The contingent effect of work roles on brokerage in professional organizations

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Abstract

In this paper, we consider whether brokerage in an intra-organizational communication network and type of work role interact to predict individual performance in a professional organization. The independent–interdependent nature of work roles is considered a key factor in structural contingency theory, but is yet to be studied in relation to brokerage. We propose that a brokerage position has a joint effect on performance along with work role in a study of organization-wide communication network in an architectural firm with 65 employees. Our analysis suggests an association between brokerage and role-prescribed performance for individuals in both interdependent and independent types of work roles. Our findings also suggest that interdependent roles requiring broad, organization-wide collaboration, and communication with others, brokerage is positively associated with the performance prescribed by the role, but for independent roles, wherein collaboration and communication are somewhat limited by the formal role, brokerage has far less of an effect. Our findings contribute to brokerage theory by comparing how brokerage affects performance in two distinct work roles by illustrating how the benefits of brokerage seem more restricted to those in interdependent work roles. The contribution of this paper is to suggest the independent–interdependent nature of work role as a boundary condition for brokerage.

Keywords

Network theory, Brokerage, Formal organization, Informal organization, Work role, Interdependency

Brokerage theory is probably one of the most influential lines of thought in network theory. Since Burt's (1992) seminal book, brokerage has been studied and associated with numerous organizational advantages for an individual, such as higher salary and faster promotion, based on the benefits of having better access to information and greater control over other actors than their more socially constrained colleagues (Burt, 2004). While brokerage generally provides benefits, some studies have found that under context-specific conditions, there may not always be positive effects (e.g. Barnes et al., 2016; Burt, 1998; Fleming et al., 2007). Therefore, as the empirical

results are mixed, the contingencies and boundary conditions for brokerage merit further research.

An important, but generally overlooked boundary condition in structural network analysis is the independent–interdependent nature of work roles, even though interdependency has been widely used as a moderator in general management studies and is at the core of structural contingency theory (Thompson, 1967). Interdependence regulates how much individuals can communicate and collaborate with others to perform their work effectively (Cummings, 1978; Wang et al., 2019), and is one of the most important factors influencing team performance in organizations (Langfred, 2005;

Saavedra et al., 1993). In structural contingency theory, numerous dimensions of interdependence, such as pooled, sequential, or reciprocal types, have been distinguished based on exchange of information or resources (Thompson, 1967).

This empirical study considered how the benefits of brokerage are contingent on the independent–interdependent nature of the work role. That is, how the informal organization, operationalized as the intra-organizational communication network structure, corresponds with the formal work role for performance. The novelty and value in this approach is that when the formal and informal organizations have been linked to performance outcomes as such, their effects on each other have not been linked so often in the literature (McEvily et al., 2014). Following the structural contingency theory logic to test the formal work role's effect as a boundary condition for brokerage, our paper explores whether work role moderates brokerage effect on performance in professional organizations.

Drawing from the nature of work at our case architectural firm, our hypothesis is developed on the starting point that work in a professional organization is generally anchored on either independent or interdependent tasks and work roles are formed accordingly. Both independent and interdependent roles prompt role-prescribed performance expectations due to the division of labor: professionals typically work in intellectually demanding projects, requiring them to focus their energy on the highly demanding operative work, simultaneously creating demand for interdependent roles to manage the projects and the supporting organizations (cf. Etzioni, 1964; Weber, 1982). Thus, the formal work role not only limits interdependence for the professionals, but also assumes managers to adopt the interdependent role to communicate and collaborate broadly across the organization. In this paper, we hypothesize that when brokerage and role-prescribed performance are aligned, individuals perform best.

Our data are derived from a communication network study of an architectural firm of 93 employees, of which 65 were classified as working mainly in either independent ($n = 31$) or interdependent ($n = 34$) roles. We chose to study this specific architectural firm as a typical professional organization because the firm had clearly distinguished work roles for the independent professional architects and interdependent managers[1]. In our analysis, we

examined the moderating effect of work role in the association between brokerage and role-specific individual performance. Role-specific performance involved an objective measure of either billable hours for the professional architects (i.e. independent work role) or a peer evaluation score of managers as promoter of ideas (i.e. interdependent work role).

