

# A Social Network Theory of Stakeholders in China's Project Governance\*

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## ABSTRACT

*A project, especially for one in China, usually involves many organizations and each organization may have multiple projects. There is a clear social network relationship between these stakeholders in a project and the stakeholders' behaviors are also subject to the structure of the social network. Based on an analysis of the social network, as a methodology that can be used to explain the relationships among project organizations, as well as an example of large-scale information system project in China, we construct in this article a way to establish the social network of governance structure, study network configurations and analyze some representative governance strategies adopted by stakeholders in China. By examining the network of project governance, we can predict the trend of the project governance structure and study the risk based on the structure.*

**Keywords:** Project Governance, Governance Strategies in China, Social Network Theory, Risk

## 1. Introduction

A number of researchers have discussed project governance theory [1]. Those developing project governance theory have concentrated on the commercial contracts that are considered to be the basis of current project governance structure in China. However, for Chinese people, business contracts cannot resolve many problems of social relationships, in part because the personal relationships in Chinese society are considered to be basis of economic and social organizations and have a high priority even in public affairs. If we ignore these social relations, project governance cannot achieve good results.

In China's large-scale projects, project governance structure is a multi-organizational network structure involving the owner, the construction companies, the supervision organization and other stakeholders [2]. One approach for understanding multi-organizational relationships is using approaches from social network analysis to examine characteristics of entire organizational relationship structures and their impact on organizations' activities. Employing social network analysis can effectively manage inter-organizational coordination as it will provide a better understanding

of networks through measuring relationships between different actors in the network. The theory's logic is derived from Scott's [3] examination of relationships among several kinds of organizations. This paper argues that we can describe the social relations among stakeholders based on social networks in project governance and the entire and individual characteristics of the stakeholder network affect the stakeholder strategies. For this aim, this study contributes to project governance research by providing a procedure for explaining the multi-organizational network structure of stakeholders and some typical organizational governance strategies based on project governance structure, which can improve the feasibility of foreseeing governance risks in China's projects.

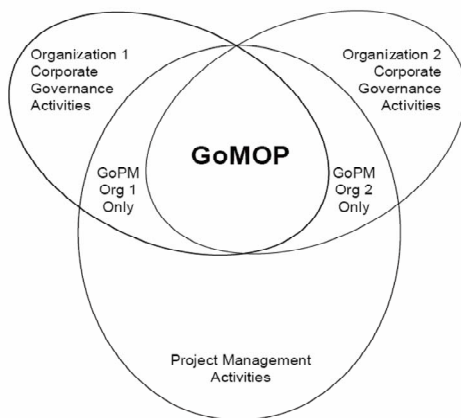
## 2. Literature Review

A number of scholars in the field have enhanced the project governance theory and the theory development has centered around two related branches: 1) defining the project governance concept and 2) studying guidelines to provide an understanding of relationships among stakeholders. Turner [4] was one of the first to analyze the nature of project governance explicitly with conceptual modeling including premises, lemmas, inherent elements and roles. He summarized that "governance is defining the objectives, the means of obtaining them and

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the means of monitoring performance". APM (Association of Project Management) proposes a guideline for governance of multi-owned projects (GoMOP) (as shown in **Figure 1** [5]). It emphasizes the establishment of decision-making and reporting mechanisms, which can enable the managers of each organization to realize the reasonable responsibility. Several authors [6,7] have treated the governance theory as the foundation to propose the conceptual framework that includes stakeholders of project governance in some projects. Their efforts have led other researchers to realize that the project governance theory potentially could explain the structure and operations of multi-organizational coordination in projects [8].

Governance structure and strategy are key elements of project governance. The project governance structure is cooperation among a number of stakeholders and network governance decision-making by members is based on the network structure they are embedded. Using multi-level analysis, Lovell [9] discusses the forms of capital, social network characteristics and other institutional factors and their impact on the members of the network. Thus, we can investigate social networks to comprehend the stakeholders' governance strategy [10,11]. There are many different types of governance strategies, in China and a faction is very typical that draws great attention. Research indicates that the relevant stakeholders will join to obtain the necessary resources [12]. Vilanova's [13] short term salient stakeholder theory also believes that managers tend to collude with a strong stakeholder. Taking those studies, extant research has proposed the embryonic form of project governance, which concentrates on the preliminary framework for project governance elements but does not give a method of meeting the framework. A project governance theory, however, requires not only an understanding of the theoretical frameworks of stakeholder



**Figure 1. Governance of multi-owned projects.**

relationships but also how to describe and analyze those relationships.

