

A PROJECT-LEVEL CONCEPTUAL FRAMEWORK FOR PRIVATELY FINANCED INFRASTRUCTURE IN THE PEOPLE'S REPUBLIC OF CHINA

Reginald MACDONALD¹, Kazumasa OZAWA², Masahiko KUNISHIMA³

¹ Member of JSCE, Ph.D. Candidate, Dept. of Civil Eng., The University of Tokyo (7-3-1 Hongo, Bunkyo-ku, Tokyo T113-8656, Japan)

² Member of JSCE, Ph.D., Associate Professor, Inst. Of Environmental Studies, The University of Tokyo (7-3-1 Hongo, Bunkyo-ku, Tokyo T113-8656, Japan)

³ Member of JSCE, Ph.D., Professor, Inst. Of Environmental Studies, The University of Tokyo (7-3-1 Hongo, Bunkyo-ku, Tokyo T113-8656, Japan)

ABSTRACT

This paper introduces a conceptual framework to comprehend project-level organization for PRC privately financed infrastructure projects. The framework is composed of three dimensions: ownership (residual claims on positive income), risk (residual responsibility for negative income), and control (effective authority and ability to influence decisions). For each dimension, subjective values are assigned based on organizational structures, as well as timing, priorities, and abilities of project sponsors. Application of the framework to actual projects shows a range of organizational structures, and indicates that, within the macro-boundaries of economy, law and administration, project-level organization strongly influences incentives and governance for public and private sponsors, and ultimately project performance.

Key Words: *privately financed infrastructure, project-level organization, ownership, risk-bearing, control.*

1. BACKGROUND

The research began with the objective of collecting data related to projects financed under the official Build-Operate-Transfer (BOT) format promoted by the PRC central government; however, early in the data collection process it became clear that the Chinese situation is, in fact, much more complex. Instead of a clear, monolithic project finance and organization, a variety of project models with differing legal, financial, and organizational characteristics exists. The author collected data on specific projects based on surveys in the PRC, direct work experience at a private infrastructure investment fund in Hong Kong, and

extensive literature searches: this effort resulted in a Database of PRC privately financed infrastructure projects with information on 335 projects, of which 268 are currently operational or under construction. The next challenge was to formulate an approach to comprehend and compare the salient aspects of these projects.

2. STRUCTURE OF PRC PRIVATE FINANCED INFRASTRUCTURE PROJECTS

The structure of a privately financed infrastructure project fits Steinfeld (1998) and Barzel's (1989)

description of a “*complex bundle of control and possession claims*”. Projects are divided into numerous contracts for specific aspects, from financing to construction and operation, with each contract functionally separate and performed by a distinct party. Figure 1 provides a basic schematic of the contractual relationships comprising a privately financed infrastructure project. It shows the project company (the legal entity representing the project) at the core of the “nexus of contracts” that comprises a privately financed infrastructure project.

The project company “contracts” with its investors – public and private sponsors – to procure equity capital in return for the rights to residual income generated by the project. In addition, there are often lenders involved at the project level, providing debt capital to the project.

Contractors include the companies that perform peripheral contracts for the project, such as design, construction, and operation. Regulators monitor the project company on behalf of the general public. In some cases, there are contracts between the project company and the ultimate users of its products or services. In power and water plant projects, “offtake agreements” usually link the project company to contractual users.

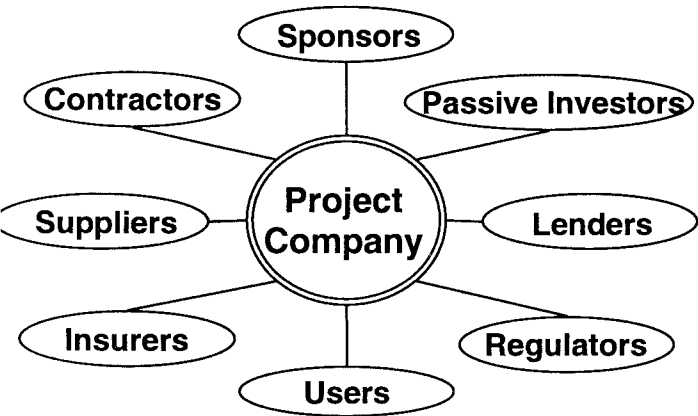


Figure 1 Basic Contractual Relationships in a Privately Financed Infrastructure Project

In actual projects, the contractual relationships between the various stakeholders are more complex than the simple organization show in Figure 1; however, the concept of multiple stakeholders connected to a project company in some way holds.