Our study contributes to the underlying assumptions about the effects of brokerage. Despite a few negative reports from the literature (e.g. Barnes et al., 2016; Fleming et al., 2007), the general understanding about brokerage is that it benefits the individual in most circumstances. In this regard, our study contributes to brokerage theory by pointing out an important contingency of work role. In practical terms, our findings imply that independent professionals, such as architects, do not seem to benefit so much from networking and bridge building, since these are less related to their role-prescribed performance. In the context of management theory, our study contributes to a better understanding of the interplay of formal and informal organizations. These two topics have historically remained separate and unconnected (McEvily et al., 2014) but have spurred number of integrative studies (Biancani et al., 2014; Kleinbaum et al., 2013; Soda and Zaheer, 2012; Srivastava, 2015). By treating work role as a moderator in molding the association between brokerage and performance, we address the gap in the literature on the topic by extending structural network analysis with contingencies (Adler and Kwon, 2002; Carnabuci and Oszegi, 2015; Cross and Cummings, 2004; Hansen, 1999; Mehra et al., 2001). By doing this, we increase the explanatory power of structural analysis (Lincoln, 1990; cf. Lincoln and Miller, 1979), resulting as an increased knowledge of how informal network position is associated with role-prescribed performance.

Contingent effect of work role on the relationship between brokerage and performance

The basic tenet of our study is that there are, on the whole, fundamental differences in the communication and cooperation requirements between independent and interdependent work roles. According to classical management theory, work roles outline a kind of bureaucratic boundary for social relationships that individuals can and should adhere to and engage in within their organization – when an individual is assigned a certain role, then the communication network becomes somewhat inherited and defined

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[1] The organization's work role structures and innovation activities were studied extensively at two-year research project with 13 theme-based interviews and several workshops. The results are reported at a PhD thesis (Tuominen, 2013).

by the role (Hansen and Haas, 2001; Lincoln and Miller, 1979; McEvily et al., 2014; Merton, 1939; Weber, 1982). Over time, individuals develop informal networks largely corresponding the role-prescribed relationships (Lincoln and Miller, 1979; Padgett and Ansell, 1993), but the networks reach beyond the formal bureaucratic boundaries as individuals communicate freely across the organization (Krackhardt, 1994).

In addition to communication, formal division of labor and corresponding roles also affect expected performance. Previous research has noted that a work role defines what types of activities an individual performs, prompts normative expectations in an organization, and sets the standard for how performance is evaluated (Biddle, 1986; Katz and Kahn, 1978; Welbourne et al., 1998). In the most extreme cases, performance that is not prescribed by the work role is prohibited and only the type of performance established for the role is rewarded (Pfeffer and Salancik, 1975). Conceivably because performance expectations are strongly determined by the work role, a notable body of research studies specifically considers work role performance, and the conditions to manage and maximize it (Griffin et al., 2007; Leroy et al., 2015).

Work roles having a contingent effect on the relationship between brokerage and performance can be analyzed using structural contingency theory combined with the conception of organization as a socio-technical system. As a socio-technical system, professional organization is a combination of social, interpersonal communication networks, and technical roles specified by the formal division of labor, wherein the formal aspects interact with the social aspects of performance (Cummings, 1978). From this perspective, work role is derived from technology and corresponds with Thompson's (1967) pooled task interdependence for independent work and reciprocal task interdependence for interdependent work. In the former category, rules and standard procedures provide enough coordination for the individuals and teams to work independently toward a common goal, and in the latter category, the coordination mechanism involves a mutual adjustment, as the work is performed together to produce the output. Specifically, the independent–interdependent nature of work has been a key focus of research related to team performance (Cummings, 1978; Langfred, 2005; Wang et al., 2019). In these studies, interdependence is built-in to the work the team performs, and then treated as a moderator of aspects such as group autonomy, collective efficacy, group potency, organizational citizenship or diversity

for several different types of outcomes (Bachrach et al., 2006; Langfred, 2000, 2005; Stajkovic et al., 2009; Wang et al., 2019).

Notable in the results of these studies is the support for the mechanisms derived from Thompson's (1967) theory that demonstrate that the need for communication and cooperation increases along with an increase in the task interdependency, complexity of goals and feedback (Saavedra et al., 1993). In professional organizations, these dimensions become increasingly complex amid higher positions in formal hierarchy simply because managers tend to have increasingly broader job descriptions than their subordinates and participate in a larger number of overlapping projects of various kinds. Typically, managers are experienced professionals in their field, and they perform some of the client project work in addition to fulfilling the expectations toward sales, organizational development and coordinating activities in their departments or other work units (e.g. Etzioni, 1964). A manager's goals are in this respect defined from both above and below their hierarchical position, and they receive feedback for their work from several others aside from their immediate colleagues. In contrast, professionals are technical specialists, and performing their job well generally requires spending more time at their desks working on specific projects, thus having inherently higher independence incorporated in their work roles, even if their project may require combining several individual's work. Table 1 summarizes how professionals and managers differ in terms of interdependency based on the dimensions identified by Saavedra et al. (1993).