Researchers increasingly are using social network analysis in a broad range of different fields as well as in management [14]. By developing models for two sets of organizational network data, Robins *et al.* [15] analyze an assessment of a trust network within a training group and a work difficulty network within a government instrumentality. Granovetter [16] states that social actors are embedded in a relational system, and one must conceive of this relational context to understand their behaviors. The Chinese culture is particularly focused on social networks. The basis of social order in China is different from American society and it is based on its strong network of relationships rather than the network of weak ties. The explanation of the formation of this difference can only rely on the historical traditions of different social structure [17]. In large-scale projects in China, state-owned enterprises and large enterprises pay more attention to local government, authorities and other similar stakeholders to create social networks. This is because in China, members with great scarce resources are mainly the media and government agencies. Furthermore, in the transaction process, the Chinese people tend to use trust rather than formal power, which makes the trust relationships become a key part of the governance structure.

Nohria and Eccles [18] provide some basic reasons for taking a network perspective. Social network analysis can effectively manage inter-organizational coordination as it provides a better understanding of networks through measuring relationships between different actors in the network. It is helpful to explain implicit contradictions, risks, change of roles and the impact of related dynamics on the project in governance structure. Thus, we propose using social network analysis to cope with challenges faced by enterprises in China's project governance.

### 3. Methodology

Several researches are increasingly incorporating a network-based perspective in their analyses and formal measures of the development of social networks models have been developed by social network theorists [19]. The methodology of the study follows those network analysis logics. In the first step, researchers familiarize themselves with the background and form an image of the series of the project stakeholders in China. Next, the researchers collect rational data and form an adjacency matrix for relationships among stakeholders that can lead to the social networks of project governance. After forming the social networks, a special focus is given to stakeholders with prominent network positions. Those stakeholders are analyzed in-depth, which involve em-

beddedness in the entire network, different kinds of the individual indexes (three kinds of centralities) and structural holes analysis. As a part of the analysis, we will provide some initial thoughts on the stakeholder strategies in the project governance social network, and it will become possible to form an evolution of the social network. Finally, the identified response strategies and network evolution should be discussed, and their effect on performance of project governance will be searched.

### 3.1. Social Network Model for Project Governance in China

Probably most commonly, the boundaries in China's large-scale project are those imposed or created by the actors themselves. All the members of stakeholders related to the project governance can constitute a population. Fortunately, in China's large-scale project, the limitations on the number of strong ties that a great number of actors have are helpful to find the boundaries. The snowball technique is a helpful approach for accurately defining network boundaries and collecting relational data [20,21]. The method can be particularly useful for tracking down "special" populations, and many multi-organizational structures can be pretty effectively located and described by it. Researchers outline a focal actor or a set of actors (the initial samples) and the initial samples' ties to other actors are collected. All the actors named (who were not included in initial samples) are added to the samples and asked for their ties. Then we need to use the same method to find contacts of their named actors [22]. The survey continues until the new actors being named are very marginal to the project governance group. Because proper initial nodes can strengthen the snowball approach, one issue is where we start the snowball rolling. In China's project governance, a natural starting point is the key actors like the sponsor who starts the project and supervision organization who is responsible for the project governance performance.<sup>1</sup>

The various nodes in the social network graph are different stakeholders. The most widely accepted definition of stakeholders is Freeman's definition that "any group or individual who can affect or is affected by the achievement of the organization's objectives [22]". In China's large-scale project, stakeholders can be classified into several categories: the demand explorer, the plan maker, actors who achieve the plan, the supplier, the monitor and the delivery user. Considering the enormous number of stakeholders involved within the project, these stakeholders can be described as relevant enterprises, institutions, departments and so on. The social network diagram of project governance in China's large-scale

<sup>1</sup>As an alternative approach, the data collection can also use triangulation method [23].

project supervision should be a directed graph. In directed networks, connections between nodes are described as ties that originate from one node and point toward another [24]. The project governance network we study is a multi-relational network, but no matter what form of relationships, the expression methods of the network are similar. Thus, this article will use a single arc as a comprehensive expression of different ties between stakeholders. The establishment of social networks in China's project governance requires not only the direction of the arc but also a value of the arc, which is part of overall social network architecture. The weight may be specific values, such as the amount of funding, personnel and so on, which should reflect the richness of the resources that the relationships convey [25]. In general, they express a demander's identification of suppliers' importance. To keep the analysis clear, we can use a binary network where the weight of a present tie is set equal to one and the weight of an absent tie is zero.

