Productivity and Performance in Academic Networks: Applications of Liaison Communication to Simmelian Ties, Structural Holes, and Degree Centrality

Devan Rosen
Department of Speech, University of Hawaii

In 1968, Donald Schwartz completed what is now seen as the first network analysis performed in the field of communication (Rogers, 1994). The results found in this paper confirm the significance of Schwartz' (1968) original research and extend his research to findings associated with the performance and productivity of academic researchers. The ability to retest the data collected by Schwarz in 1968 is a testament to his methods and processes, while new processes, such as a unique measure of Simmelian ties, were developed and utilized in this study. The similarity of the perceived and demographic data across three dimensions, Simmelian tie, structural holes, and degree centrality, not only support the original research but also provide insights into the effects of structure and position on performance and perception of academic networks. Findings related to categorical demographic data, rank and gender, offer a view into the nature of academic organizational networks and help tell their story. Structural holes (constraints) were found to decrease as tenure increased in an educational context, contrary to Burt's (1992b) findings and in support of Susskind et al.'s (1998) findings. This finding is explained as a combination of the level of seniority of the respondents and general organizational structure. The current research highlights the ability of network analysis to reveal organizational structure via communication linkages.

Authors*: Devan Rosen, Ph.D. (Cornell University, 2007) is an Assistant Professor at the University of Hawaii at Manoa. He has published on topics including decentralized social networks, self-organizing systems, flock theory, and computer-mediated communication. He has also developed network analytic methods for the structural and content analysis of online communities and virtual worlds.*

Acknowledgments: *An earlier version of this manuscript was presented to the 2001 International Communication Association Conference, Washington, D.C. The author would like to thank Dean Krikorian for editorial comments on earlier drafts, Mirit Shoham and Dean Krikorian for data coding, Sung-Choon Kang and Hichang Cho for statistical help, and Donald Schwartz for his pioneering research, and for sharing his original data set.*

Correspondence: *Contact Devan Rosen, Department of Speech, University of Hawaii, George 326, 2560 Campus Rd, Honolulu, HI 96822, rosend@hawaii.edu, 808-956-8911.*

INTRODUCTION

Schwartz' study, "Liaison Communication Roles in Formal Organizations" (Schwartz, 1968), has become a classic in the field of organizational communication. His research, then a doctoral dissertation, is now seen as the first communication network analysis performed in the field of communication (Rogers, 1994). Schwartz based his study largely on the work of Jacobson and Seashore (1951) and Weiss and Jacobson (1955), which postulated that interpersonal and group work-related communication patterns could help conceptualize and describe the structure of an organization. Seven years later, Schwartz revisited these notions in a study that reported on the liaison role in complex organizations and how they represented an elaboration of the descriptive analysis of complex organizations (Schwartz & Jacobson, 1975).

The current research revisits and reanalyzes Schwartz' original data using more recent theories and methodologies, and also extends the original research with contemporary concepts and methods. The first section describes the social network approach and the three network theoretic approaches used; Simmelian ties, structural holes, and degree centrality. Following a brief description of the main research question and the relevant sources of data, Simmelian ties (Krackhardt, 1996), structural holes (constraints) (Burt, 1992a), and degree centrality (Freeman, 1979) are operationalized in the context of the current study. Finally, results are presented, followed by discussion, theoretical and practical applications, and conclusions.

Social Networks

Social network perspectives focus on the structure of social systems and how the elements of a social system come together. Individual characteristics are only part of the story; people influence each other, and ideas and materials flow throughout the network. From the network perspective, the social environment can be expressed as patterns or regularities in relationships among interacting units. These patterns are often called structure. The current section elaborates some of the network concepts and terminology used in the subsequent methods of analysis.

The form of network that will be utilized is a communication network, defined as the patterns of contact that are created by the flow of messages among communicators through time and space (see Monge & Contractor, 2003; Rogers & Kinkaid, 1981). Communication network analysis identifies the communication structure, or communication flow. Relation ties (linkages) between actors are channels for either the transfer (flow) of material or nonmaterial resources, or for an association between actors, such as friendship ties. The ties that exist between the nodes can vary along several elements, including direction, reciprocity, and strength.