A brokerage position in a communication network of interdependent work roles can provide a major boost to effective communication and cooperation. Studies show that brokerage provides the best position to coordinate work across other areas of a work communication network (Burt, 1992; Granovetter, 1973) and increases the ability to convey ideas across the organization to the distant individuals in the network (Reagans and McEvily, 2003). Brokerage also increases the chances that an individual's activities are to be considered and engaged by others, and concomitantly, to be judged valuable (Burt, 2004). In general, brokerage means less structural constraint, more diversity, and weaker ties (Aral and Van Alstyne, 2011), and allows individuals to benefit from non-redundant sources of knowledge (Hansen, 1999). The more interdependent the work role is, the greater the need for brokerage in a professional organization. Our hypothesis evaluates how brokerage in the communication network and

Table 1. Differences between independent and interdependent work roles in a professional organization.

	Independent roles in a professional organization	Interdependent roles in a professional organization
Typical formal role	Professional	Manager
Task interdependency	Client projects of several sequential and parallel tasks to be worked on alone and coordinated within the project team	Supervision over work units, selling, negotiating, and participating in several client projects. Member of business development and strategy development teams
Goal interdependency	Client project provides clear goals for each individual and for compiled output of project	Several goals coming from projects, firm, and clients
Feedback interdependency	Individuals receive feedback from colleagues working on the same project. Collective feedback provided by superior and client during and after project	Feedback from the subordinates, from clients and from top management. Feedback from several projects
Requirements for collaboration and coordination	Lower	Higher

independent–interdependent work roles interact with each other:

H1. Work role moderates the relationship between brokerage and role-prescribed performance such that the contribution of brokerage is stronger when the work role is interdependent compared to independent.

Methods

Data

We tested our hypotheses using data collected in an architectural firm during a two-year study. We collected questionnaire and timesheet data from employees who participated in client projects residing in the same open office and who were employed during the first and second years of the study ($n=65$). To control for common method variance and develop a causal argument on the network positions and performance, the data on dependent variables were collected in the second year of the study from time sheets and from an additional online survey. In total, there were 93 employees at the start of the study and the remaining 28 employees worked at other physical locations, left the company or belonged to administrative staff (e.g.

information system administration and payroll). There were five formal roles: professionals, project managers, senior project managers, and managing partners. The professional architects were coded as independent roles ($n=31$) and all manager roles were coded as interdependent roles ($n=34$). The professionals performed different aspects of design and drawings, and managers attended to sales, project management, and development.

Based on 13 interviews about work roles and innovative activities at the case company reported by Tuominen (2013), the professionals were clearly a distinct group from the managers and were allowed to focus mainly on their solitary architectural design work. Conversely, managers were given broad responsibilities in managing work units and engaged in development and innovation. The case firm invested heavily in innovation and development and just before the beginning of our data collection, promoted several individuals previously working as professional architects to project managers. Both work roles required talent and extensive training in architectural design, but they differed in communication patterns, the managers have to communicate across the firm to participate in and supervise several development projects. A total of 33% of the sample were women, and 83% had a master's degree in architecture, which

is minimal required training for certified architects. The remaining 17% had a bachelor's degree or vocational degree in related design field. The average tenure was 9.25 years (SD = 6.83) for managers and 5.17 years (SD = 4.89) for professionals.

Measures

Dependent variables

We used billable hours from clients as a dependent variable of the role-prescribed performance for the independent work roles. This was constructed based on time sheets, where the employees had allocated their working time in a variety of categories. We chose billable hours from the client category as a performance measure of independent work roles, because the firm aimed at maximizing it, and it was directly linked to annual profit. We calculated a monthly mean of the number of billable hours to generate a uniform variable to describe individuals' average performance through the year. Monthly mean billable hours for interdependent roles were 94.76 (SD = 38.04) and for independent roles 114.16 (SD = 22.27). The variable was normalized with second power transformation to adjust its skew.