### 3.2. Measures in the Analysis and Their Implications in China's Project Governance

Positions and embeddedness of organizations in the network influence organizations' behaviors and outcomes [26]. Jawahar and McLaughlin [27] assert that firms will use different strategies to manage different stakeholder groups.

Density expresses tightness of the link between various stakeholders, and it can be defined as the sum of the ties divided by the number of possible ties. The density of a network may provide insights into the speed at which information diffuses among the stakeholders, and the extent to which actors have high levels of social constraint. Closely linked networks become an important force in limiting stakeholders' development [28]. For China's large-scale project supervision, as strategies adopted by stakeholders largely depend on the network structure, there is little chance for them to adopt revolutionary strategy which strongly affects the whole network in a closely linked network. As a result, powerful stakeholders will tend to increase density to maintain the existing status. The second measure is centralization. Centralization may express the degree of inequality or variance in a network as a percentage of that of a perfect star network of the same size. If centralization is high, we can explain that the network has a focus of power. The power distribution in the network is relatively uneven. Therefore, a high centralization can lead to unstable network structure. To regulate relationship between stakeholders in China's large-scale project supervision, decrease of centralization may be a good choice. The third measure is centrality. Though the definitions of what it means to be at

the center differ, each of the three approaches can analyze the locations of individuals in terms of how close they are to the "center" of actions in a network. We can explain centrality in China's project governance field as follows: degree centrality measures the existence of intensive transactions at the location of specific stakeholders; closeness centrality expresses the stakeholders' capacity to share information and other resources in the network; betweenness centrality is to measure the stakeholders' control of information and other resources in the network. Furthermore, Ronald Burt coined and popularized the term "structural holes" to refer to some very important aspects of positional advantage/disadvantage of individuals that result from how they are embedded in neighborhoods. These holes and how and where they are distributed can be a source of inequality among stakeholders embedded in networks [29].

There are some representative governance strategies based on what is measured in the analysis adopted by the stakeholders in China's projects. 1) Contention for a central position in the network: the structure of large-scale project in China describes a relatively dense institutional context controlled by some stakeholders, which increasingly extend their powerful character and hold important network resources on the one hand, and on the other hand a group of others stakeholders (usually not the government), which draw a very small part of network resources. So, based on the acquired powerful competitive advantages, central stakeholders reinforce their dominance and position as dominant players in the project. To analyze this kind of strategies, we can refer to centrality that indicates the degree to which a stakeholder has succeeded in developing a dominant position in the overall network of multi-organizational partnerships. 2) The emergence of alliances: in large projects in China, lots of organizations want to enhance power and deal with pressure from other stakeholders by allying with their stakeholders [30]. A faction not only affects behaviors of members within the faction, but also affects the performance of the overall project governance network. As this strategy can greatly increase the alliance's power, in some cases, stakeholders may intentionally or unintentionally control other stakeholders to strengthen their own positions and put project governance at risk. (3) Occupying a vantage position in the network: in China's projects, stakeholders want to find and occupy a bridge or a cut-off point to control information and other resources. The method to find a bridge or cut-off point is as follows: if two groups are linked by the only relationship, this relationship can be defined as a "bridge" [31]; cut-off points are some individuals in

the overall network who play an important intermediary role; if we remove them, the overall network may be divided into two or more sub-networks. Furthermore, broker can also be a vantage position in the network for it examines ego's relations with its neighborhood.

## 4. Case Analysis

In this section, we employ network methods, including network visualization, centrality of position, centralization and structural holes, to describe the structural properties of inter-firm partnerships and examine the role and the influence of particular stakeholders based on the inter-firm partnerships in the China's large-scale project over three periods.

### 4.1. Case Background

Large-scale water resources information system project in China adopts the supervision system. A total investment of the project is 0.802 billion RMB, including the national investment of 0.571 billion RMB. Major tasks of the project are: to build the backbone network system between Ministry of Water Resources and provincial water administrative departments, to construct hydrological information collection systems in essential areas and to improve some important flood warning communication systems. Though it is performing well on the surface, but how to analyze the complex relationships among stakeholders and is there any risk we have to forecast?

