Communication Roles, Perceived Effectiveness, and Satisfaction in an Environmental Management Program

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Abstract

Earlier research has shown a relationship between various forms of structural centrality and perceived leadership and role satisfaction in small experimental groups. The limited amount of research on this topic in naturally occurring social networks has yielded results that often conflict with one another. Different results have generally been attributed to possible differences in task environments. This paper examines the relationship between two types of structural centrality and perceived influence, role satisfaction, and perceived effectiveness in an environmental resource management program. Findings in this paper suggest that the observed differences in relationships between the network and other variables is partly a function of global network properties (e.g., marginality of subgroups) and related task environments.

Keywords: intraorganizational networks, centrality, role satisfaction, effectiveness, power, environmental management

1. Introduction

A large body of research on communication roles in organizations since the '50s has repeatedly found a relationship between an actor's centrality or communication activity and his/her satisfaction, performance, and positive aspects more generally (Roberts and O'Reilly, 1979). Some have cautioned about the generalizability of these results because this research has not been conducted on "real" organizations where size, structure, goals, etc. may effect the observed relationships (Roberts and O'Reilly, 1979).

In a replication of Bavelas's MIT experiment (Bavelas, 1950), Freeman et al. (1980) found two measures of structural centrality that had an effect on leadership selection, group problem solving and individual satisfaction in small experimental groups. The experiment examined the relationship between three types of structural centrality and three dependent variables that included leadership, satisfaction, and efficiency across four structural forms. They found that two of the three centrality measures, specifically betweenness and degree centrality, helped in explaining leadership nomination and role satisfaction in the group. Generally, betweenness centrally, because of its potential for control of communication,

was important for understanding leadership choice while satisfaction was dependent on both betweenness and degree.

These findings are compelling in that they seem to point to the possible ways different measures of structural centrality reflect important sociological concepts such as control, power, influence, and activity and their relationship with group performance, efficiency, and individual satisfaction. But as they themselves admit, their work raises several questions concerning the replicability and generalizability of their findings. Most importantly, can these experimental findings be generalized to "naturally occurring human social networks" (ibid: 137)?

Although there has been no direct empirical test of the findings of Freeman et al. (1980) there has been a good deal of subsequent research on "natural" social networks exploring the relationship between the different types of structural centrality and individual influence, power, and control (see Brass, 1992, 1985; Brass and Burkhardt, 1992, 1993; Burkhardt and Brass, 1990; Krackhardt and Brass, 1994). Brass (1984), for example, found that although it is important to distinguish between the two forms of betweenness centrality as control and degree centrality as access, the two measures did not overlap to the degree expected and seemed to capture different aspects of centrality more generally (e.g., the relationship to individual influence). He attributes this to possible elements of the organizational environment such as task uncertainty and task structure. In another study, Brass (1981) found a negative relationship between one measure of centrality (closeness) and job satisfaction among nonsupervisory employees in a firm. As with the former study, he speculates that elements of the task environment, namely routinization, may mediate the relationship between satisfaction and centrality.

In more recent research Ibarra and Andrews (1993) observed a relationship between centrality in an advice network and feelings of autonomy. Similar to Brass above, Kilduff and Krackhardt (1993) found a negative relationship between one measure of centrality (betweenness) and job satisfaction in a friendship network. Although they too point to the possible influence of task environment on the direction of the relationship, they additionally note that individual actors in these central positions may experience stress due to their mediation role between actors who are not friends. This study is important as it points to the potential negative aspects of centrality as power, control, brokering, and mediation that may lead to lower satisfaction with an individual's position and/or role in a network (Krackhardt and Brass, 1994).

It is certainly the case that as we move from a controlled, experimental situation to a more natural context our ability to anticipate possible influences on such things as leadership nomination or attributed influence, role satisfaction and group or organizational efficiency is somewhat hampered. Yet, although there are definitely challenges associated with the study of natural social networks, we expect that the experimental findings discussed above will reflect aspects of even the most complex of organizational settings, albeit with some variation. In this paper we explore some of the propositions posited by Freeman et al. (1979, 1980) and others through a study of the communication networks of an environmental resource management program, the Albemarle-Pamlico Estuarine Study (APES). But we limit, at least in this paper, the set of propositions to be tested to those directly implied by the experimental work of Freeman et al. (ibid).

2. Background

The National Estuary Program (NEP) identified several estuaries throughout the country that were suffering from environmental degradation that could fatally upset their delicate ecological balance. The Program coordinates federal and state management agencies with local elected officials, professional staff and management personnel, interest group representatives, and the general public in the production of regional comprehensive conservation and management plans. These plans, when implemented should maintain and in some cases improve productivity, resources and the health of the respective estuarine regions.

The management conference for the Albemarle-Pamlico region was publicly announced in November, 1987, after the Secretary of North Carolina's Department of Natural Resources and Community Development and the Acting Regional Administrator for EPA Region IV signed an October conference agreement committing the state and federal government to joint responsibility for management in the sounds in North Carolina.

