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SOCIAL CAPITAL IN PROJECT-BASED ORGANIZATIONS: ITS ROLE, STRUCTURE, AND IMPACT ON PROJECT PERFORMANCE

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ABSTRACT

The goal of this research is to provide evidence about the role of social capital within project-based organizations. We collected primary data via sociometric questionnaires on 48 projects in the construction field of Jehad naser firm at Kermanshah city. The analysis has been conducted to study the distinctive structural configuration of projects' social capital, among which we emphasize the role of network cohesion and network range. Our finding show that social relations produce benefits that directly affect single projects, the extension of such benefits to the whole organization will depend on the capability to further manage such social relations beyond the duration of the project. In this situation, project social capital might be incorporated, and turned into; organizational social capital. Also results provide evidence that levels of project performance are significantly related with the particular structure of projects' social capital.

Keywords: Project-based organizations; Social capital; Performance; Knowledge integration; Organizational design

1. INTRODUCTION

According to project modes of organizing and controlling work are a response to changing contextual factors (Powell, 1996). Specifically, these modes' temporary is seen and bringing organizational change as well as responding to the increasingly environments that organizations are faced with a result of the high pace of technological development in the innovative sectors. In such organizations, projects do not occur against a backdrop of relatively established, routine activities. Instead, they constitute the organization, creating a scenario in which knowledge and emergent working practices are a result of a complex interplay between structural and environmental project conditions and the role played by each individual who takes part in the project itself. Within temporary organizations, members are aggregated in order to bring together individuals and their resources. The complex environment often requires frequent interactions that concern individuals affiliated with different projects. To understand of how individuals and projects gather access to tangible and intangible resources may come from studying these patterns of interaction, as well as their structure. The way individuals and groups of people are linked, creating a system of interdependent social exchanges between partners are called tangible and intangible resources, is here referred to as project social capital. While prior literature devotes considerable attention to formal multi-project management arrangements (Cusumano and Nobeoka, 1998), there is a study on the benefits that informal social exchange relationships may have for a number of organizational outcomes. The aim of this research is to explore whether and how a project's social capital has an impact on its levels of performance. Therefore the structural properties of social capital might have important performance implications for projects. In particular, we analyze the structural configurations of projects' social capital, among which we emphasize the role of cohesion and diversity (Burt, 1992). The level of cohesion of project social capital accounts are strongly interconnected project members is used to highlight the degree of restriction of actors as network members. The level of diversity of project social capital, also known as network range, considers how different the partners involved in social exchanges are, taking into account the

prevalence of cross-boundary social interactions between projects.

2. Theoretical background

2.1. The project-based organization

The PBO is an organizational form in unit projects for production organization, innovation and competition (Hobday, 2000). The literature has revealed that PBOs are significantly need customized industries, such as complex products and systems (Hobday, 1998), software development (Ibert, 2004), construction (Bresnen et al., 2004), engineering design (Cacciatori, 2008). They refer to better processes, control and lead-time reduction (Verona and Ravasi, 1999), higher quality (Bresnen, 1990), increasing ability to respond quickly and flexibly to each customer's needs (Hobday, 2000) and to innovate in collaboration with clients and suppliers (Pinto and Rouhiainen, 2001). Moreover, the model of this organizational allows a flexible application and integration of different types of organizational knowledge and skills, learning within the project boundary and coping with production, project risks and uncertainties (Keegan and Turner, 2002). As well as PBOs present considerable drawbacks in performing routine tasks, achieving economies of scale and coordinating cross-functional resources (Hobday, 2000). In addition, they show difficulties in promoting organization-wide and project-to-project learning (DeFillippi and Arthur, 1998). This happens because knowledge generated in the project activities is embedded in tacit experiences of the group members and is therefore difficult to consolidate and spread at the organizational level (Prencipe and Tell, 2001).