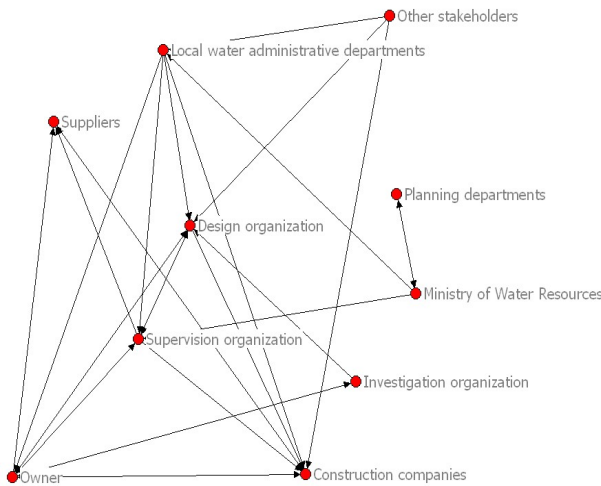
### 4.2. Data Gathering

In our studies, it is helpful to begin snowball searches with the supervision organization and the owner, for they are key stakeholders in the project. The stakeholders supported our investigation, which is conducive to the use of local knowledge to build models [32].

According to the network adjacency matrix, we used the software called NetDraw to get network expression of the project (**Figure 2**). Arcs in the figure indicate relationships from a stakeholder to the other stakeholder, such as arc from the Ministry of Water Resources to supervision organization indicates that the Ministry of Water Resources approves the qualifications of the supervision organization. To explore how to comprehend stakeholders' strategies through analysis, the software called Ucinet will be used to calculate indicators in social network analysis.

### 4.3. Network Configurations

The density of the whole network is 0.3111. That is 31.11% of all the possible ties are present. The overall network centralization is not high. In the project, the



**Figure 2. The network of large-scale water resources information system project in China.**

out-degree graph centralization is 27.16% and the in-degree graph centralization is 39.51%. That means stakeholders who send information are significantly less compared to the stakeholders who use external information. Closeness centralization is not computed for unconnected graphs. According to the betweenness centralization measure, there are stakeholders with a strong ability to control information (16.15%).

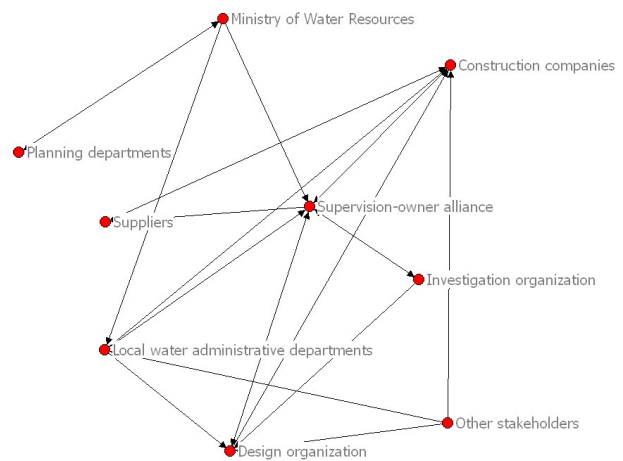
For each stakeholder, we calculate the measures of centrality. When we come to the degree centrality, the owner has the greatest out-degree (55.56%) and could be regarded as the influential stakeholder in the network. The construction companies are significant when we examine in-degree (66.67%). According to the closeness centrality, construction companies have a high inward closeness centrality (69.23%), which shows that the actors enjoy great independence from other actors' control. Ministry of Water Resources has high outward closeness centrality (37.50%), which shows it is less dependent than others in the project governance. The betweenness centrality reveals that the owner and Ministry of Water Resources are likely to exert influence on others.

Through structural analysis, we know that suppliers' tie to the owner is largely redundant, as 75% of ego's other neighbors also have ties with the owner. Supervision organization's tie to local water administrative departments is relatively redundant. And design organization and local water administrative departments are also embedded in their neighborhoods where there are not many structural holes. For supervision organization, the contact with the owner is of the strongest control (0.16) and requirements from the owner therefore will be difficult to evade. The supervision organization has an effective size of 3.50 and an overall constraint of 0.46.

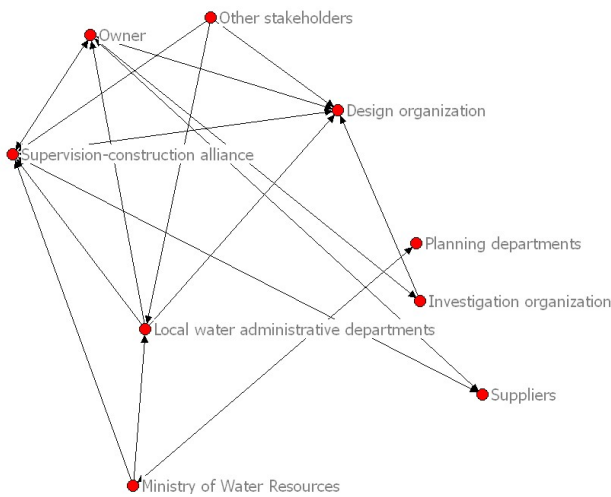
#### 4.4. Stakeholder Strategies: The Emergence of Alliances