The specific structure to be used to organize the interests for any management conference is not specified in National Estuary Program (NEP) legislation. The legislation is generally limited to a four-phase guideline requiring: (1) broad participation in the development of a management framework, (2) characterization and problem definition, (3) creation of a Comprehensive Conservation and Management Plan, and (4) the implementation of that plan and an evaluation of the effectiveness of the actions taken.

To execute phase 1 of the National Estuary Program and begin studies, a committee structure known as the Albemarle-Pamlico Estuarine Study, or APES, was created. It took two years to develop the formal structure for the Albemarle-Pamlico Estuarine Study (APES) before it could be designated a management conference. Pursuant to the directives of the Water Quality Act, the EPA Administrator was given the authority and responsibility to convene a conference to carry out the mandates of Water Quality Act (Public Law 100-4).

The Region IV EPA Director and the Secretary of North Carolina's Natural Resources and Community Development Agency (NRCD) were appointed co-chairs of the APES Policy Committee in early 1986. They were delegated the authority and responsibility to create the appropriate management conference and the Comprehensive Conservation and Management Plan for the Albemarle-Pamlico Estuary. To accomplish this task five more members were added to the Policy Committee that year: a representative from Congressman Jones's office in Washington, D.C.; the director of Duke University Marine Laboratory on the coast in Beaufort, North Carolina; the director of the Beaufort Laboratory of the National Oceanic and Atmospheric Administration's Southeast Fisheries Center, also located in Beaufort, North Carolina; the director of the University of North Carolina's Institute of Marine Science; and a representative of the U.S. Fish and Wildlife Service in Raleigh, North Carolina. Later, in 1988, the chairperson for each of the two Citizen Advisory Committees were also given seats on the Policy Committee, bringing the total membership to nine. The Policy Committee has final authority and responsibility for the work and results from APES.

The second addition to the program was a twenty-one member Technical Committee to administrate the program on a regular basis subject to Policy Committee approval in certain circumstances. The co-chairs of this committee, like those for the Policy Committee,

consist of senior level management from EPA Region IV in Atlanta (the Director of the Water Management Division) and the Department of Natural Resources and Community Development (the Assistant Secretary of NRCD). The technical committee has a broader representation of state agencies and NRCD divisions than the policy committee whose principal members are from federal agencies (i.e., 7 of 21 on the technical committee are with the state—30%—compared to four of nine on the policy committee—44%).

The Technical Committee is structured to provide technical support and review and also to carry out the day-to-day execution of the management policies and programs established by the Policy Committee. In addition, the Technical Committee through its standing sub-committee on Public Participation, set out to fill the Water Quality Act mandate to include "affected industries and the general public" (PL100-4; Sec 320[C] [5]). Several approaches were considered as a means to include regional interests and citizens, including having eight Citizen Advisory Committees of 12–15 members each. The Subcommittee later settled on (and the Technical Committee approved) establishing two fifteen-member Citizen Advisory Committees (CAC) that would represent the known users or established interests in each of the Sounds in the study area. Each Citizen Advisory Committee was to include representatives in each of the eleven areas: public officials (2), education, tourism, development, sport fishing, commercial fishing, agriculture, (large) industry, coastal engineering/surveying, environmental interest groups, and private citizens (4). Nominations for members of the CACs were put forward by existing Policy and Technical Committee members, state agency staff, and local citizens who were aware of APES evolution. As the process of nomination and approval of the Citizen Advisory Committee (CAC) members ensued the size of each CAC was expanded to thirty members. The additional fifteen members expanded the 'private citizen' category so that instead of four private citizen representatives on each committee there were nineteen.[1]

The charge to the newly established Albemarle and Pamlico Citizen Advisory Committees was to:

1. provide a mechanism for structured citizens input into the Albemarle-Pamlico Estuarine Study from their respective regions; and
2. assist in the dissemination of information relevant to or developed by the Albemarle-Pamlico Estuarine Study in their respective regions. (Natural Resources and Community Development 1987).

It should be noted that although the Technical Committee is supposed to "help design and evaluate effective...public participation programs," the Citizen Advisory Committees must provide the "mechanism for structured citizens input" into APES.

When the conference agreement was signed in 1987 the Albemarle-Pamlico Estuarine Study consisted of 89 different members on four bodies; a Policy Committee, Technical Committee, Albemarle Citizen Advisory Committee, and Pamlico Citizen Advisory Committee. Additionally, to increase the opportunity for meaningful discussions and informed citizens the policy committee approved the dual appointments of the citizen advisory committee chairs to the policy committee and the vice-chairs of each CAC to the technical committee. Figure 1 shows the "formal" organizational structure of the program as officially noted in a program publication.