For the variable describing role-prescribed performance for interdependent work roles, we chose promoting of new ideas. Following the survey examples from Wasserman and Faust (1994), the variable was constructed from a questionnaire in which the respondent was asked to name five individuals in the firm who promote new ideas. Each nomination received one point, and points were summed resulting in a count variable of interdependent work roles' performance. This procedure was chosen, because it provides a single component measure of a person's perceived competence and ability to put forth actions in the organization that will eventually lead to innovation (March, 1991). This measure also corresponds with the current understanding of creativity that highlights the generation of both novel and useful ideas (Amabile, 1996) and provides a measure to identify those individuals who are both coming up with ideas and promoting them. The variable was normalized with square root transformation to adjust its skew.

Independent variables

The network data consisted of information on self-reported social ties in three types of work-related communication collected through an online sociometric survey instrument in the first year of study.

Preliminary interviews consistently identified three types of informal, work-related interaction among employees that we distinguished in our survey: communication about the (i) day-to-day architectural design work, (ii) innovative new ideas, and (iii) business development. The network data were obtained from a free-choice survey with two-way directed questions, wherein giving-information-to and getting-information-from components of communication were asked separately (Wasserman and Faust, 1994). Thus, three network survey question pairs were used: one for communication about the day-to-day architectural design work, one for innovative new ideas, and one for business development.

The wording of the questions were tailored to reflect the conditions of the company based on the interviews, and were checked with one of the supervisors before publishing the survey online. A one-sentence example was given in all three types of communication. Communication about the day-to-day architectural design work was defined as relating to the output delivered to clients that was recurring and was in the realm of respondent's line of expertise. Communication for innovative new ideas was defined as work-related ideas that the respondent was not aware of anyone else proposing previously. Business development communication was defined as communication about improvements in pre-existing products or services, or internal company process or personal work practices. The response rate was 90% for the questions about communication in day-to-day architectural design work and business development tasks and 84% in communicating innovative new ideas.

In the online survey, the network questions were presented after a filtering question wherein the employees had defined their own acquaintances from a roster of all employee names. Small organization size permitted a full roster method, which rules out recall bias thus increasing reliability of the network measures (Marsden, 2011). Separating giving-and-getting components of communication further increases psychometric reliability by allowing confirmation of each social tie (Krackhardt, 1990). The frequency scale in communication was set to choices of (4) daily, (3) weekly, (2) once a month, (1) less than once a month, or (0) = not at all.

We transposed the getting-information-from component in each of network question pairs, and joined the resulting two networks together, by using the value of the giving-information component as communication frequency resulting in confirmed communication ties between individuals. Before generating the brokerage measures, we combined

the three networks by summing up the frequencies, then dichotomizing at the mean frequency (MIN = 1, MAX = 12, MEAN = 3.411, SD = 2.47).

Brokerage

Our first brokerage measure was the additive inverse of Burt's constraint (Burt, 1992). First, we generated Burt's constraint with Ucinet VI structural holes routine limiting the measure to consider only an individual's contacts' ties and using both outgoing and incoming ties. Then we generated our brokerage measure by calculating 1 minus constraint, following recent network studies (Carnabuci and Oszegi, 2015; Soda et al., 2019). Thus, the higher the resulting brokerage measure is, the more brokering opportunities the individual has. In other words, our measure indicates how an individual's communication is concentrated in non-redundant contacts in groups of connected colleagues, because the less constrained actors are connected to more groups of others (Burt, 1992). In our analysis, the higher the additive inverse of Burt's constraint, the better opportunities for brokerage the individual has. As the second brokerage measure, we used Betweenness centrality (Freeman, 1977) generated with Stata function "nwcommands". We added Betweenness centrality to the measures, because it has been frequently used as an additional brokerage measure (e.g. Fang et al., 2015).

Independent work role

We created a dummy variable to distinguish between independent and interdependent roles. All individuals in any of the manager roles ($n = 34$) were coded as interdependent (0) and all individuals in professional architect roles ($n = 31$) were coded as independent (1).

Control variables

We requested that the human resource manager of the company to provide us with demographic data of the employees. From that data, we created the control variables for organizational tenure, gender, and education to be used in our models because they were found to be significant in earlier studies of network positions and various outcome variables (Reagans and McEvily, 2003; Reagans and Zuckerman, 2001). Language skills and age were also considered in evaluating the modeling strategy, but these variables did not increase the explanatory power of the models and were dropped. Individuals were very homogeneous in terms of language skills, and age was highly correlated with tenure. There were six divisions in the firm specializing in certain types of architectural projects, for example, office buildings or shopping malls. We checked for an intraclass correlation (ICC) between the units to determine whether unit affiliation is a considerable source of variance in performance and did not find justification for hierarchical models.