Links between actors can be measured as either directional or non-directional. Links that are directional indicate the movement from one point to another, such as the number of phone calls one person makes to another, or the degree of liking one person has for another. Additionally, these links can also be symmetrical or asymmetrical. If the link is directional but without the same value of relation the link is asymmetrical and lacks reciprocity. Non-directional links simply indicate an association of two actors in a shared partnership, such as two students being part of the same class. Several measures of how connected individual nodes are, as well as how connected the entire network is, are discussed below.

Simmelian Ties

The notion of Simmelian ties largely stems form the work of David Krackhardt (see Krackhardt 1992, 1996), as a combination of Granovetter's (1982) notions of strong ties and Simmel's (1950) contributions concerning triads as the fundamental unit of analysis. Strong ties within a network provide a greater motivation to assist and are typically more available than weak ties (Granovetter, 1982). Strong ties can be comprised of four main elements (Granovetter 1973):

1) Amount of time interacting
2) Emotional intensity during the interaction
3) Extent of mutual confiding in the relationship
4) The degree of reciprocal services enacted

Similarly, Simmel focused on the relationships that form between actors as being integral to the understanding of behavior. Simmel (1950) visited the notion that social triads are fundamentally different from dyads and should be studied accordingly. Simmel's model visited three main ways that triads could be distinguished from dyads in the way that the participants interact.

First, triads preserve a smaller amount of individuality that dyads. In a group of three or more a majority can be derived and an individual can thus be outvoted, resulting in the likely suppression of individual interests; that regardless of an individuals strength of preference, majority still wins.

Second, actors have less bargaining power in a triad that a dyad. A dyadic group can be destroyed if the demands of an individual are not accommodated, whereas in a triad the demanding actor can leave and thus has the most to lose; departing individuals would be isolating themselves while the group still remains intact. The remaining members are still able to make decisions without the defector, albeit no longer able to take advantage of the social benefits of the triadic structure.

Third, triads are more able to deal with conflict than dyads. The presence of the third party allows for hardened positions to be moderated and reformulated. This action is not necessarily intentional, the simple presence of the third party can alleviate tensions. Simmel (1950) states, "The appearance of the third party indicates transition, conciliation, and abandonment of absolute contrast. Such mediations need not occur in words: a gesture, a way of listening, the quality of feeling which proceeds from a person, suffice to give this dissent between two others a direction toward consensus."

Krackhardt (1996) derives a consequence of Simmel's approach, "One would expect that individuals who are part of a three person (or more) informal group are less free, less independent, and more constrained than a person who is only part of a strong dyadic relationship." Based largely on the work of Simmel, Krackhardt (1996) defines a Simmelian tie thusly, "two people are 'Simmelian Tied' to one another if they are reciprocally and strongly tied to each other and if they are each reciprocally and strongly tied to at least one third party in common." He goes on to point out that Simmelian ties are best thought of as "super strong" ties that add durability and power above that found in strong dyads, thus making Simmelian ties longer lasting.

Applying a Simmelian tie to the Schwartz dataset allows for a level of analysis utilizing the richness of strong tie information. Ties can be modeled as Simmelian and indicative of the strength of triadic relationships.

Structural Holes

Structural holes have been studied widely but are primarily based on the work of Ronald Burt (1992a, 1992b). Burt (1992a) states that, "a structural hole is a relationship of non-redundancy between two contacts. The hole is a buffer, like an insulator in an electric circuit. As a result of the hole between them, the two contacts provide network benefits that are in some degree additive rather that overlapping." He also highlights that these holes can have different effects for individuals with different attributes as well as for organizations of different kinds.

Burt (1992b) performed a longitudinal study looking at the rate of promotions for managers in a large diversified company. He found that managers in conditions of higher structural holes were promoted more quickly, suggesting that structural holes lead to increased recourses and network influence. It was also noted that structural holes might not be equally advantageous for all (such as women or the elderly). Burt's (1992a, 1992b) research focused

on social networks in business organizations, which may represent different social and structural phenomena than an academic organization.