- First Typology - Legal

In the PRC, a first typology can be made based on the legal format of the project company. There are three basic forms for an economic enterprise in the PRC: two forms of Sino-Foreign Joint Venture (S-F JV) – Cooperative Joint Venture (CJV) and Equity Joint Venture (EJV), and Wholly Owned Foreign Invested Enterprise (WOFIE). Specifically for infrastructure projects, there is also an official Build-Operate-Transfer (BOT) format promoted by the central government on an experimental basis since 1995. In fact, regardless of how the projects are referred to legally, they are all basically “unofficial BOTs”: ventures whereby private sponsors invest in a project and have rights to manage aspects of it and receive dividends for a limited time period of 10 to 30 years.

The nexus of contracts for a privately financed infrastructure project undertaken on a Sino-Foreign Joint Venture basis is sketched in Figure 2:

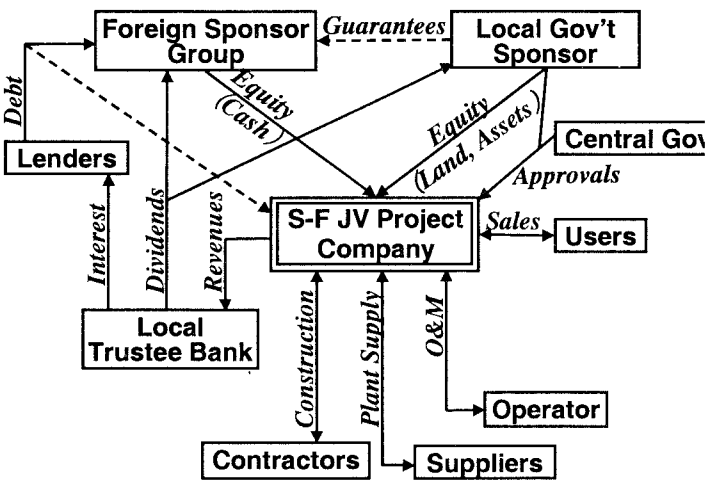


Figure 2 Basic Contractual Relationships in an S-F JV Infrastructure Project

Figure 2 provides a taste of the complexity of S-F JVs. The varying identities of the private sponsors, plus the multiple roles of the local government sponsor creates the possibility for myriad organizational permutations. The stakeholders and the contracts that bind them vary on a case-by-case basis, as private (foreign and domestic) investors

negotiate directly over the conditions of specific projects. Guarantees, preferential dividend payments, and a variety of special conditions often appear on S-F JV projects.

The organizational structure of an official BOT project is roughly similar to Figure 2, except that (1) the project company is 100% foreign-owned (i.e. a WOFIE legal format), with no local government equity investment; (2) there are no minimum return guarantees provided by local government; (3) peripheral contractors (construction contractors, plant suppliers and facility operators) are often partners in the project company; (4) debt is provided at the project on a “limited recourse” basis.

- Second Typology - Financial

A second approach to typology of Chinese privately financed infrastructure projects is based on source and mode of finance. Some project use “project finance” (also “limited recourse finance”), where project-level debt is provided by foreign commercial banks with recourse limited to the assets of the project. In addition, a variety of modes of “corporate finance”, from equity on foreign stock markets to high-yield “junk” bonds to corporate bank loans with recourse to the parent company, have been prevalent in PRC private infrastructure. Each mode and source of financing carries different conditions and constraints, fundamentally affecting project-level governance and incentive structures.