Results

Table 2 presents bivariate correlations and descriptive statistics of the variables. Dependent variables and work role are numbered 1 to 3, followed by control variables and brokerage measures. We found

Table 2. Means, standard deviations, and correlations.

	Variable	Mean	SD	1	2	3	4	5	6	7
1	Billable hours	103.88	32.89							
2	Promoting new ideas	4.18	6.15	−0.56**						
3	Independent work role	0.47	0.5	0.30*	−0.41**					
4	Tenure	7.37	6.31	−0.07	0.16	−0.32**				
5	Female	0.33	0.48	0.13	−0.18	0.11	−0.13			
6	Master's degree	0.83	0.38	−0.06	0.2	−0.39**	0.08	−0.20		
7	Inverse of Burt's constraint	0.06	0.06	−0.19	0.41**	−0.35**	0.25*	−0.41**	0.06	
8	Betweenness centrality	77.29	89.72	−0.32**	0.77**	−0.27*	0.12	−0.25*	0.11	0.6**

Notes: *$p < 0.05$; **$p < 0.01$.

a positive correlation between both brokerage measures and idea promotion. The number of billable hours negative correlation is significant with betweenness centrality, but not with the inverse of Burt's constraint. The independent role (i.e. 1 = independent, 0 = interdependent) correlates positively with the number of billable hours and negatively with idea promotion, which supports the assumption of distinct output expectations between the work roles. Having a master's degree and tenure correlate negatively with independent work role, indicating that those in interdependent work roles have higher education and higher tenure than independent roles. Both brokerage measures are positively intercorrelated as expected.

We z-standardized all independent variables to facilitate better interpretation of the moderation effect as suggested by Dawson (2014). Tables 3 and 4 present the results of the regression analyses testing the association between the inverse of Burt's constraint, betweenness centrality, promoting new ideas, and billable hours. As postestimation of the models showed heteroscedasticity of the residuals caused by slight non-normality of the transformed dependent variables, we used robust standard errors to control for this, as suggested by Antonakis and Dietz (2011). OLS regression was chosen because it

has been considered a valid modeling strategy when network measures are included as independent variables (e.g. Reagans and McEvily, 2003; Srivastava, 2015). However, the network measures violate the independence of observations, which is one of the key assumptions of OLS regression resulting as underestimating of standard errors and over-rejecting of hypotheses (Srivastava, 2015). To correct this, we chose a procedure suggested by Borgatti et al. (2018) and compared the results of our conventional OLS models with those obtained from Ucinet VI node-level regression, which uses the OLS regression to generate the coefficients, but permutation technique for the p-values. As both modeling techniques are presented side by side in Tables 3 and 4, it can be observed that the permutation technique generally results in higher t-values for those coefficients that are statistically significant, providing additional support for our results.

Our hypothesis about the work role's boundary effect on brokerage means that brokerage is associated with higher work role-prescribed per-formance, if the role is interdependent. In other words, as employees in interdependent work roles are expected to engage in promoting new ideas in the organization, they benefit from brokerage. To test this aspect of the hypothesis, we first examined the

Table 3. Results of conventional and node-level OLS regression analysis for promoting new ideas (t-values in parentheses).

Promoting new ideas	Model 1 conventional OLS	Model 2 permutation OLS	Model 3 conventional OLS	Model 4 permutation OLS
Independent work role	−0.54 (−1.62)	−0.54 (−1.79)	−0.82 (−3.08)**	−0.82 (−3.25)**
Tenure	0.06 (0.45)	0.06 (0.50)	0.10 (0.79)	0.10 (0.91)
Female	0.34 (1.57)	0.34 (1.17)	0.22 (1.20)	0.22 (0.92)
Master's degree	0.15 (0.60)	0.15 (0.41)	0.11 (0.52)	0.11 (0.35)
Inverse of Burt's constraint	2.10 (3.47)**	2.10 (4.97)**		
Independent × Inv. of Burt's constraint	−1.78 (−2.81)**	−1.78 (−3.76)**		
Betweenness centrality			0.86 (5.92)**	0.86 (7.22)**
Independent × Betweenness			−0.33 (−1.25)	−0.33 (−1.12)
Constant	1.20 (3.09)**	1.20 (na)	1.65 (5.80)**	1.65 (na)
R^2	0.48	0.48	0.62	0.62
n	65	65	65	65

Note: **$p < 0.01$.