In looking at organizational down-sizing, Susskind, Miller, and Johnson (1998) summarize structural holes as existing when two members not directly connected to each other lack a common network contact. Likewise, structural holes make a network more constrained or sparse as individuals have less opportunity to access novel information and resources. Structural holes can also lead to inequality between network members and power opportunities.

Constraint, as presented by Susskind et al. (1998), represents the distribution of relationships across a member's network or the extent to which an actor's network is dependant on a limited number of network members. "Constraint is positively related to the formation of structural holes, as high constraint indicates more structural holes for an employee." (Susskind et al, 1998). The measure used to indicate structural holes in the current study is the Constraint measure. Constraint is the most applicable structural hole indicator for the Schwartz dataset because of the nature of the academic organizational context; educational ties are generally distributed to limited actors within the overall network. For example, departmental units in an educational context would tend to cluster around functional linkages (Shoham, Lee, & Jones, 2001). By its very nature, pockets of clusters would seemingly reflect intra-departmental communication within departmental cliques (Stefanone, Moyersoen, & Krikorian, 2001). Constraint, as dependency among actors, can be viewed as a negative characteristic in oligarchical, or diffused organizational structures.

Degree Centrality

The degree measure of centrality is calculated by counting the number of adjacent links to or from an actor in a network (Brass & Burkhardt, 1992). Freeman (1979) conceptualized this measure as an indicator of individual activity, yet it does not capture system-wide properties of the network. It does, however, represent the number of alternatives available to an individual in the network. This in turn makes it a viable centrality to use in conjuncture with structural holes.

Degree centrality may also be appropriate for capturing those power-enhancing behaviors that happen via direct interaction, such as integration and reciprocation. Degree centrality can also indicate other direct interactions such as coalitions or the avoidance of relying on mediating actors for indirect access to resources (Brass & Burkhardt, 1992).

While a relatively straightforward measure, degree centrality provides insight into individual contributions to the interconnectedness of the overall network (Rogers & Kincaid, 1981). In the Schwartz dataset degree centrality can be used in comparison with structural holes and Simmelian tie measures. In this manner, the goal of the current research is not only to apply contemporary measures of network analysis, but also to contrast the results of these three different measures.

The research question addressed in this paper is: To what extent are Simmelian ties, structural holes, degree centrality, and individual characteristics reflected in the Schwartz dataset as related to productivity and performance?

METHODS

Data

The data used in this study was obtained from Donald Schwartz with permission for use. Schwartz initially used the data in 1968, and then revisited these notions in a study that reported on the liaison role in complex organizations and how they represented an elaboration of the descriptive analysis of complex organizations (Schwartz & Jacobson, 1977). The data provides for a multi-level evaluation of the productivity and effectiveness of professors and researchers in a research-based environment. Particularly relevant to the current analysis are demographic questions, liaison actor

identification, and perceived characteristics of liaison ties.

The population from which samples were drawn consists of the professional faculty and staff of a single college, situated in a single building on a university campus, with a sample size of 142. The questionnaires incorporated a contact checklist for network data, perceived characteristics of the personal contacts, and demographic data such as the number of publications and academic rank.

The data from the Schwartz study is of particular interest because it was collected specifically to investigate the relationship of network structure, communication, and performance. Whereas the initial study was specifically looking at liaison roles, which act as "gatekeepers" between otherwise unconnected parts of the network, the data that was collected lends itself extremely well to investigating structural holes, degree centrality, research performance, productivity (publications), and organizational performance (academic rank).

The methods described below explicate the techniques used to reconfigure the Schwartz matrix into Simmelian ties, structural holes, and degree centrality.

Simmelian Ties

The method to build a Simmelian tie matrix is a five-step process:

Step1: Symmetrize the original strength tie matrix with average values of tie strength with two actors (e.g., if actor 1 → 2 & tie strength = 3; actor 2 → 1 & tie strength = 5, the symmetrized strength of the tie between actors 1 and 2 is (3+5)/2 = 4).

Step2: Construct a strong tie matrix by dichotomizing the ties into strong and weak ties

Step3: Perform a clique analysis to identify a co-clique member; with Ucinet 5, Tool: Clique overlap; (see Borgatti, Everett, & Freeman, 1998).