2.2. Inter-project relationships and project social capital

Inter-project coordination is a desirable thing when the adoption of new technologies or development of new project could be used and applied elsewhere in other projects of the organization. As a consequence, whether PBOs live on their ability to mobilize projects, for organizational performance but for other projects some key managerial tasks are needed to integrate project-based learning into the organization (Gann and Salter, 2000). Organizational projects are unit's knowledge-based organizations; represent the way through which organizations seek to achieve innovation and new knowledge production. Project units allow dividing labor within organizational boundaries and giving firms the opportunity to focus on fewer but highly customized activities, and producing at the same time a high degree of differentiation into organizational sub-systems (Lawrence and Lorsch, 1967). Such differentiation is reflected, partial vision of whole organizational activities, potential conflicts among projects, and different priorities that characterize scheduled activities. This approach to organizational design complicates the management of interdependences across projects performing different tasks and activities. In contrast, internal learning and knowledge creation via long-term changes in explicit and tacit knowledge are essential for organizations in order to achieve an adequate profitability and to stay competitive in knowledge-based contexts. The activities of each project must be integrated and the access to the knowledge and competences is required to respond appropriately to the environment. The diversification of composition team project and members characteristics, such as demographic tenure and competence diversification, is often firms integrate sub-systems according to the need to coordinate tasks and activities. Yet the rotation of individuals is desirable to reconcile single projects' differentiation with knowledge integration at the organizational level. To achieve integration effectively, a project needs to establish and maintain exchange relationships with other projects within the organization. Tasks and activities carried out at the project level are based on heterogeneous and often complex sets of knowledge and information (Polanyi, 1966). Sharing of explicit and tacit knowledge rely on the combination of Innovation and technology development that allow individuals to learn and gain access to experiential knowledge and new techniques and methods developed by colleagues (Cockburn and Henderson, 1998). Under these circumstances, relationships with other projects in the organization are likely to provide a valuable set of tangible and intangible resources, which may be important for project performance. Among such resources, social capital available through individual members' social relations appears to be of critical importance, given the work performance and work processes at the project level. Social capital and its effects have been studied at different levels of analysis: individual (Burt, 1997), group (Oh et al., 2006) and organizational (Pennings and Lee, 1999). In this paper we introduce the concept of project social capital, defined as the overall web of inter-personal and inter-project relationships in which single project units are embedded, and through which important resources can be accessed. The importance of the

project social capital relies on a number of recent studies which have stated that projects are more than just temporary systems (Sydow and Windeler, 1998), in the light of the complex web of network relationships which they create to perform project tasks and from which they mobilize essential resources (Sydow and Staber, 2002).

2.3. Social capital and project performance

Even though the social capital resources are affected project effectiveness, we hypothesize that the structural properties of project social capital might have important performance implications for projects. In general, the idea of social capital of the structural properties highlighted that actors with the "right" types of network ties can more effectively employ, mobilize and use informational (Hite and Hesterley, 2001). In the traditional view of social capital, one of the network structural properties that can assume a production of knowledge for network members is cohesion (Coleman, 1988; Reagans and Zuckerman, 2001). A network is defined as "cohesive" when members are strongly interconnected, taking into consideration the proportion of ties between a set of nodes that exist (Gargiulo et al., 2009). In highly cohesive networks, information diffuses rapidly, and individuals belonging to the same network are sharing the same knowledge. Cohesion is promoting the creation of social norms and sanctions within networks, and to facilitate trust and effective coordination between network members (Coleman, 1988; Reagans and McEvily, 2003). Thereby increasing the willingness of members to engage in discussion and knowledge exchange a cohesive network would benefit from greater cooperation, conformity to norms, information sharing, and less tendency to engage in competitive behavior. As it increases and obtaining a specific resources to apply to their context which Increasing individuals' access to knowledge is important for the performance of project units. In this manner, individuals use also knowledge to further stimulate the usefulness of their own skills. However, cohesive networks are sometime efficient in developing new knowledge and, in turn, for performance of single projects. First, if they result of cohesive networks are comfortable or validating interactions might have unintended consequences but not in the most relevant and useful knowledge for the project activities at hand (Mizruchi and Stearns, 2001). Burt (1992) suggested in his theory of "structural holes", cohesion is the empirical indicator of redundancy, because in densely connected networks many of the ties carry the same information and there are many alternative paths that the information follows to reach individuals belonging to the network. In this respect, when a project shares knowledge and intellectual capital with another project within the same organization, the two projects become more redundant inside the network. The two projects have knowledge and ideas, and therefore represent substitutable points of exchange in the collaborative network. Project teams are structures and have a goal finishing the project in time. By generating redundant information and less diversified knowledge, high levels of network cohesion can produce information, scarce novelty and unintended knowledge homogeneity within collaborative networks among projects. Based on the above discussion, we argue that project performance has an inverted U-shaped relationship with the level of cohesion of project social capital because it is at moderate levels of cohesion that the access to useful knowledge resources by projects within networks will be maximized. Therefore, we hypothesize:

H1. Project performance has an inverted U-shaped relationship with the level of cohesion of project social capital, and is maximized at a moderate level of cohesion.