APES Administrative Structure
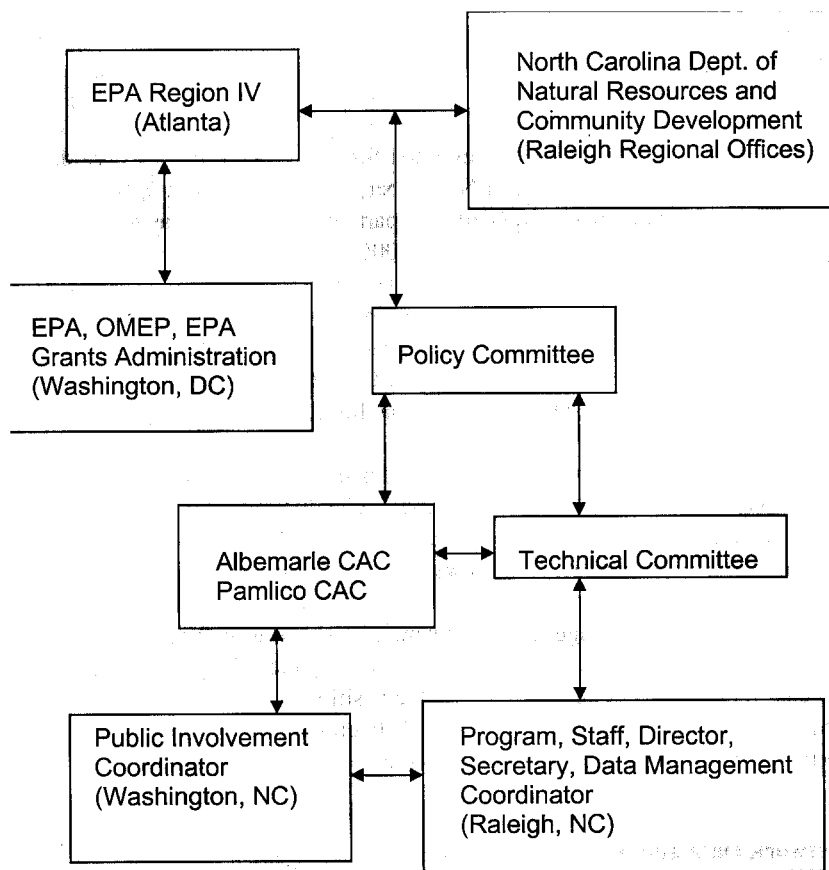
Albemarle-Pamlico Estuarine Study

Figure 1. Organizational structure of APES program as conceived of in APES publications.

It took 18–24 months to establish who the original program participants should be, but even this changed as the program evolved. Some agency personnel were shifted to other programs or departments and citizen commitments often conflicted with meetings so that they have had to resign from active participation.

To complete all four phases of the National Estuary Program, EPA administrators felt it was absolutely necessary to involve all the public and private representatives of APES Management Conference in a consensus building process. Thus, they felt success in the final implementation phase would occur because the process of problem identification and the development of solutions had involved citizens and provided for their participation (i.e., both in the selection of issues to address and in decisions about how to solve the problems

identified). The APES program structure provides participation for a wide range of citizen user groups in eastern North Carolina.

Overall, the APES membership is well educated. Eighty-one percent (58) of the sample had education beyond the level of Bachelor's, in fact, 31 percent (22) had a Ph.D. Of the 19 percent (14) with less than a Bachelor's degree, only 1 had less than a High School Diploma, and five had a High School Diploma.

3. Methodology

All APES Committee meetings were attended for a seventeen-month period, beginning in July, 1987 and continuing through November, 1988. Twenty-one of the twenty-four main committee meetings were attended as a participant-observer, as well as four public meetings and six subcommittee meetings. A 100% sample was attempted and 84% of the participants were successfully interviewed so that 75 of the 89 members of the APES were interviewed. The 14 individuals that were not interviewed include ten Citizen Advisory Committee members (six of which resigned during the study), three Technical Committee members, and one of the co-chairs of the Policy Committee (who also resigned during the study). The survey contained seven questions that formed the basis for the network analysis presented here.

Although four months elapsed from start to finish of these interviews, most were conducted in May and in June, between meetings. Conducting interviews between Citizen Advisory Committee meetings served to minimize communication between individuals about the contents of the survey. Interviews were conducted between April and July, 1988, in the respondent's home or office.

There were occasional changes in program membership during the period of this research. Staff was hired in a newly created position (the Public Participation Coordinator), and in another case there was a personnel change in the position of Project Director. Appointments to fill vacancies created by the resignation of Citizen Advisory Committee members were so late into the research that the new participants were not interviewed.

4. Network Data and Measures

To derive the network information, each respondent was asked a series of questions. Each person was handed a list with 94 names on it. Listed names belonged to individuals who had been designated as an APES participant at some point since the Study's inception. Respondents were asked to check off each individual on that list they knew. Following this they were asked to identify the 15 people that they interacted with or talked to most often concerning information about APES. They were then asked to rank the 15 actors in terms of amount of interaction.