Step4: Dichotomize the ties if A and B have a same clique membership; if members of the same clique, then Simmelian tie value = 1, else = 0.

Step5: In above co-clique matrix, diagonal elements reflect the total number of individual membership cliques; diagonal elements are the sum of Simmelian ties of each actor.

The process used to generate the Simmelian tie matrix is unique to the methodology described herein. Further, the process can be converted into a working algorithm (i.e., allowing for automatic calculations), and relies upon tie-strength data.

Liaison Data

For the liaison data the difference between liaison and non-liaison actors is derived in terms of ties measured from the demographic questionnaire in Schwartz (1968). See Appendix A for details of items from the original survey. A value of one is assigned as liaison (n=22), values of two, three, and four are assigned as non-liaison (n=95), and values of five are isolates.

Structural Holes

The constraint measure in Ucinet V (Borgatti, Everett, & Freeman, 1998) was used to identify structural holes. As noted earlier, this particular measure seems best suited to the context of academic departments within a collocated geographical building.

Degree Centrality

Measures of degree centrality were likewise derived from Ucinet V (Borgatti, Everett, & Freeman, 1998). The centralities were then normalized by dividing the simple degree (or number of links) of an actor by the maximum degree possible, n*(n-1) and dividing this by 2 (bi-directionally) (see Wasserman & Faust, 1994).

The results of these various tests are then run through SPSS to produce correlation and MANOVA to indicate the relationships of Simmelian ties, structural holes, and degree centrality with demographic variables, liaison tests and perceptual variables in the original dataset.

RESULTS

Demographic Data

The results of the demographic tests can be found in Table 1, and revealed a Pearson Correlation of 0.464 ($p<0.01$) between the normalized degree centrality and Simmelian ties and a -0.687 ($p<0.01$) correlation between constraints (structural holes) and normalized degree centrality A non-significant correlation of –0.170 is revealed between constraint and Simmelian ties.

The specific demographic questions have generally low or insignificant correlation to the three variables tested, with the exception of committee work and degree centrality. There is a general trend of negative correlations with constraints and positive correlations with centrality.

Categorical Demographic Data

The two categorical questions tested accordingly are academic rank and gender (see Table 1 and 2). As academic rank increased, centrality also increased ($F= 4.096$, $p<0.001$), and structural holes decreased ($F= 5.584$, $p<0.001$). For gender, males had 38% lower structural hole scores than women ($F= 13.548$, $p<0.001$) and were 33% more central than women ($F= 4.987$, $p<0.001$).

Table 1. Demographic Variables

	Simmelian Ties	**Normalized Degree Centrality**	**Constraints**
Simmelian Ties	1.000	.464**	-.170
Normalized Degree Centrality	.464**	1.000	-.687**
Constraints	-.170	-.687**	1.000
Age	-.015	.107	-.278**
Rank	-.066	-.244**	.182*
Research	-.147	-.264**	.183*
Consulting	.002	.052	-.054
Committee Work	.108	.252**	-.175*
Admin. Duties	.105	.367**	-.275**
Year First at University	.104	.125	-.173*
Dept. Level Committees	.272**	.231**	-.152
College Level Committees	.097	.508**	-.270**
University Level Committees	.171	.542**	-.346**
Total # Committees	.232**	.462**	-.301**
Committees Meetings/Month	.286**	.383**	-.213*
# of Articles	.044	.123	-.213*
# of Books	.005	.109	-.173
Hours/Week Work	-.191*	-.223**	.247**

*Note: * =p≤.05, ** = p≤.01*

Table 2. Categorical Demographic Results, Rank

	Simmelian Ties	Normalized Degree Centrality	Constraints
Lecturer (n=2)	2.00	10.85	.53
Instructor (n=17)	1.00	13.82	.42
Assistant Professor (n=29)	1.12	19.99	.36
Associate Professor (n=29)	1.04	23.84	.24
Professor (n=49)	1.80	29.38	.22
	F=1.056	F=4.096***	F=5.584***