Table 4. Results of OLS and node-level regression analysis for billable hours (*t*-values in parentheses).

Billable hours	Model 5 conventional OLS	Model 6 permutation OLS	Model 7 conventional OLS	Model 8 permutation OLS
Independent work role	0.43 (1.48)	0.43 (1.44)	0.62 (2.07)*	0.62 (2.07)*
Tenure	0.10 (0.69)	0.10 (0.72)	0.09 (0.65)	0.09 (0.73)
Female	0.09 (0.37)	0.09 (0.34)	0.10 (0.41)	0.10 (0.46)
Master's degree	0.31 (1.05)	0.31 (0.89)	0.29 (0.92)	0.29 (0.80)
Inverse of Burt's constraint	−0.91 (−2.55)*	−0.91 (−2.20)*		
Independent × Inv. of Burt's constraint	1.21 (3.06)**	1.21 (2.60)*		
Betweenness centrality			−0.25 (−1.67)	−0.25 (−1.83)
Independent × Betweenness			0.32 (1.12)	0.32 (0.94)
Constant	−0.34 (−0.86)	−0.34 (na)	−0.53 (−1.32)	−0.53 (na)
R^2	0.18	0.18	0.14	0.14
n	65	65	65	65

Notes: *$p<0.05$; **$p<0.01$.

main effects of the inverse of Burt's constraint and betweenness centrality and then their interactions with independent versus interdependent work role. According to the main effects of the brokerage measures in Models 1 to 4 in Table 3, brokerage is associated with higher scores for promoting new ideas. When examining the significant interaction effect of the work role in the Models 1 and 2 in Table 3, it is evident that employees in interdependent roles benefit from brokerage more than those in independent roles for promoting new ideas. For example in Models 1 and 2, the positive effect of the inverse of Burt's constraint for interdependent work roles is 2.10 and for independent work roles, the effect is 2.08−1.78=0.30.

Further, according to our hypothesis, for independent work roles, brokerage should have less effect on role-prescribed performance than for interdependent roles. In Table 4, brokerage is modeled with billable hours, which is the role-prescribed performance measure for independent work roles. The main effects of Models 5 and 6 in Table 4 indicate that brokerage is negatively associated with billable hours. The interaction effect of the work role in Model 5 shows that the negative effect of the inverse of Burt's constraint for interdependent work roles is −0.91 and for independent work roles, the effect

is −0.90−1.21 = −2.11. This shows that higher brokerage is associated with lower role-prescribed performance for independent roles.

According to the main effects of the models presented in Tables 3 and 4, brokerage seems to be associated with higher performance in idea promotion and lower performance in billable hours, despite work role. However, in order to distinguish the work role-specific effects, further examination is needed. For this purpose, we examined the interactions by studying the simple slopes, which is a procedure in probing the interaction patterns (Dawson, 2014). After generating the significances of the simple slopes for interactions of the models with the inverse of Burt's constraint and betweenness centrality for both promoting new ideas and billable hours (Models 1, 3, 5, and 7 in Tables 3 and 4) with Stata's "margins" procedure (Table A1), we confirmed the hypothesis. For promoting new ideas, the coefficients of the simple slopes were statistically significant and positive for interdependent roles with both brokerage measures. Betweenness centrality was positive and significant also for independent roles, suggesting that brokerage is also associated with independent professionals in promoting their ideas. This was the case for the independent professionals in our study

who were not expected to promote new ideas, which was evident because 12 professionals out of 31 received zero nominations as promoters of new ideas. Notably, for interdependent roles, brokerage is associated with lower number of billable hours.

Discussion

Our study adds knowledge on the relation of brokerage to performance and improves the empirical understanding of how formal organization is related to the informal. In our case organization, our finding is that brokerage is associated with higher role-prescribed performance for those in interdependent roles, but not for those in independent roles. Therefore, our findings show that work role is a contingency, a boundary condition for brokerage. As brokers are bridging structurally distinct groups (Adler and Kwon, 2000; Burt, 1992, 1997; Reagans and McEvily, 2008), brokerage correlates with managerial performance in our empirical setting but does not have an association with independent professional's performance measured with the amount of billable hours.