In keeping with Freeman et al. (1980), two centrality measures and "leadership" nomination were examined. Because of the structure of the APES program, it was felt that simple leadership nominations would not be appropriate. Instead, attributed leadership is treated as attributed influence, something the respondents could readily answer. Other

work has previously tied network centrality to measures of influence (Brass, 1984; Boje and Whetten, 1981), while still others have linked the process of leadership to influence (Shaw, 1981).

Both betweenness and indegree centrality are used as independent variables. The "indegree" of a point (an individual) is obtained by summing the number of other points that have a directed relationship to ego. This measure of centrality is an index of the individual's "potential communication activity" (Freeman, 1979). Betweenness measures "the frequency with which a point falls between pairs of other points on the shortest or geodesic paths connecting them" (Freeman, 1979). The existence of a point on a line between other points indicates its potential to control information between those points.

Individuals ranked from 1 to 5 in the communication network were used to calculate the classic measures of indegree and betweenness after Freeman (i.e., when respondents ranked those they talked to most often, only those ranked from 1 to 5 were used to develop the centrality measures). For the sake of producing a binary chooser-chosen matrix each of the top five received a score of 1, while the others a score of 0.

$$X_{ij} = \begin{cases} 1, & \text{if } c \le 5 \\ 0, & \text{otherwise} \end{cases}$$

The UCINET (Borgatti et al., 1992) program was used to calculate the indegree and betweenness scores for each respondent yielding the two variables, INDEGREE and BETWEEN. Where symmitrical matrices were required, data were symmitrized through the union of row and coloumn values.

In addition to the two centrality measures and perceived influence additional variables were developed to aid in understanding the communication flow among participants. HIRANK2 indicates the two most active people in the communication network based on those to whom others talk and includes only the top two nominations for communication ranking.

$$X_{ij} \begin{cases} 1, & \text{if } h \le 2 \\ 0, & \text{otherwise} \end{cases}$$

This measure is included to determine possible differences in activity levels between upper and lower level administrators and its relationship to both the dependent and independent variables. As previously mentioned, the index of perceived leadership was based on who was perceived as influential (WHOSINFL) and was generated using a survey question asking each respondent to name those individuals they felt were the most influential in the program.

Finally, to measure communication between the citizens and other program members, participants were divided into two groups, advisory (the 48 citizens appointed to the advisory committees) and nonadvisory (the 27 policy and technical committee members and the program staff). Using each individual's response to the ranked network question, the proportion of an individual's communication links with people within their group (INGRPTK5) and outside their group (OTGRPTK5) were calculated. Again, only the top

five ranked individuals on each person's list were used to formulate these measures (so the sum of these two variables would be one). For instance, a citizen might talk to three people within their advisory group and two people outside (i.e., nonadvisory member).

The last set of variables represents a series of related dependent variables used in this analysis to test propositions concerning centrality and individual satisfaction with the program, committee effectiveness, and perceptions about personal effectiveness. Individual questions, as opposed to some composite index, were used to be in keeping with the instrument used in Freeman et al. (1980). Each question below had a scaled set of five responses: strongly disagree, disagree, undecided, agree and strongly agree.

ROLESATF: I am satisfied with my role in the program.
COMEFFCT: My committee is a very effective unit within the program.
INPUTDIR: I feel I am having real input into the direction of the current program.
POSTOUT: I am consulted before positions are taken outside my committee.
ACTOUT: I am consulted before actions are taken outside my committee.

Due to the potential for violation of assumptions and problems in parametric analyses of the kind of data in this study (i.e., ordinal, skewed, small sample size), comparisons of independent and dependent variables will be based on both Pearson correlations and Linear-by-linear association tests. The latter nonparametric method provides an exact test with a 99 percent confidence interval for the Pearson correlation coefficient (Mehta and Patel, 1995) ensuring the valid assessment of significance, no matter the nature of the data.

Based on the findings of Freeman et al. (1980) we will test hypotheses related to two relevant propositions.

P_1: Control of communication and activity, defined here as betweenness centrality and indegree centrality, respectively, will be positively related to leadership choice, viewed here as perceived influence.

P_2: Satisfaction, here viewed in terms of role satisfaction, personal control, and perceived effectiveness, will be positively related to aspects of both control (betweenness) and activity (degree) in the communication network.

With regard to the two propositions, the relationship between the two measures of structural centrality and elements of satisfaction and influence within the organization will be examined.

4.1.   Structural Centrality and Perceived Influence

Table 1 presents the correlations for the total sample ($N = 75$) for our measures of perceived influence, network communication, and centrality. The two centrality measures (INDEGREE and BETWEEN) correlate well (0.6796) and both of these measures correlate highly with the measure of who is most active in the communication network, HIRANK2 (0.9074 and 0.6269). All three of the preceding measures correlate significantly with those perceived as most influential (WHOSINFL), although the correlation with

Table 1. Communication and influence correlations ($N = 75$) with 99 percent confidence intervals for exact *p*-values.