*Note: * =p≤.05, ** = p≤.01, ***= p≤.001*

Table 3. Categorical Demographic Results, Gender

	Simmelian Ties	Normalized Degree Centrality	Constraints
Male (n=112)	1.23	24.47	.23
Female (n=17)	1.76	16.55	.43
	F=1.132	F=4.987*	F=13.548***

*Note: * =p≤.05, ** = p≤.01, ***= p≤.001*

Table 4. Liaison Test

	Simmelian Ties	Normalized Degree Centrality	Constraints
Non-Liaison (n=95)	1.11	20.82	.32
Liaison (n=22)	3.14	39.71	.17
	F= 29.68***	F= 45.51***	F=14.68***

*Note: * =p≤.05, ** = p≤.01, ***= p≤.001*

Table 5. Perceived Characteristics of Liaison and Non-Liaison Actors

	Structural Diversity	Number of Contacts	First Source of Information	Importance of Secondary Contact	Perceived Power	Dyadic Opinion Leader
Non-Liaison (n=159)	11.64	8.92	7.18	14.55	23.72	20.53
Liaison (n=22)	12.82	11.55	9.45	18.60	28.08	22.48
	F=14.41 ***	F=35.17 ***	F=28.34 ***	F=54.88 ***	F=22.14 ***	F=5.39 *

*Note: * =p≤.05, ** = p≤.01, ***= p≤.001*

Liaison Tests

Liaisons have more Simmelian Ties (F= 29.68, p<0.001) and higher Degree Centrality (F= 45.51, p<0.001) than non-liaison actors, and less constraint and lower structural hole scores (F=14.68 p<0.001).

Perceived Characteristics of Liaison Ties

Tests of the perceived characteristics of liaison and non-liaison actors revealed that liaison actors have greater structural diversity (F=14.41, p<0.001), larger numbers of contacts (F=35.17, p<0.001), are more likely to be the first source of information (F=28.34, p<0.001), greater importance of secondary contact (F=54.88, p<0.001), and higher perceived power than non-liaison actors (F=22.14, p<0.001).

Results from the tests of perceived characteristics of liaison ties, as based on the personal contact questionnaire, show that Simmelian ties have a correlation of 0.476 (p<0.01) with normalized degree centrality, and –0.212 (p<0.01) with constraints. Normalized degree centrality has a correlation of -0.763 with constraints (p<0.01).

Table 6. Network Measure Correlations from Perceived Characteristics

	Simmelian Ties	Normalized Degree Centrality	Constraints
Simmelian Ties	1.00 (n=223)		
Norm. Degree Centrality	.476**	1.00 (n=223)	
Constraints	-.212**	-.736**	1.00 (n=223)

*Note: * =p≤.05, ** = p≤.01*

DISCUSSION

In general, the findings in this paper support the original research with some notable extensions to the original findings. Concerning the results of the demographic data, it can be inferred that since constraint and Simmelian ties are not significantly correlated, degree centrality can be seen as a predictor variable. Degree centrality, having a positive correlation of 0.464 with Simmelian ties and a negative correlation of –0.687 with constraint, sets centrality as a good predictor of both. This finding alludes to the notion that as an actor is more central in a network, the more likely they are to have really strong ties with other actors, as well as fewer structural holes around them. In an academic organization this is an intuitive finding. The more prominent faculty members and central administrators will be likely to have fewer roles not filled around them, including committee work, which is reflected in the data (See Schwartz & Jacobson, 1975). It is also important to note that the measures of productivity (the number of articles and books published) have insignificant correlations accept for number of articles and constraints with a correlation of –0.213 ($p<0.05$). While this correlation is narrowly significant, one cannot help but pose a refinement to the old adage by saying that in academe one must "publish or become a structural hole."