- Third Typology - Organizational

The challenge of understanding the fundamental characteristics of PRC privately financed infrastructure is deeper than the legal classification of CJV, EJV, WOFIE, etc.; Shapiro (1991) touches the core issue:

“The various forms of ‘foreign investment’ included in China’s open-door policy encompass organizational arrangements wider than those usually termed as ‘foreign direct investment’. Not only are there wholly-owned foreign invested enterprises (WOFIEs) and equity joint ventures

with a range of equity participation, but China has also welcomed the structuring of cooperative and contractual ventures ... The flexibility is such that sometimes these different forms are melded or linked so as to defy precise categorization.” (Shapiro 1991, p52)

Financing can provide a meaningful means of distinguishing different project structures, but does not directly help to comprehend project-level relationships among stakeholders.

In an attempt to compensate for the “blind spots” of the first and second typologies, the focus here is on project-level organization. It is proposed that infrastructure projects can be examined on the basis of a limited set of factors to determine their features and provide a framework for comparison. Such factors might include allocation of ownership, control and risk; presence of competition and degree of openness; sources of financing and return profiles; and a variety of other frames of reference corresponding to different aspects of privately financed infrastructure projects. The author focuses on three basic dimensions of organization – ownership, risk, and control – as the foundation for a conceptual approach for understanding privately financed infrastructure projects in the PRC.

3. FLOW OF CONCEPTUAL FRAMEWORK AND APPLICATION PROCESS

The flow of the conceptual framework’s development and applications consists of five steps:

Step 1: Select dimensions and define them for use in conceptual framework for project-level organization.

Step 2: Establish ranges for values of each dimension and project aspect for different sponsor types, project types, and timing.

Step 3: Consider each project in the Database. While keeping within the ranges defined in the preceding step, assign values with reference to specific project and the abilities and priorities of specific sponsors.

Step 4: Synthesize values for ownership, risk, and control to obtain triangular configurations for specific projects and phases.

Step 5: Examine patterns in triangular configurations as well as macro-factors of economic, legal & regulatory, and administrative environment, financing modes and sources of capital for their implications regarding project performance.

Step 1: Selecting & Defining Dimensions

The choice of ownership, risk, and control is initially made on the basis of the author’s experiences and observations, and later refined based on academic literature in the areas of economic organization, property rights, and Chinese transitional economics.

(i) **Ownership.** Ownership is defined as residual claims on positive income. Throughout, a word of advice regarding the definition of organizational ownership is kept in mind:

“... keep reality in touch: a constant inquiry as to ‘who owns what’ and what, precisely, it is that each party receives and concedes in a transaction.” (Barzel 1997, p14)

As for ownership in PRC privately financed infrastructure projects, the framework considers equity investment proportions of the project company, as well as of companies receiving revenues from peripheral contracts for design (technical study and facility design), construction, plant supply, and operation & maintenance. (Fig. 3) In doing so, the framework grasps the distinct ownership structures for different aspects of the project.

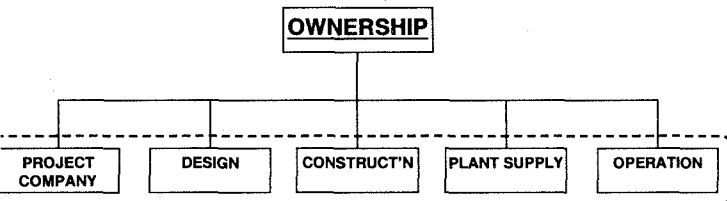


Figure 3 Framework for PRC Privately Financed Infrastructure Project OWNERSHIP

(ii) **Risk.** Risk-bearing is examined at the project level, focusing on “residual risk bearing”: that is, who is ultimately responsible for bearing the effects

of uncertain negative income. For PRC privately financed infrastructure, the framework examines modes for the bearing of market, counter-party, expropriation, design (technical study and facility design), construction, plant supply, technical operation & maintenance, exchange and currency conversion risks. (Fig. 4)