After analyzing network configurations, we focus on the dynamics of the network. According to a comprehensive analysis of the results, the owner and the construction companies have become the center of the large-scale project supervision in China, with great power. Supervision organization in the project has relatively small rights and weak power. As it is easy to be affected by construction companies, while there is a dispute, the court can not accept evidence from supervision organizations because of their improper relationship with construction companies. Project supervision system in China has become nominal in part [33]. In this case, the owner usually exerts influence on the supervision organization or even allies with supervision organization for its own interests. Supervision organization's strategy choice is closely related with the construction companies, so the powerful construction companies also hope to achieve great control over network resources through alliance with supervision organization. Then we can see the networks under these different strategies (as shown in **Figure 3** and **Figure 4**). While the initial network of large-scale water resources information system project in China is named model 1, model 2 indicates the social network when supervision organization and the owner adopt an alliance strategy and model 3 is the social network after supervision organization and the construction companies become an alliance. For each period, we give the measures of density and centralization, and the three types of centrality.

**Table 1** illustrates the density and centralization measures for the three periods of analysis. When super-



**Figure 3. The network of large-scale water resources information system project in China when supervision organization and the owner adopt an alliance strategy.**



**Figure 4. The network of large-scale water resources information system project in China when supervision organization and the construction companies adopt an alliance strategy.**

**Table 1. Statistics for the whole network.**

Index	Model 1	Model 2	Model 3
Density (matrix average)	0.3111	0.2917	0.3056
No. of Ties	28.0000	21.0000	22.0000
Standard deviation	0.4629	0.4545	0.4606
Degree Network Centralization			
Out-degree	27.160%	23.438%	21.875%
In-degree	39.506%	37.500%	50.000%
Closeness Network Centralization	-	-	-
Betweenness Network Centralization	16.15%	24.22%	14.51%

Note: “-” indicates index that is not exist in a network. The same below.

**Table 2. Degree centrality measures for all networks—values expressed as factors (centrality × 100).**

Stakeholder	Model 1		Model 2		Model 3	
	Out-degree	In-degree	Out-degree	In-degree	Out-degree	In-degree
Supervision-owner alliance	-	-	50.00	62.50	-	-
Supervision-construction alliance	-	-	-	-	37.50	75.00
Supervision organization	44.44	44.44	-	-	-	-
Investigation organization	22.22	11.11	25.00	12.50	25.00	12.50
Design organization	33.33	55.56	25.00	50.00	25.00	62.50
Suppliers	11.11	33.33	12.50	25.00	12.50	25.00
Construction companies	22.22	66.67	25.00	62.50	-	-
Owner	55.56	55.56	-	-	50.00	50.00
Other stakeholders	33.33	0.00	37.50	0.00	37.50	0.00
Ministry of Water Resources	33.33	11.11	37.50	12.50	37.50	12.50
Local water administrative departments	44.44	22.22	37.50	25.00	37.50	25.00
Planning departments	11.11	11.11	12.50	12.50	12.50	12.50

vision organization and the owner adopt an alliance strategy in the social network, density and the degree network centralization show a slight decrease while the betweenness network centralization shows a slight increase. When supervision organization and the construction companies adopt an alliance strategy, the density has slightly decreased; the inward degree network centralization in the network has significantly increased.

The remaining central stakeholders change from the first period to the two subsequent periods. In **Table 2**, when supervision organization and the owner adopt an alliance strategy in the social network, the construction companies as a power center still have a high inward degree centrality (62.50%). At the same time, the supervision-owner alliance has become the center of exchanges (50.00%, 62.50%). When supervision organization and the construction companies adopt an alliance strategy, in contrast to the second period, the centrality measure shows that the supervision-construction alliance is of large trading capacity (37.50%, 75.00%). In **Table 3**, when supervision organization and the owner adopt an alliance strategy in the social network, Ministry of Water Resources, planning departments and the other stakeholders still enjoy a high closeness centrality. It shows that the governance strategy doesn't affect independence or effectiveness of information transmission much among them. When supervision organization and construction companies adopt an alliance strategy, the supervision-construction alliance becomes a powerful and independent governance decision maker (80.00%, 19.51%). In **Table 4**, when supervision organization and the owner adopt an alliance strategy in the social network, Ministry of Water Resources strengthens its ability to effectively control other actors (10.71%). A joint strategy improves the supervision alliance's capacity of resources

