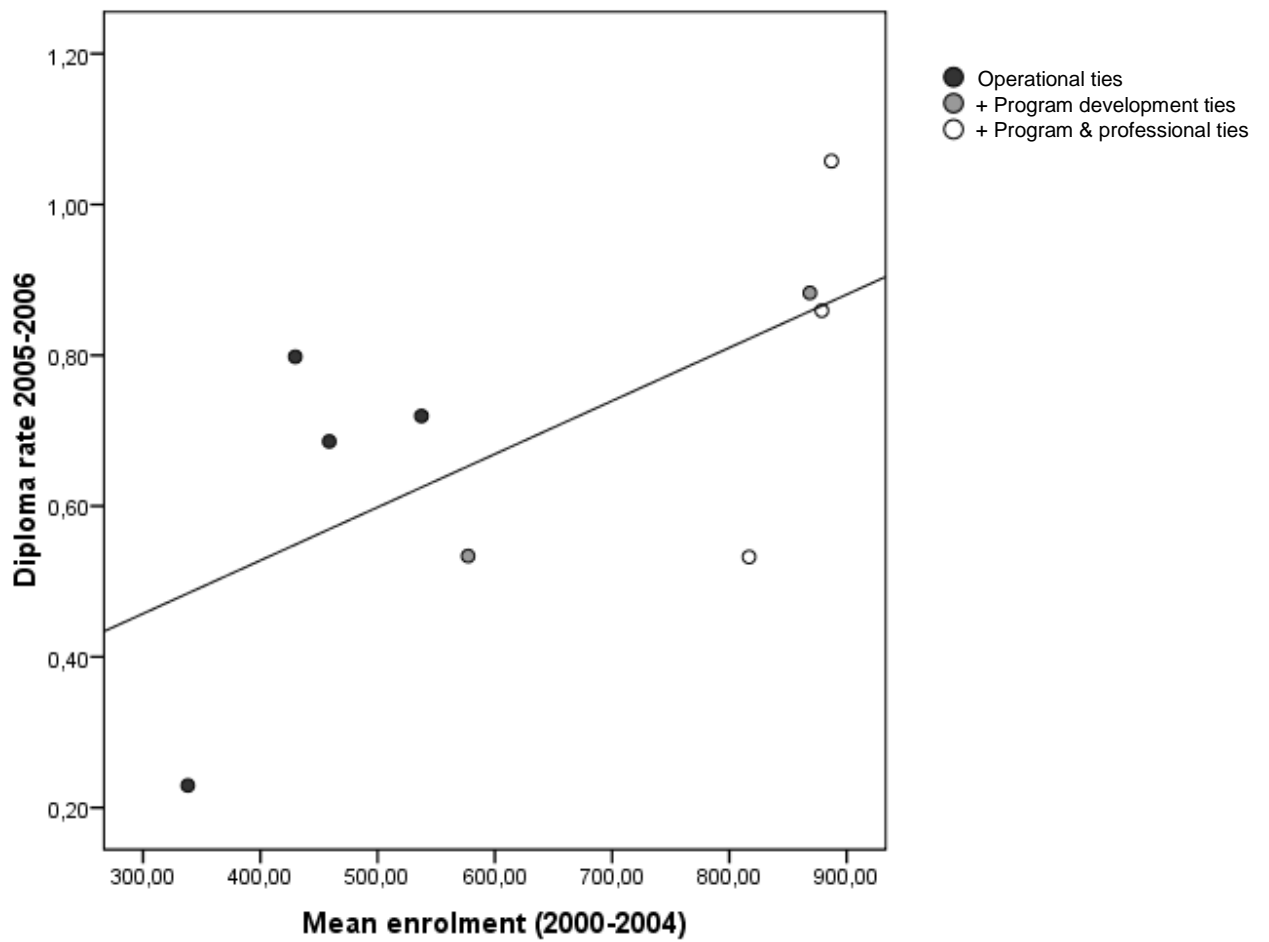


Figure 4a: Relation between college size and diploma rate (2005-2006) for colleges with different types of external network ties