As exploring the project performance considers the relationship between cognitive diversity and performance of single projects. Therefore, knowledge diversity is shaped by the project members, as well as by their previous work experiences. Following the arguments on social capital, the discussion about cognitive diversity relates directly to the collaborative ties that project members may establish with other colleagues in different areas of expertise. While similarities in the stock of knowledge is owned by individuals and improve communication among them, diversity increases the capacity for creative problem-solving and allows individuals to share different sets of contacts, skills, information, and experiences (Reagans and Zuckerman, 2001). Burt (1983) is defined network range as the prevalence of ties that cross institutional, organizational, or social boundaries. Relations have range to the extent that they connect an actor with an extensive diversity of other actors. Actor diversity is indicating network range, and a number of different types of actors. The number of different types of actors that an individual takes part in a single project is linked, to the diversity of information and social support which the individual can have access to (Burt, 1983). In this paper, we consider cognitive diversity of both the

different project members' areas of expertise and the relations with heterogeneous project members. Each area of expertise can be viewed as a distinct pool of knowledge possessed by individuals affiliated with the various projects within the organization. Network range reflects a property of the project social capital that takes into account the extent to which project members' interpersonal networks are rich in "cognitive diversity".

As a result, they are exposed to knowledge that is more diverse. The network range of single projects is therefore high. The importance of property in diversity is crucial in the PBOs. Frequent communication among their members is desirable in a condition within project teams. Those who have a different background may enhance an individual's capabilities to interpret ideas from people with different knowledge connections with members of other projects in a way that suits his or her knowledge and experiences. Therefore, at the same time, individuals are capable of transferring different" ties with different backgrounds in an easier manner. The effective and ability of transfer knowledge leads to uncovering projects to a broader set of perspectives and fertilization of ideas, and change of knowledge and problem-solving approaches could identify project teams and use multiple knowledge components in their activities. As a result, the higher levels of diversity of their network relationships will be related with higher performance. Although relations across disciplines can be beneficial, in certain cases high levels of diversity can be problematic. Therefore, to transfer knowledge in a across boundaries demarcate distinct bodies of knowledge; it is unlikely that individuals on both sides of the boundary will have much knowledge in common. Cohen and Levinthal (1990) stated that the ability to adjust a new knowledge gained from external sources as "absorptive capacity". As well as they argued that absorptive capacity tends to develop cumulatively and builds a related knowledge. High levels of diversity project of social capital could result in a lack of common knowledge among linked projects, decreasing their absorptive capacity and making their attempts to transfer knowledge across the boundary vulnerable. But lower ability to transfer knowledge will reduce opportunities to gain different cognitive strategies and others' experiences, reducing potential for project performance. According to above discussion, we state that project performance has an inverted U-shaped relationship with the level of diversity of project social capital because it is at moderate levels of diversity that projects maximize to integrate and combine knowledge resources into their activities. Overall, we hypothesize the following:

H2. Project performance has an inverted U-shaped relationship with the level of diversity of project social capital, and is maximized at a moderate level of diversity.

3. Methods

3.1. Institutional setting

In the construction industry the relationship between project social capital and performance looks quite salient, in this context as the work performed is at the project level through available information increases heavily. We chose this sector to explain the detail of it. The construction industry is taken to be the norm across a significant range of activities. In this industry, project teams are decentralized and heterogeneous because they consist of a mixture of staff from different professional and organizational backgrounds, and the regular movement of staff between projects is common (Bresnen, 1990). These conditions imply that the individuals in the project teams are recombined in each project. The construction project is considered as a network, where the firms have to coordinate their activities and resources among the different construction projects in which they are involved (Dubois and Gadde, 2002: 624). Moreover, these characteristics shows that the knowledge obtained from a project can be captured and spread in others, because of the project nature of the knowledge produced. Project-based firms often have knowledge of their own portfolio of projects, relying on informal channels of communication between project groups as the principal source of information on their activities (Bresnen et al., 2004).Some researcher's studies to identify mechanisms of the project level to play an important role in shaping innovation processes (e.g. Gann, 2000). Dubois and Gadde,(2002); Grabher, (2002a; 2002b) suggest that among the different ways the integrative and relational capabilities might influence innovation processes, one important mechanism is the ability to build upon existing inter-organizational and intra-organizational networks to generate resources . Networks among project teams represent, an important mechanism through organizations involved in innovation processes and create relevant informational resources.