**Table 3. Closeness centrality measures for all networks—values expressed as factors (centrality × 100).**

Stakeholder	Model 1		Model 2		Model 3	
	In-closeness	Out-closeness	In-closeness	Out-closeness	In-closeness	Out-closeness
Supervision-owner alliance	-	-	72.73	20.00	-	-
Supervision-construction alliance	-	-	-	-	80.00	19.51
Supervision organization	60.00	19.57	-	-	-	-
Investigation organization	40.91	18.75	44.44	19.05	40.00	19.05
Design organization	60.00	19.15	57.14	19.05	66.67	19.05
Suppliers	56.25	17.31	53.33	17.78	53.33	18.18
Construction companies	69.23	18.75	66.67	19.05	-	-
Owner	64.29	20.00	-	-	61.54	20.00
Other stakeholders	10.00	28.13	11.11	28.57	11.11	28.57
Ministry of Water Resources	11.11	37.50	12.50	40.00	12.50	38.10
Local water administrative departments	14.06	23.68	16.33	23.53	16.33	23.53
Planning departments	11.11	29.03	12.50	30.77	12.50	29.63

**Table 4. Betweenness centrality measures for all networks—values expressed as factors (centrality × 100).**

Stakeholder	Model 1	Model 2	Model 3
Supervision-owner alliance	-	27.68	-
Supervision-construction alliance	-	-	19.05
Supervision organization	9.26	-	-
Investigation organization	0.00	0.00	0.00
Design organization	3.01	2.08	2.08
Suppliers	0.00	0.00	0.00
Construction companies	8.80	10.12	-
Owner	20.37	-	16.96
Other stakeholders	0.00	0.00	0.00
Ministry of Water Resources	9.72	10.71	10.71
Local water administrative departments	7.18	4.76	6.55
Planning departments	0.00	0.00	0.00

control (27.68%). When supervision organization and the construction companies adopt an alliance strategy, the supervision-construction alliance gains much benefit; it is in the core of the network, with great power (19.05%).

It is noticeable that in the large-scale projects in China, the project network has a low density and decentralized centers of power, which can be explained by China's present status. In China, the supervision system is incomplete. Supervision quality is not high and a lot of supervision organizations only know engineering knowledge and cannot control the project. Furthermore, stakeholders may take a specific governance strategy to obtain some individual benefit. But if a particular individual has imposed influence on others that is not conducive to the overall project interests, the rationality of the project governance structure will be affected and thus make the

overall project face a high risk.

## 5. Discussion

Study of social network analysis in project governance, especially in China, is a new field, so we see our work as a starting point. Obtaining more details about it requires that attention be given to several issues. First, the model is prescribing some typical strategies that stakeholders are likely to adopt under the conditions specified in China's project. Research into other evolution patterns seems necessary to understand the actions of various stakeholders based on network structure. That may be the subject of our next paper.

A second issue to consider is how to use value ties to express relationships among stakeholders in the network. In the social network data set of China's large-scale project, relations among actors that are quite relevant to our study are information transmission. This is because most decisions can be made based on project governance information. According to the system theorist, information is non-conserved and is considered to be key factor in the project governance process. So if we want to emphasize the weighting of relationships based on information, application of tools in Information Theory may be a good choice.

## 6. Conclusions

We have studied project governance in China using the social network theory and presented a case study using this approach. The study makes a contribution to the analysis of China's project governance as follows:

First, we have demonstrated the viability of analyzing China's project governance based on SNA (social network analysis) and a social network model for project

governance in China was devised. We propose that the project governance structure in China be conceptualized as a social network of relationships among stakeholders. We discuss the availability and practical values of social network analysis in project governance, study the relationship between social networks and stakeholders' strategies and show their effect on project governance.

A number of important structural configurations in China's project governance associated with some representative governance strategies (such as coalition) were identified and quantified using SNA. Network density, centralization, stakeholder centrality and structural holes were proposed as the appropriate SNA measures for the stakeholder strategies and network evolution study of the governance of China's projects. Some study suggested that "the advantaged party may use differentials to further entrench its position and modify institutional structures to its advantage" [33]. Our study offers additional evidence to the research that stakeholders are more likely to collaborate with others. The collaboration strategy is likely to be suggested by relatively powerful stakeholders.

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