	INDEGREE	BETWEEN	HIRANK2	WHOSINFL
INDEGREE				
BETWEEN	0.6796			
	(0.0000, 0.0005)			
HIRANK2	0.9074	0.6269		
	(0.0000, 0.0005)	(0.0000, 0.0005)		
WHOSINFL	0.6331	0.2473	0.5000	
	(0.0000, 0.0005)	(0.0303, 0.0397)	(0.0000, 0.0009)	
INGRPTK5*				
OTGRPTK5*				

*There was virtually no variation in who nonadvisory members talked to. With two exceptions all nonadvisory members talked to other nonadvisory members.

BETWEEN is relatively weak. Though it follows from these correlations that centrality and perceived influence are related, what's interesting is the change in the magnitude and significance of these correlations when we split the actors into two groups, advisory and nonadvisory.

The centrality measures are all intercorrelated for the total sample ($N = 75$), but when advisory and nonadvisory status of the actors is controlled, relationships observed in the full organization vary. Looking at the correlations for nonadvisory members (i.e., policy committee members, technical committee members and staff) we see that the correlations between our two centrality measures (INDEGREE and BETWEEN) and those most active in the communication network (HIRANK2) increase (Table 2). More importantly, however, the correlations between each of the centrality measures and who is perceived as influential (WHOSINFL) decrease or disappear altogether.

Table 2. Nonadvisory communication and influence correlations ($N = 27$) with 99 percent confidence intervals for exact *p*-values.

	INDEGREE	BETWEEN	HIRANK2	WHOSINFL
INDEGREE				
BETWEEN	0.8000			
	(0.0000, 0.0005)			
HIRANK2	0.9129	0.8540		
	(0.0000, 0.0005)	(0.0000, 0.0005)		
WHOSINFL	0.4896	0.1903	0.2606	
	(0.0103, 0.0161)	(0.1573, 0.1765)	(0.1125, 0.1293)	
INGRPTK5*				
OTGRPTK5*				

*There was virtually no variation in who nonadvisory members talked to. With two exceptions all nonadvisory members talked to other nonadvisory members.

The fact that the correlation between those most active in the communication network (HIRANK2) and those that are perceived as most influential (WHOSINFL) disappears entirely is important. The WHOSINFL variable measures those who are perceived as most influential in the APES network, while HIRANK2 indicates those who are most highly ranked in the communication flow based on communication activity. The lack of correlation between the HIRANK2 and WHOSINFL indicates that those who are most active in the communication network are not those individuals who are perceived as the most influential. Also, a link of relationship between BETWEEN and WHOSINFL suggests that those perceived as most influential display little in the way of brokering behavior in the network, again pointing to little activity in the day-to-day workings of the organization.

One interpretation of this is that for the nonadvisory participants, those individuals who are most active in the communication network are most likely to be the mid-level managers who, because of hierarchical organizational constraints are also most likely to talk to others at surrounding levels as opposed to those in high-level positions in the existing state or federal bureaucratic structure (those who are perceived as most influential). Whereas there is little difference between the two groups in terms of the extent to which their members display the different types of centrality, perceived influence is clearly viewed as residing within the nonadvisory group (see Table 4). The lack of variation in this nonadvisory group in the communication activity between themselves and the advisory committee members (OTGRPTK5) indicates they also do not talk much with CAC members.

A similar look at the intercorrelations of these variables for the advisory group in Table 3 reveals a slight decrease in the strength of the relationship between centrality (INDEGREE and BETWEEN) and communication activity (HIRANK2), as compared to the entire network. Further, there is an increase in the associations between the various centrality measures and an individual's perceived influence (WHOSINFL) when compared to the network as a whole or the nonadvisory group.

Table 3. Advisory communication and influence correlations ($N = 48$) with 99 percent confidence intervals for exact *p*-values.

	INDEGREE	BETWEEN	HIRANK2	WHOSINFL
BETWEEN	0.6341			
	(0.0000, 0.0004)			
HIRANK2	0.8941	0.4797		
	(0.0000, 0.0005)	(0.0032, 0.0068)		
WHOSINFL	0.8797	0.4421	0.9048	
	(0.0000, 0.0005)	(0.0060, 0.0106)	(0.0000, 0.0005)	
INGRPTK5*	−0.1261	−0.2635	−0.1757	−0.2349
	(0.1896, .2102)	(0.0226, 0.0310)	(0.1252, 0.1428)	(0.0646, 0.0778)
OTGRPTK5*	0.3683	−0.0157	0.3106	0.4447
	(0.0055, 0.0101)	(0.4625, 0.4883)	(0.0183, 0.0259)	(0.0005, 0.0025)

There is also enough variation among the measures for the advisory participants regarding how many people were communicated with both inside and outside their group (INGRPTK5 and OTGRPTK5) to include these variables. Again, remember that the indegree centrality and the measure of those most active in the communication flow (HIRANK2) correlate highly with those who are perceived as most influential (WHOSINFL) in Table 3. INDEGREE and HIRANK2 are also related to the measure of those who talk with members outside their group of advisory participants (OTGRPTK5). This is interpreted as an indication that those who are talked to the most and who have the highest centrality are those who most frequently communicate with individuals outside their advisory network. These individuals are also perceived as among the more influential advisory group members.