The generally low correlation of the non-categorical demographic variables with the Simmelian tie matrix shows that strongly associated cliques do not necessarily affect their performance and do not relate to their tenure. However, the generally positive correlations of the demographic areas with normalized degree centrality show that as an actor is more central they will sit on more committees more frequently and have more administrative duties. While the greater the amount of structural holes an actor experiences the fewer committees they will sit on and the less administrative duties they will have. This result provides more evidence of the nature of constraints as indicative of disproportionate power relations. Similar to Susskind et al's (1998) findings, structural holes in this study can lead to the "down side" of power relations; that structural holes can be used to indicate disadvantaged or advantaged individuals. The similarity between the current research and Susskind et al.'s (1998) findings regarding the down side of power relations could be that both studies examined the structural holes of employees at mostly lower levels of the organization. However, Burt (1992b) examined the structural holes of managers. Given a one-up one-down relationship (Rogers & Millar, 1979; Watzlawick, Bavelas, & Jackson, 1967) structural holes can be indicators of one-up and one-down power relations in organizations.

Analyses of the categorical demographic data showed that academic rank is positively related to degree centrality ($F= 4.096$, $p<0.001$) and negatively related to constraint ($F=5.584$, $p<0.001$). The constraint values went from a mean of 0.53 for a lecturer down to a 0.22 for a professor. While lecturers had a mean centrality of 10.85 going up to a 29.38 for professors, again with increasing through instructor (13.81), assistant professor (19.99), and associate professor (23.84). This finding provides further evidence of structural holes (constraint) as negative indicators of advancement in the context of this study.

Gender was significantly correlated with constraint ($F=13.55$, $p<0.001$) and degree centrality ($F= 4.987$, $p<0.05$). There are 112 males in the sample and only 17 females, which strengthens the constraint findings as a result of the high significance. The finding that males are more central and have fewer constraints leads to a conclusion that there is indeed a disparity in the way females acted in this network as opposed to the males. However, the disparity between the two categories was not as large concerning constraints as it was concerning centrality. Thus although the males were far more central, they only experienced 33% less structural holes.

The current study found the opposite relation of promotion and structural holes than Burt (1992b), as individuals increased in tenure their structural holes decreased. Burt (1992b) also indicates that structural holes can be disadvantageous for women and the elderly--this

study adds full professors to the list by indicating a negative relationship between career advancement and structural holes.

The results of the liaison tests echo Schwartz' (1968) results. Non-liaison actors were found to have fewer Simmelian ties ($F= 29.67$, $p<0.001$) and thus fewer "super" strong ties and lower degree centrality ($F= 45.51$, $p<0.001$), as well as more structural holes ($F= 14.68$, $p<0.001$) than liaison actors. Liaison actors thus play a more central role, have stronger ties, and have fewer constraints than non-liaison actors.

Incorporating perceived aspects of the data in liaison tests also replicates previous findings. Liaison actors have greater structural diversity, which supports the finding in the previous liaison test. Liaisons are also more likely to be the first source of information, have a greater importance of secondary contact, and have a higher perceived power.

The results from the tests of the perceived characteristics of liaison actors from the personal contact questionnaire show a very similar correlation to the results of the aforementioned demographic tests (see table 5). The demographic correlation of Simmelian tie to degree centrality is 0.464 ($p<0.01$), while the liaison correlation is 0.476 ($p<0.01$). Likewise, the demographic correlation of constraints to degree centrality is -0.687 ($p<0.01$), while the liaison correlation is –0.763 ($p<0.01$). These similarities further support the original research and call for further investigation into the similarity of these findings. These findings point to the accuracy of Schwartz' (1968) data by linking perceived characteristics with demographic information—as related to network variables.

Implications and Applications

Theoretical implications of this research examine the relationship between degree centrality, constraints, and Simmelian ties. The mediating role of degree centrality has interesting applications. For example, one who communicates as a hub, with many indegrees and outdegrees, would seemingly be able to perform more liaison functions because they already have the most number of ties. The relation between constraint and Simmelian ties is mediated by the number of ties. Also, differences in constraints for women in this study echoes findings from Ibarra (1997) who found structural differences between women and men regarding network homophily and contact range. Ibarra's research (1992, 1993), along with other studies that have measured structural differences between the genders (Brass, 1985, Burt, 1992b), have focused on traditional organizations for analysis. As such, further research into similar network measures (e.g. structural holes, homophily) in academic or research organizations may produce interesting differences.