3.2. Sample and data collection

In this study, we analyses the single project. Our sample is demonstrated by 48 projects that operating in the construction industry. But currently operates in three strategic areas of business (gas and fluid pipelines; electric power plants, factory building) with more than 1060 employees. The present analysis is developed with the support of primary data collected through semi-grounded mode and with the use of secondary data already available. So, primary data related to the collection of information about the structure of single projects' social capital. In this study we interviewed with corporate managers and with project managers allowed us to make assumptions, develop the methodology of investigation, and make a pre-test of the subsequently administered questionnaires. Therefore a questionnaire was submitted to project managers and team members in order to gather relational data about each investigated project. Of the 48 investigated projects, 24 belong to the gas and fluid pipelines business area, 22 to the electric power plants business area, and 2 to the factory building business area. In the first section, (gas and fluid pipelines) indicate inter-project exchanges of technical resources typically undertaken in the daily project work. Therefore to follows a questions as: "Does your project unit offer products of services to other units? Further, the employees in each project were given a questionnaire and asked to indicate with whom they usually discussed two predefined matters integral to project activities: (1) the current dialog and exchange of opinions about the development of the project, and (2) the utilization of specific knowledge to develop specific parts of their work. We obtained a relational data between members of the projects. Regarding performance, there was consensus by project leaders about the net profit margin and quality problems as good measures of project performance. When the product is delivered during and after the time, the quality problems have been derived (Love and Li, 2000). Defective workmanship, insufficient work separation, delays, and failures in setting out are among the main causes of additional costs in construction projects (Josephson et al., 2002) and have a negative impact on performance. Data for each project were gathered from internal sources of information available, mostly electronic annual reports. In addition, we interviewed managers and project leaders that provided us with archival data used to compute the control variables of this study.

3.3. Variables

3.3.1. Dependent variable

In this research we use two different indicators that consider the economic as well as the quality dimensions of project performance. The first variable, Economic Performance, is measured as the net profit margin on the total revenues. The second variable is called Quality Problems and concerns the frequency with which delays, defective workmanship and other forms of technical negligence are encountered during project activities and reported by project managers. Within the company, problem detection is managed by a quality-system that provides information about the average frequency of problems for single projects. We measure Quality Problems by dividing the number of actual problems reported by the number of possible problems that may be encountered. Higher percentages of quality problems detected at the project level correspond to lower levels of quality achieved. Data for both variables were gathered from annual reports and company archives for the year 2014.

3.3.2. Independent variables

Our indicator measuring the level of social capital project is Network Restraction, an appropriate indicator to measure the extent to which inter-project collaborations at the organizational level are redundant (Burt, 1992):

$$NC_{ij} = \sum_{a-}^{N} V_{ia} V_{aj}, a \neq j$$

where V_ia is the strength of the network connection from project member i to individual/alter α, and 〖V〗_aj is the strength of the connection from member α to member j. All connections used for the calculation of this measure are only intra-organizational ties among project members. The above formula expresses a triadic cohesion measure of how much an actor is constrained by its direct neighborhood, and indicates the presence of strong third party connections around a relationship.

Third-party ties link member i to member j indirectly to the extent that member I has a strong network link with member α and member α has a strong network link with member j. We summed V_ia across all partners α in order to obtain the strength of the third-party connections around collaborative relationships. The Network Restraction measure was aggregated to the project level in order to test the first hypothesis.