This contrasts to some degree to what was found for the nonadvisory members. In Table 3 the magnitude of the correlation between HIRANK2 and WHOSINFL nearly doubled for the advisory group as compared to the total sample. It would seem that those who communicate the most are also those who are perceived as having the most influence (which is not true for the nonadvisory group). This indicates that those who are placed in structurally important positions in the CACs are recognized as most influential and that they are also actively talking to other program participants.

Whether in the advisory or nonadvisory group, we see that those individuals that are identified as most influential have, in each instance, structural roles that place them high in the management hierarchy (two CAC chairs, three PC—one co-chair, two TC—one co-chair, and two staff members). Among those perceived as most influential were the chairs of every committee. There was only one technical committee member who was not at least a co-chair that was perceived as highly influential. To keep communication between committees open and be aware of the work that the policy and technical committees were conducting, the citizen advisory committee members felt, since the inception of this program, that they needed appointments from each of their committees to other committees. As indicated earlier, this was approved and the chairs and vice-chairs of each CAC were formally appointed to the policy and technical committees, respectively.

Though the data does not provide conclusive evidence, it intimates that those who have high betweenness are not necessarily perceived as the most influential (based on the lower correlations between WHOSINFL and BETWEEN compared to WHOSINFL and INDEGREE), but they may possibly be the more local or regional opinion group leaders (although not significant). By looking at the positive correlation between INGRPTK5 and BETWEEN and the negative correlation between OTGRPTK5 and BETWEEN for the advisory group, it is evident that these individuals (with relatively high centrality based on their betweenness score) communicate more with those in the advisory committees than with other participants in the overall structure.

4.2. Structural Centrality, Satisfaction, and Effectiveness

We now turn to test of the relationships implied in the second proposition. Specifically, this calls for an examination of the relationship between centrality and perceived influence,

Table 4. Comparison of centrality measures between advisory and non-advisory groups.

Dependent variable	T*	Sig.	Chi^{2}** approx. (1DF)	Sig.
BETWEEN	0.022	0.982	0.050	0.823
INDEGREE	−2.108	0.038	3.203	0.073
WHOSINFL	−4.394	0.000	22.282	0.000
HIRANK2	−1.738	0.087	0.762	0.383

*Pooled variance T reported.
**Based on Kruskal-Wallis One-Way ANOVA.

and communication inside and outside of your group with variables regarding the actors attitudes about satisfaction with and perception of the effectiveness of roles, actions, and positions within the program. The methods section lists the specific questions for the additional variables, (POSTOUT, ACTOUT, COMMEFFCT, ROLESATF, INPUTDIR) shown below. The attitude variables used a five-scale ranking from strongly disagree to strongly agree.

A look at the entire network ($N = 75$) finds significant correlations between those who are perceived as influential and each of our satisfaction variables (Table 4). Those who are perceived as most influential feel they are consulted before positions and actions are taken outside their committee, that their committee is effective and, lastly, they are satisfied with their role in APES. One can also observe that for both measures of centrality and those who are actively communicating with others regarding APES feel their committee is effective.

An examination of these same relationships, when program participation using advisory and nonadvisory groups is controlled, reveals that the correlations of committee effectiveness with betweenness, communication activity and perceived influence are maintained for the nonadvisory program members while the significance of those correlations disappears completely for the citizen advisory committee members (see Table 5). For the policy and technical committee members, as well as staff, perceived committee effectiveness is positively related to both measures of centrality, communication activity, and perceived influence. For citizens, though, these same relationships are not significant. That is, among citizens, those who are perceived as influential and who are most active in APES communication activity do not feel they are consulted before positions or action are taken outside their committee, have no sense their committee is effective, and are less satisfied with their role in the program as compared to nonadvisory members.

Overall, a comparison between advisory and nonadvisory groups reveals a difference between the two groups with respect to the perceived effectiveness of committees and the extent to which an individual feels they have input into the direction of the program (see Table 6). Generally, the nonadvisory group members tend to have higher levels of satisfaction, independent of network positions.

Table 5.   Correlations of APES centrality with program satisfaction and effectiveness with 99 percent confidence intervals for exact *p*-values.