Theoretical contributions

By presenting work role as a boundary condition for brokerage, this paper makes several contributions to theory. First, the study complements earlier studies on the interplay of formal and informal organization (Biancani et al., 2014; Kleinbaum et al., 2013; Soda and Zaheer, 2012; Srivastava, 2015). Our results show that formal and informal structures reinforce each other, as proposed by McEvily et al. (2014) as one interaction mechanism between the formal and informal structures. Second, the study complements the contingency perspective on network theory. The network theory's structuralist argument suggests a direct causal link from brokerage to performance (e.g. Emirbayer and Goodwin, 1994; Mayhew, 1980), traditionally giving less attention to contingencies. This has probably led to underrepresentation of network studies taking moderators such as work roles into account, only with few exceptions (Ahuja et al., 2003; Brass, 1981; Burt, 1998; Ibarra and Andrews, 1993), and only quite recently, the individual attributes as contingencies have been consistently included in network studies (Landis, 2016).

Therefore, this study contributes to most brokerage literature that seems to imply that brokerage position benefits the broker, and sometimes but not always the network, all the time under all circumstances. Our study provides empirical evidence that suggests that

it is in the role of managers to broker relations and communication among the horizontally and vertically differentiated units and employees for which they have responsibility. Our study suggests that formal work role not only greatly influences the performance targets, but also limits the advantage of brokerage to the behavior prescribed by the work role only for interdependent work roles.

The strength of our study is in its organization-wide approach. We obtained network data from the entire population of employees in the firm with a particularly detailed survey questionnaire backed up with qualitative interviews. We separately surveyed giving-and-getting types of informal work-related communication ties enabling improved accuracy in examining brokerage. This so-called whole-network approach increases the validity of the brokerage measures used in the models (Borgatti et al., 2018). The second strength of our study is that it measured the role-prescribed performance with objective performance data: independent work role's performance with billable hours from the time sheets and interdependent role's performance with peer evaluations of idea promotion. By doing so, we complement the studies that have connected organization-wide networks and work performance (Brass, 1981; Carboni and Ehrlich, 2013; Cross and Cummings, 2004; Mehra et al., 2001; Sparrowe et al., 2001).

Limitations and future research

Despite its contributions, this study has several limitations providing motivation for further research. The first one concerns the case study character of our study. Our data were gathered from one firm, which limits the generalizability of the results. Yet, we were able to collect detailed survey, timesheet, and demographic data about the individuals working in the firm, resulting in organization-wide, bounded network data with the dependent variables that were meaningful proxies for performance. Confirming with the interviews and reviewing the self-reported job descriptions of professionals and supervisors, we concluded that the architect office seems like so many professional organizations, where work requires both high talent and extensive training, and where managers have professional backgrounds. The architects are regulated by a national regulatory agency with certification exams, and most of the individuals we studied were certified architects, thus the professional's work in the firm was similar compared to firms in the same industry. The firm was well established in its market, and the employee

turnover was relatively low providing prerequisites for established communication network structures and divisions of labor between the work roles.

The second limitation is the reverse causality caused by common method variance, which is the usual limitation discussed in survey-based network studies (e.g. Carboni and Ehrlich, 2013; Sparrowe et al., 2001). We addressed common method variance by constructing our network variables from the first year of study and used the dependent variables from the second year. According to the assumptions of the structuralist approach of network theory, we assumed the causality of brokerage predicting performance in our research design. Our approach speaks to this causality, but as the communication network structures may take time to develop and become rigid, we are still left with a concern of reverse causality in which performance leads to structural advantage to some extent. This may be the case with the employees in interdependent roles, since brokerage was, as expected, associated with a higher idea promoter score, and promoters have a tendency to become central individuals (Obstfeld, 2005; Scott, 2000), making our idea promoter DV actually a measure of prestige. Nevertheless, becoming prestigious in a professional organization arguably requires brokerage between others, so we are certain to have captured the right phenomenon with our measure of idea promotion.

The third limitation is related to alternative explanations on the mechanisms of why the nature of work role moderates brokerage. Our argumentation developed around Thompson's (1967) idea of more independent roles (e.g. professional architects in our case) requiring less collaboration and coordination, thus benefiting less from brokerage is in line with previous research. However, differences in legitimacy between professional architects and managers would provide an alternative explanation for our hypothesis in our data. For example, Burt (1998) shows that women do not benefit from brokerage unless they have a more senior mentor as a sponsor, and argues that this effect is common for all low-status individuals in an organization (Burt and Merluzzi, 2014). High-status versus low-status distinction is not entirely unrelated to the interdependent–independent distinction in our paper as the managers, on average, in our case firm have higher tenure and education levels than professional architects. However, nothing in our interviews and discussions in the company signaled to us about a possible legitimacy problem in the company.