The current research introduced a new approach to the development of Simmelian ties measures and how they may be implemented. The five-step process can be used as a type of measure for Simmelian ties. It would be interesting to know how such Simmelian ties operate in other organizational conditions. This measure can be used as an indicator of cluster strength and could potentially be used to detect covert operations (e.g., cabals) at early stages. As another example, the growth of an online community can be seen as clusters of activity around message topics or threads (See Krikorian & Kiyomiya, 2001). In this manner, the strength of message ties can be based on frequency and duration of message threads.

Schwartz (1968) found that more linkages were evident in higher positions in the network. This study echoed this finding in a different manner: the higher the position, the less structural holes. This finding was perhaps most interesting as it opposed Burt's (1992b) finding of more structural holes for advancing managers. Arguments supported both the organizational level (e.g., seniority) and the structure of the organization (e.g., oligarchy) as potential explanations for the appositional relations between tenure and structural holes. Practically, one should pay attention to the inherent structure of an organization before analyzing network ties. Also, the height and width of the organizational structure can affect whether structural holes or

Simmelian ties are more favorable in advancement processes.

It is interesting to see the similarity of demographic and attitudinal data. More research is called for in this comparison. If there is a mediating effect of networks between demographic and attitudinal variables, then this could have implications in the use of network data by providing insight into the mechanisms of interpersonal and group communication networks.

CONCLUSIONS

The results found in this paper confirm the significance of Schwartz' (1968) original research and also highlight the methodological foundations for supporting his original results. The ability to retest the data collected by Schwarz in 1968 is a testament to his methods and processes, while new processes, such as a unique measure of Simmelian ties were developed and used in this study. The similarity of the perceived and demographic data across three dimensions; Simmelian tie, structural holes, and degree centrality, not only support the original research but also provide unique insight into the data by extending these findings to include new measures and methods of analysis, as well as new theoretical implications. Likewise, the findings of the categorical demographic data, rank and gender, offer a view into the nature of organizational networks and help tell their story. Structural holes (constraints) were found to decrease as tenure increased in an educational context, contrary to Burt's (1992b) findings and in support of Susskind et al.'s (1998) findings. This finding is explained as a combination of the level of seniority of the respondents and general organizational structure. The current research highlights the power of network analysis to reveal organizational structure via communication linkages. It is hoped that this paper has helped open a window into the organization of organizations, and how this organization affects all of the actors within.

REFERENCES

Borgatti S., Everett M., & Freeman L. (1998). *Ucinet 5 For Windows*. Harvard, MA: Analytic Technologies.

Brass, D. (1985). Men's and women's networks: A study of interaction pattern's and influence in an organization. *Acadamy of Management Journal, 28*, 327-343.

Brass, D. J., & Burkhardt, M. E. (1992). Centrality and power in organizations. In N. Nohria & R. G. Eccles (Eds.), *Networks and organizations: Structure, form, and action* (pp. 191-215). Boston: Harvard Business School Press.

Burt, R. S. (1992a). The social structure of competition. In N. Nohria & R. G. Eccles (Eds.) *Networks and organizations: Structure, form, and action* (pp. 57-91). Boston: Harvard Business School Press.

Burt , R. S. (1992b). *Structural holes, the social structure of competition*. Cambridge, MA: Harvard University Press.

Freeman, L. C. (1979). Centrality in social networks: Conceptual clarification.*Social Networks, 2*, 215 – 239.

Granovetter, M. S. (1973). The strength of weak ties. *American Journal ofSociology, 78*, 1360-1380.

Granovetter, M. S. (1982). The strength of weak ties: A network theory revisited.In P. V. Marsden & N. Lin (Eds.), *Social structure and networks analysis* (pp. 105-130). Beverly Hills, CA: Sage.

Ibarra, H. (1992). Homophily and differential returns: Sex differences in network structure and access in an advertising firm. *Administrative Science Quarterly, 37*, 422-447.

Ibarra, H. (1993). Personal networks of women and monorities in management: A conceptual framework. *Academy of Management Review, 18*(1), 56-87.

Ibarra, H. (1997). Paving an alternate route: Gender differences in network strategies for career development. *Social Psychology Quarterly, 60*(1), 91-102.

Jacobson, E., & Seashore, S.E. (1951). Communication practices in complex organizations. *Journal of Social Issues, 7*, 28-40.