		INDEGREE	BETWEEN	HIRANK2	WHOSINFL
Program	POSTOUT	0.303 (0.02, 0.23)	−0.0256 (0.03, 0.42)	−0.0020 (0.03, 0.39)	0.2179 (0.01, 0.03)
	ACTOUT	0.1130 (0.02, 0.16)	0.0800 (0.03, 0.26)	0.0295 (0.03, 0.40)	0.2071 (0.012, 0.046)
	COMEFFCT	0.3427 (0.002, 0.003)	0.2482 (0.008, 0.022)	0.2815 (0.006, 0.01)	0.3077 (0.005, 0.007)
	ROLESATS	0.1464 (0.008, 0.115)	0.0933 (0.02, 0.22)	0.0781 (0.03, 0.29)	0.2083 (0.03, 0.25)
	INPUTDIR	0.1761 (0.059, 0.072)	0.126 (0.137, 0.155)	0.1086 (0.185, 0.206)	0.2193 (0.021, 0.029)
Nonadvisory	POSTOUT	0.1159 (0.026, 0.286)	−0.1195 (0.23, 0.28)	0.0858 (0.03, 0.33)	0.3396 (0.014, 0.062)
	ACTOUT	0.2184 (0.02, 0.153)	−0.0421 (0.03, 0.44)	0.1098 (0.03, 0.30)	0.4047 (0.008, 0.019)
	COMEFFCT	0.5199 (0.003, 0.004)	0.4871 (0.005, 0.007)	0.4440 (0.007, 0.015)	0.3446 (0.012, 0.049)
	ROLESATS	0.2236 (0.021, 0.149)	0.1267 (0.03, 0.28)	0.2203 (0.02, 0.17)	0.3203 (0.014, 0.065)
	INPUTDIR	0.2457 (0.111, 0.128)	0.2863 (0.068, 0.081)	0.2664 (0.09, 0.106)	0.164 (0.224, 0.246)
Advisory	POSTOUT	0.1262 (0.03, 0.402)	0.0243 (0.026, 0.300)	−0.1485 (0.03, 0.302)	−0.0951 (0.03, 0.405)
	ACTOUT	0.0136 (0.03, 0.472)	0.1543 (0.02, 0.143)	−0.0534 (0.03, 0.376)	−0.0306 (0.03, 0.422)
	COMEFFCT	0.1297 (0.03, 0.270)	0.1038 (0.03, 0.247)	0.0876 (0.03, 0.266)	0.0770 (0.03, 0.314)
	ROLESATS	0.0186 (0.03, 0.462)	0.0670 (0.03, 0.337)	0.831 (0.03, 0.302)	−0.0744 (0.03, 0.318)
	INPUTDIR	0.0276 (0.428, 0.454)	0.0983 (0.245, 0.267)	−0.0663 (0.312, 0.342)	−0.1241 (0.208, 0.229)

Table 6.   Comparison of dependent variables between advisory and nonadvisory groups.

Dependent variable	T^*	Sig.	Chi^{2**} approx. (1DF)	Sig.
ROLFSATF	2.201	0.031	3.24	0.072
COMEFFCT	2.280	0.017	4.661	0.031
INPUTDIR	4.098	0.000	11.656	0.001
POSTOUT	1.659	0.102	2.229	0.135
ACTOUT	0.394	0.695	0.33	0.565

*Pooled variance T reported.
**Based on Kruskal-Wallis One-Way ANOVA.

5.   Summary and Conclusions

For nonadvisory participants (who are mostly public agency personnel), there is no relationship between those who are most active in the communication network and those who are perceived as most influential, reflecting formal aspects of the program structure (i.e., the presence of high-level government officials). In fact, nonadvisory members generally talk only to other nonadvisory participants. This is exactly the opposite of what we found for advisory members (private citizens and interest group representatives). In this case, there is a relationship between being active in the flow of communications and being perceived as influential. It is just those advisory participants who are actively communicating and who control information, especially those who communicate outside their committee, that are perceived as influential.

One reason for the difference between the correlations for perceived influence and communication activity of advisory and nonadvisory participants may be that the measure of perceived influence is based on who controls resources, not expertise. This difference in communication activity may also be a result of the constraints imposed by the formal aspects of organizations versus informal ones. The public agency personnel may be more constrained regarding who they may communicate with concerning APES so that their dialogue is with other mid-level managers, administrators, and staff in their own or nearby divisions within Department of Natural Resources and Community Development (NRCD), rather than with the senior level NRCD administrators that are perceived as most influential. This difference in activity between high and mid-level managers and administrators in these committee settings is not unusual. Porter (1995), for example, describes differences in activities and involvement for different levels of administration in the Federal Inter-Agency Basin Committee charged with developing standardized methods for assessing costs and benefits in various federal projects. As he notes:

"That subcommittee's members were high level administrators from each of the four central agencies: the Corps of Engineers, Bureau of Reclamation, Department of Agriculture, and Federal Power Commission. 'Also present' were some staff people, who attended far more meetings than their superiors, and who did most of the work." (ibid: 183)

Additionally, this whole program, because of its citizens' participation, faces many of the same problems described by Selznick (1948) in his study of the grass roots programs of the TVA in the '30s and '40s. This basic philosophy of such programs is that success is contingent on the appropriate integration of citizens into the policy process in some fundamentally democratic way. But the differing goals, and associated realities, between citizens and "administrators" often limit any true democratic participation on the part of citizens. As Selznick notes:

"In effect, those responsible for organizing the system of committees or associations are under pressure to shape their actions according to exigencies of the moment, and those exigencies have to do primarily with the needs of administration. As the needs of administration become dominant, the tendency for democratic participation to be reduced to mere involvement may be expected to increase." (ibid: 226).