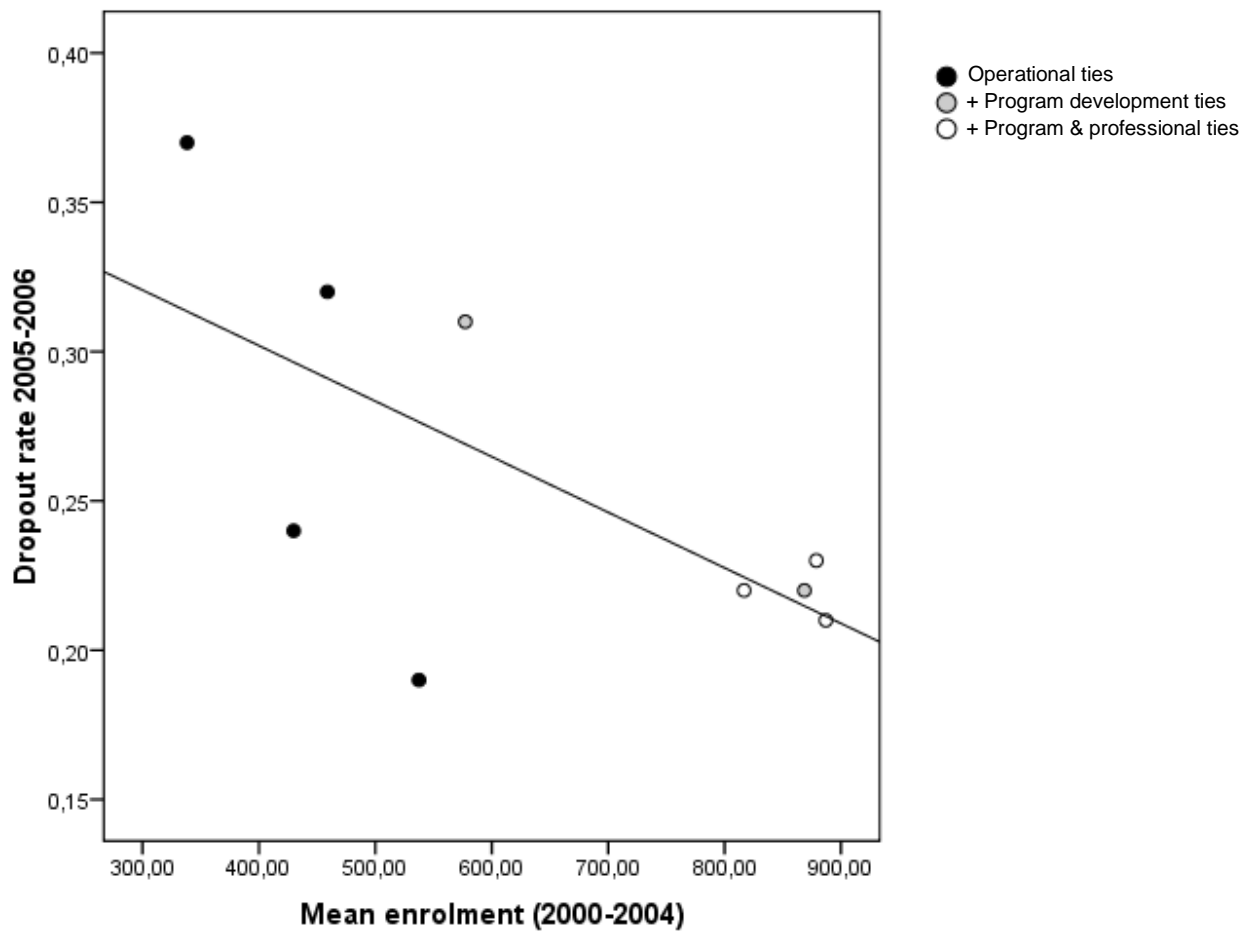


Figure 4b: Relation between college size and drop-out rate (2005-2006) for colleges with different types of external network ties