In order to test a curvilinear relationship between of project social capital and its performance, also included Network Restraction squared. Our indicator measuring the level of diversity of project social capital is Network Range (Burt, 1983). Projects are surrounded by a "diverse" social capital to the extent that the members spread their exchange social relationships across multiple areas of expertise, namely the three business areas of the surveyed company. Network Range has two components. The first is a function of how project members' ties are spread across different expertise areas. The second is a function of the strength of connections with other projects working in those areas. Thus, this variable is defined as:

$$NR_{ij} = 1 - \sum_{k=1}^{N} V_{k\,V2_{IK}}$$

where Vik is the strength of the network connection from member I to area k, and V k describes the strength of the connections between project members in area k, while Vi k is in turn defined as:

$$V_{ik} = \frac{\sum Nk=1 x\,ij}{\sum_{q}^{N}=1 \overset{X}{iq}, q=j}$$

where N_ik is the number of ties that project member i has with other project members working in area k, N is the total number of network relationships of project i, xij is the number of ties that project member i has with project member j, and xiq is the strength of the network connection from project member i to individual/ alter q. Tie strength within area k, vk, can be expressed as follows:

$$V_{k} = \frac{\sum_{j}^{Mk}=1 \quad Xij}{\sum_{q}^{Sk}=1\, Xiq.q=j}$$

where Sk is the number of contacts that a given project member maintains in area k ,Mk is the number of employees with expertise in the area k, xij is the intensity of the relationship between a given project member in area k and any project member, xiq is the intensity of the relationship between a project member in area k and a project member working in the same area. Therefore, increasing vk indicates the absence of diverse knowledge inside a network. The Network Range measure was aggregated to the project level in order to test our second hypothesis. We test curvilinear relation by including Network Range squared. For further discussion about this measure, (Burt ,1992; Reagans and Zuckerman ,2001).

3.3.3. Control variables

We controlled several variables to capture the effects of other factors which are important to explain project performance. (1) Dimension. At the project level the dimension affect the level of performance achieved. We control the dimension by considering variables that takes on 1 for those projects whose number of employees was above the median value of the sample, and 0 otherwise for projects below the median. (2) Duration. Project duration affect the level of performance. A dummy variable, considering whether the project has annual or multiannual duration, takes on 1 for annual projects and 0 otherwise.

4. Analysis and results

Ordinary least squares (OLS) regression equations are used to test our hypotheses (Table 1). Our goal is to determine whether the two cohesion and diversity (social capital) have an influence on the project performance, measured distinctively as economic performance and quality. For both variables, we create two models. In Model 1, we examine the impact of the control variables on the performance of single projects. In Model 2 we include the variables that directly speak about the explanatory power of social capital resources on project performance, focusing our attention on Restriction and Range. In a final Model we entered the quadratic terms of the independent variables of theoretical interest, to test for a nonlinear relation between cohesion and diversity, and project performance which give answer to our hypotheses. Therefore our findings shows that higher net profit margins correspond to higher levels of economic performance, in contrast, the higher the percentages of quality problems encountered, the lower are the levels of quality achieved. One concern with network data is that the observations may be interdependent, because each actor in the network appears in multiple dyads. Using network data the requirements of OLS with regard to the distribution of error terms may not be met.

Ta OLS estimation.

	Economic performance			Quality problems		
Variable	Model 1	Model I2	Model 3	Model 1	Model 2	Model 3
Constant	0.33 * (0.14)	0.45 * (0.23)	0.45 * (0.24)	−0.24 * (0.12)	−0.36 * (0.12)	−0.33 * (0.11)
Duration	0.27 ** (0.08)	0.29 ** (0.09)	0.26 ** (0.08)	−0.44 ** (0.13)	−0.46 ** (0.15)	−0.41 ** (0.13)
Dimension	0.12 * (0.05)	0.14 * (0.03)	0.16 * (0.04)	−0.24 * (0.09)	−0.24 * (0.12)	−0.25 * (0.12)
Network constraint		0.13 * (0.03)	0.17 * (0.04)		−0.12 * (0.06)	−0.16 ** (0.07)
Network constraint			−0.18 ** (0.08)			0.13 ** (0.03)
Network range		0.22 * (0.08)	0.22 * (0.12)		−0.19 ** (0.11)	−0.18 * (0.08)
Network range			−0.18 * (0.07)			0.14 * (0.12)
R2 (adjusted)	0.328	0.344	0.354	0.425	0.435	0.439
NO projects	48	48	48	48	48	48