Krackhardt, D. (1992). The strength of strong ties: The importance of philos in organizations. In N. Nohria & R. G. Eccles (Eds.), *Networks and Organizations: Structure, form, and action* (pp. 216-239). Boston: Harvard Business School Press.

Krackhardt, D. (1996). *Groups, Roles, and Simmelian Ties in Organizations*. Working Paper Series: Heinz III School of Public Policy and Management. Pittsburgh, PA: Carnegie Mellon University.

Krikorian, D. H., & Kiyomiya, T. (2001). Bonafide groups as self-organizing systems: Applications to elecrtronic newgroups. In L. Frey (Ed.), *Groups in context: Bona fide groups*. New York: Houghton-Mifflin.

Monge, P. R. & Contractor, N. (2003). *Theories of communication networks*. New York: Oxford University Press.Rogers, E. M. (1994*). A history of communication study: A biographical approach.* New

York: Free Press.

Rogers, E. M., & Kincaid, L. D. (1981) *Communication networks: Toward a new paradigm for research*. New York: Free Press.

Rogers, L. E., & Millar, F. E. (1979). Domineeringness and dominance: A transactional view. *Human Communication Research, 5*, 238-246.

Schwartz, D.F. (1968). *Liaison communication roles in a formal organization* (Doctoral Dissertation, Michigan State University, 1968). University Microfilms No. 69-11, 162.

Schwartz, D. F., & Jacobson, E. (1977) Organizational communication network analysis: The liaison communication role. *Organizational Behavior, 18*, pp.158-74.

Simmel, G. (1950). Individual and Society, In Wolf, K.H. (Ed.), *The Sociology of Georg Simmel*. New York: Free Press.

Shoham, M., Lee, J., & Jones M. (2001). The microanalysis of liaison communication. Paper presented to the 2001 *International Communication Association Conference*, Washington, D.C.

Stefanone, M.A., Moyersoen, J., & Krikorian, D. (2001). The microanalysis of liaison communication. Paper presented to the 2001 *International Communication Association Conference*, Washington, D.C.

Susskind, A.M., Miller, V.D., and Johnson, J.D. (1998). Downsizing and Structural Holes. *Communication Research, 25*, 1, 30-65.

Weiss, R. S., & Jacobson, E. (1955). A method for the analysis of the structure of complex organizations. *American Sociological Review. 20*, 661-668.

Watzlawick, P., Bavelas, J. B., & Jackson D. D. (1967). *Pragmatics of human communication: A study of interactional patterns, pathologies, and paradoxes*. NY: W. W. Norton.

Wasserman, S., & Faust, K. (1994). *Social Network Analysis: Methods And Applications*. New York: Cambridge University Press.

Appendix A – Survey Items from Schwartz (1968)

Academic Rank
What is your academic rank?
1. Instructor, 2. Assistant Professor, 3. Associate Professor, 4. Professor
5. Other (Please specify)_____

Committee Service
How many faculty or administrative committees do you belong to including both standing and ad hoc committees?
___1. Departmental (or Institute) level committees
___2. College level committees
___3. University level committees

Publications
How many professional journal articles have you published (or had accepted for publication) and how many papers have you presented at professional meetings since 1965? ____ (combined total)

Personal contact checklist
Now go back over the past two or three months and think of the professional people in the College of (--) with whom you worked most closely. We would like to have you list below the names of the people in the college with whom you work most closely. By "work with most closely" we mean the professional people with whom you usually have at least one contact per week on matter related to programs or activities of the College, or in teaching, research, or consulting in which you or the other person is engaged. You need to only list people who are officed in (---) Hall. By "professional people" we mean faculty with academic rank of instructor or higher and/or administrators.

For each of the individuals you list below, check how frequently in an "average" week you have contact with (talk to in person or on the phone, write) each of them. Name as many or as few people as accurately describe your usual contacts

(A) List the name of each person in the College with whom you work most closely.
(B) For each person listed, check the appropriate frequency column.

Name_____
Frequency of contact:
1) Several times daily __
2) About once per day __
3) 2 or 3 times per week __
4) About once per week __