Further, in the course of making "administrative" decisions, rationality and need for technical expertise often excludes citizen input since they (the citizens) cannot be expected to know what "good" science is or what appropriate funding priorities should be. Of course, it is the technical committee members who "know" such things and they make the recommendations on such matters.

It is also possible to conclude that those individuals in the advisory group are less isolated within the full APES network than their counterparts in the nonadvisory group since they actively participate in more wide-ranging communications. Those nonadvisory members in structurally important positions who have high level bureaucratic roles do actively communicate with other APES members. Even though department heads may be communicating, they are only talking about APES with other public agency people, generally lower level administrators and staff and never directly to citizens.

This is important because it shows that although the CAC members that are using the formal structure felt that it was important to link communication between all four committees, it is primarily a one-way communication. The correlations in the advisory subsample between WHOSINFL, HIRANK2, and OTGRPTK5 show that the CAC members with dual appointments (the chairs and vice-chairs) are also those individuals most active in the communication flow. Without such appointments the CACs would be completely isolated, thus jeopardizing APES success. A lack of full citizen participation would threaten the legitimacy of the program; there would be no information flowing to the CACs for the citizens to disseminate to the public or the means by which to communicate public input to the other committee members—both of these items being formal charges to the CACs.

So what do we make of these differences between advisory and nonadvisory? With respect to the first proposition, we observed distinctly different relationships between our measures of structural centrality and perceived influence. Activity in the communication network for the nonadvisory group has less to do with attributed influence than with holding a high level position in a formal organization (e.g., Dept. of Natural Resources). Here the formal has an impact on the informal; influence is more a function of who you are (in the formal sense) than what you do (in the informal sense). For the advisory group, however, activity and control are everything. Although these private citizens have more than likely been chosen because of their political connections and standing in local communities, perceived influence is a combination of formal status in the program (co-chair) and activity (indegree) and control (betweenness) in the program, at least within their own groups.

With respect to the second proposition, the nonadvisory group partially met expectations, in terms of perceived effectiveness, while the advisory group did not meet expectations. Each group has a different stake in the success of the program. To the nonadvisory group members, committees and boards of the type observed in the APES program are seen as a regular part of career enhancement. Thus, program success often is related to career success. In addition, the organizations themselves see these kinds of exercises as important for maintaining visibility and legitimacy. Boje and Whetten (1981) see this process as an important strategy in organizational relations:

> "One way to increase network centrality is to create advisory councils or boards of directors on which elite members of other organizations are invited to serve. This strategy increases a social service organization's visibility and legitimacy with organizations that

provide clients and services. In addition, because of their stake in the success of the organization, board members may volunteer resources, information, and expertise" (ibid: 383).

For many in the advisory group, on the other hand, serving on the committee has little to do with career enhancement. The success or failure of the program will have little impact on their lives outside of a possible personal concern for the environment or concern for how tax dollars are being spent. Thus one's stake in the program outcome can partly explain why we observed satisfaction and perceived effectiveness among the nonadvisory as opposed to the advisory.

However, this is only a part of the story. As we saw in the analysis, nonadvisory members rarely if ever claim to communicate with advisory members. The communication can be characterized as one way or nonreciprocal, moving from the advisory to the nonadvisory. Although this sounds reasonable on the surface, particularly in light of the committees designation as "advisory," it presents a situation where these committees can be left out of the decision—making loop almost entirely. Thus, those members most active in the network among the advisory group may be those most likely to be dissatisfied or frustrated because of perceptions on their part of having little or no control over the process. In reality, the organizational structure shown in figure 1 should have only a one-way link between the citizen advisory committees and the policy and technical committees moving from the citizens to the other committees. This finding supports previous work pointing to the sometimes vulnerable and dependent positions of central actors (Boje and Whetten, 1981; Kilduff and Krackhardt, 1993).

In conclusion, being central in a network of actors does not always lead to higher role satisfaction or higher perceived effectiveness. In more complex organizational settings task environments and actor heterogeneity (e.g., bureaucrats vs. citizens) appear to have an impact on global network structure and, hence, on attributed influence and potential role satisfaction. Being a leader in an isolated and less powerful segment of the network structure may lead to lower perceived control and, hence, a lack of role satisfaction. Centrality at the margins may not always be a satisfying experience.

Note

1. This move was seen by many program participants as a politically motivated maneuver to entrench the Republican political party before the next election.

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