Robust standard errors in parentheses

* p<0.05

** p<0.10

In previous studies, in our models we estimated standard errors and significance using the random variation method for constructing sampling distribution of R-squared and slope coefficients (Snijders and Borgatti, 1999). Model 1 in Table 1 regresses separately the Economic Performance and the Quality Problems on the set of control variables. Overall, the results in a model of control variables show significant differences from a null model. Of the three control variables, two are significant. As expected, surveyed projects characterized by Duration and Dimension above the median are achieve higher levels of performance. This makes sense since duration indicates the previous experience developed at the project level, which in turn can influence the performance. Also the variable Dimension is positively and significantly related with performance. Therefore, , it is expected that projects composed of a large number of team members perform better, at least in terms of gross profit. Model 2 in Table 1 shows, the variables of social capital, on project performance expressed both as the percentage of the net profit margin on the total revenues and as the percentage of quality problems encountered and reported by project managers. The coefficient for Restriction is positive and significant, providing strong confirmation that the level of cohesion of projects' social capital within the organization has a positive effect on the level of performance that they achieve. It is true that cohesive relationships enable to transfer knowledge and share information among project units. Also the coefficient for Range is positive and significant, showing a positive relationship between the level of diversity of project social capital and the variable Economic Performance. This result implies that the creation of collaborative ties with other units operating in different areas of expertise enriches effectiveness of projects. In the third model, network hypotheses are tested. Hypothesis H1 proposed an inverted U-shaped relationship between cohesion of project units' social capital and their effectiveness. To support an inverted U-shaped relationship, the coefficient estimates for Restriction should be positive and the estimates for Restriction squared should be negative and significant. But, the expectation is reversed for the quality project performance. The results in Model 3 in Table 1 show that, for both the variables considered, that the project performance was maximized, suggesting support for the hypothesized inverted U-shaped curvilinear relationship between the level of cohesion of project social capital and project effectiveness. Also, for the dependent variable Economic Performance the coefficient for Restriction is positive and significant, and the coefficient for Restriction squared is negative. On the contrary, for the variable labeled Quality Problems the coefficient for Restriction is negative and

significant, and the coefficient for Restraction squared is positive and significant. These findings support the hypothesis that cohesion of projects' social capital within the organization has a positive, and then a negative, effect on the level of performance that they achieve.

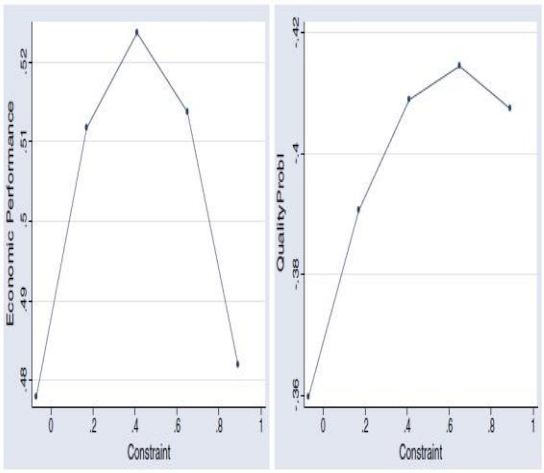

Fig. 1. Predicted project performance and network constraint (NC).

Fig. 1 shows that as we increase the level Restriction of the Economic Performance at first grows, but thereafter reaches a maximum and begins to decrease gradually. Fig. 1 also shows that as we increase the level of restriction the Quality Problems at first decrease but, once past the minimum, begin to increase. Model 3 in Table 1 adds also the variable labeled Network Range in order to test our Hypothesis H2 that relates to the diversity of each project's social capital. In this case, we proposed an inverted U-shaped relationship between Range and performance for single projects. Table 1 show that when the variable measures projects' quality problem were considered the variable Economic Performance is coefficient for Range and is positive and significant and the coefficient for the same variable squared is negative and significant. Vice versa, the coefficient for Range is negative and significant and the coefficient for Range squared is positive and significant. These results support hypothesize inverted U-shape curvilinear relationship between the diversity of project social capital and project performance.