The fourth limitation is related to our performance measures. Billable hours as a measure of professional's performance is uniform across all individuals, but the idea promotion score merits further examination. Superior evaluations have been the most commonly used across previous network studies, despite variation across superiors (Teigland and Wasko, 2009). Our peer evaluation method's strongpoint is that it rules out the variance between different supervisors evaluating their subordinates. We considered peer evaluation meaningful, because the size of the firm was rather small, and everyone knew each other since they shared the same open office space.

Future research could extend the findings of this paper in numerous directions. One direction comes from the contribution of this paper suggesting the independent–interdependent work role as a boundary condition for brokerage. As brokerage theory has been applied to a wide range of work contexts, which might be argued to vary in terms of interdependence, the interdependence aspect has not been at the core of their research design implying that it should be equally well applicable to both. Moreover, most of the empirical evidence of benefits of brokerage up until now has been done exclusively with managers, therefore coming from the work that is fundamentally interdependent (e.g. chain managers or investment bankers). Further research would be needed to complement brokerage theory with work role point of view to clarify this specific boundary condition. Further research could also investigate more how status differences and legitimacy issues between individuals act as boundary conditions. For theorizing this stream of research, brokerage theory could benefit from hypotheses of status differences coming from evolutionary psychology and behavioral economics.

Management theory's formal–informal aspects present another future research direction. An innovative approach would be to study the co-existence and effectiveness of formal and informal structures with operationalizing formal structures not only as role hierarchies but also as workflow networks derived from project data and control for clearly work-related communication between superiors and employees. As most professional organizations are not as stratified as architectural firms, participating in the same project would serve as a proxy for formal structure. Novel data gathering methods about informal social structure could also be used. Since work-related communication is increasingly taking place digitally, communication data can be gathered from databases in addition to self-administered surveys. By analyzing the content of communication by text mining; for example, examining the content of e-mails individuals send each other, and dividing the content between formal and informal communication, would shed light on a multiplicity of relationships,

efficiency and innovativeness on a large scale, and answer the question as to how these network structures are associated with each other.

Managerial implications

In addition to the theoretical contributions, our study has implications for managers of professional organizations. According to the extant understanding in the managerial practice, successful organizations are both highly efficient in what they do and capable of adapting to changes. Typically, in professional organizations, professionals work primarily on tasks requiring specialized skills and competence, and managers work primarily in project management, sales, and offering development. Executives of professional organizations, at least in the most artistically and intellectually demanding kind, such as architecture, should therefore proceed with caution with the ideas of flattening formal hierarchies and divisions of labor in their organizations, in order to sustain simultaneous managerial capacity and professional performance. The finding that brokerage affords limited advantage to independent professionals suggests that, contrary to common belief, such people maybe should not invest a great deal of their time in networking and bridge building if that is not what their professional roles require. An informal organization in a professional organization can thus be seen as a mixture of independent professionals and interdependent managers. A successful firm balancing efficiency and adaptation is one that provides room for both independent and interdependent work roles and considers that not everyone should behave as brokers.

Conclusion

In this paper, we examined how work role moderates the advantages of brokerage for role-prescribed performance. Our findings suggest that the advantage is contingent upon the work role and brokerage facilitates role-prescribed performance for individuals in interdependent roles but not for those in independent roles.

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Appendix

Table A1. Simple slopes of the Models 1, 3, 5, and 7.

	Delta method					
	dy/dx	SE	*z*	*P>|z|*	[95% conf. interval]	
Promoting new ideas						
Inv. of Burt's constraint independent work role						
0	*2.09692*	*60510*	*3.47*	*0.001*	*88567*	*3.30816*
1	0.31451	0.19970	1.57	0.121	–0.08523	0.71427
Betweenness centrality independent work role						
0	*0.86236*	*0.14562*	*5.92*	*0.000*	*0.57087*	*1.15386*
1	*0.53269*	*0.22076*	*2.41*	*0.019*	*0.09077*	*0.97460*
Billable hours						
Inv. of Burt's constraint independent work role						
0	*–0.90929*	*0.35692*	*–2.55*	*0.014*	*–1.62375*	*–0.19484*
1	0.30558	0.18013	1.70	0.095	–0.05499	0.66157
Betweenness centrality independent work role						
0	–0.25708	0.15388	–1.67	0.100	–0.56511	0.05093
1	0.06624	0.24507	0.27	0.788	–0.42432	0.55680

Note: Statistically significant slopes italicized.