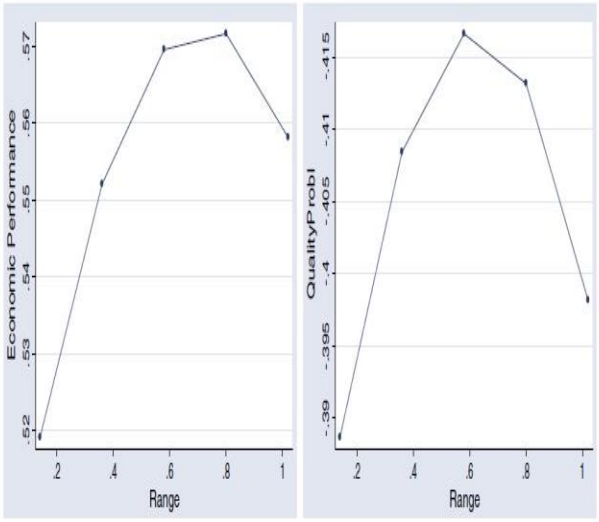

Fig. 2. Predicted project performance and network range (NR).

As shown in Fig. 2, results implies that creation of collaborative ties with other units operating in different areas of expertise enriches effectiveness of projects, there are also costs for projects which seek other units to add and integrate new know-how to their knowledge stock. As further collaborative ties which cut across areas of expertise boundaries are added, the cost of assimilating, absorbing, and combining diverse information eventually begins to outweigh the benefits.

5. DISCUSSION

We emphasized that the members of a project can engage in formal or informal socializing relationships with people within and outside their unit. These all represent different types of ties through which project social capital flows. We analyzed the structural properties of social relationships among individuals affiliated with 48 projects relating to an organization operating in the construction industry, focusing in particular on the properties of cohesion (Coleman, 1988) and diversity (Reagans and Zuckerman, 2001). Our findings shows that a positive relationship between the cohesion of projects' social capital and their effectiveness. It follows that cohesive ties can also generate redundant information, less diversified knowledge and scarce novelty (Burt, 1992) which, we suppose, influence project effectiveness negatively. Our empirical results show a quadratic U-shaped curvilinear relationship between the cohesion

of project social capital and project performance, demonstrating that intermediate levels of cohesion maximize project performance. Diversity relates to the areas of single projects and project members: it is shown that although heterogeneity enhances the capacity for creative problem-solving and allows individuals to share different sets of contacts, skills, information, and experiences, an excessive level of diversity featuring the project social capital decreases absorptive capacity, and in turn project performance. Results shows that there is a U-shaped curvilinear relationship between diversity of project social capital and project performance, showing that intermediate levels of network range maximize single project performance. To our knowledge, except in a few cases (Grabher, 2002a), there is a lack of studies exploring in an analytical way and through the use of empirical data the interdependences between projects and the network of personal relationships built around projects (Grabher, 2002a). In the present study we have examined how resources and knowledge are channeled through network relations that involve the project level. Although the effects of social capital have been studied at individual, group, and organizational level (Oh et al., 2006), there is a study on project social capital. Recent literature has shown that "the set of resources made available to a group through group members' social relationships within the social structure of the group itself, as well as in the formal and informal structure of the organization" as group social capital (Oh et al., 2006: 570). Our notion of project social capital, however, is introduced to compete with that of group social capital, and adapt and expand it to the specific context in which PBOs operate and perform. Therefore, projects are formed by multiple members who are engaged in frequent communication with other individuals within and outside the group. But projects often involve people working together on complex innovative tasks for a well-defined limited period of time. It is seem that projects will become highly embedded in a set of project-specific relationships in addition to those that their individual members develop. Also our construct of project social capital differs from organizational social capital, defined as a distinctive organizational resource reflecting the character of social relations within the firm (Pennings and Lee, 1999). We use this project- definition, because it is show how social capital contributes both to resources and information generation and their appropriation with project-based organizations, where employees likely engage in social activities either inside or outside of the workplace (Bresnen et al., 2004). As a result, whereas social relations produce benefits that directly affect single projects, the extension of such benefits to the whole organization will depend on the capability to further manage such social relations beyond the duration of the project. In this situation, project social capital might be incorporated, and turned into, organizational social capital. Our findings have important managerial implications as well. They may be helpful for project leaders and individuals who manage people working in project-based contexts, because they provide important insights about the management of inter-project exchange networks within organizations. Our results suggest that through an appropriate management of social capital, project units can increase coordination and knowledge integration, producing in turn high levels of performance at the project level. More specifically, the social capital is reducing the number of quality problems, which are some of the main causes of additional costs in construction projects.

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