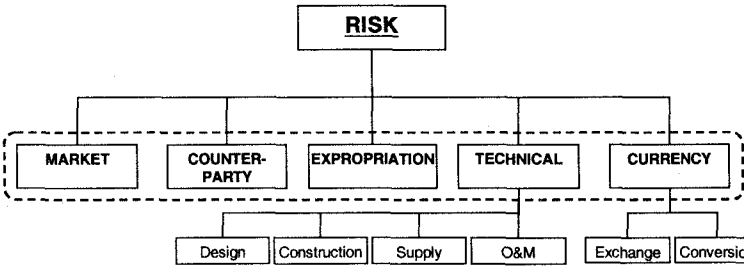


Figure 4 Framework for PRC Privately Financed Infrastructure Project RISK

(iii) **Control.** Control is defined as effective decision rights. Examined at the project level, effective control is analyzed using the “decision process” classification of initiation, notification, ratification, implementation, and monitoring. In addition, staffing concerns are considered, based on the observation that ultimate control in business is not only the processes of decision-making, but also the selection of people to control.

In PRC privately financed infrastructure, control over decision processes affecting each phase of the project – top level staffing, capital budgeting, design (technical study and facility design) financing (capital raising and pricing), construction (contractor selection and construction), plant supply, and technical operation & maintenance – are considered separately. (Fig. 5)

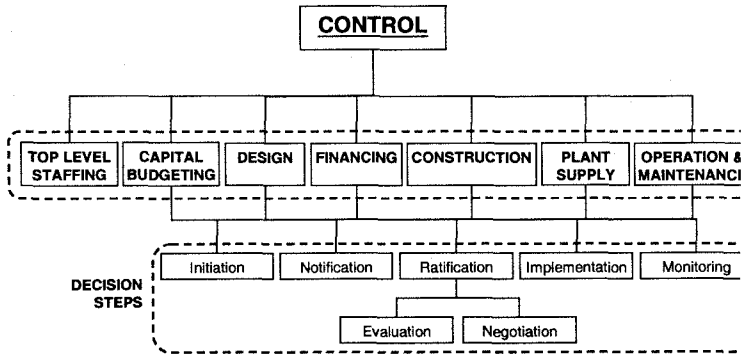


Figure 5 Framework for PRC Privately Financed Infrastructure Project CONTROL

Steps 2 & 3: Defining Ranges and Assigning Values

The next step of the analysis involves a thorough, qualitative evaluation of the organizational structures, types and timing of project investments, as well as of the strategies and abilities of the private sponsors and local governments involved. Ranges for the ownership, risk-bearing, and control values of each aspect are assigned, and then project-specific values are determined within these ranges.

For ownership, the question is relatively straightforward: “what revenues ultimately accrue to the private sponsor?” For risk, the ranges combine the issues of “what risks are ultimately borne by the private sponsor?” and “how large are the risks given the sponsor’s abilities and strategies and the type and timing of the project?” Control, the most complex aspect, considers: “what is the private sponsor’s level of influence over each step of the decision process for each aspect of project control?”

The ranges are established based on a subjective evaluation of project types and sponsor strategies. A subjective scale – ranging from “zero” (0%) to “low” (25%), “medium” (50%), “high” (75%), and “complete” (100%) – is used in evaluating organizational structures and strategies. Value ranges are presented corresponding to distinct sponsor groups and their organizational structures, including: H shares (provincial infrastructure sponsor companies listed on the Hong Kong stock exchange); municipal bond-type deals (where facilities are securitized by local government-controlled investment companies issuing corporate bonds overseas); red chips (conglomerate firms established in Hong Kong but directly controlled by mainland government authorities), passive foreign sponsors in S-F JVs, active foreign sponsors in S-F JVs, and official BOT / WOFIE projects. In each case, the analysis takes a specific perspective: for H Share-sponsored projects, the H share company; for municipal bond-like projects, the municipal government; for other S-F JVs, the red chip, foreign

passive or foreign active investor; for BOT / WOFIE projects, the foreign sponsor consortium.

After the value ranges for sponsor and project types are established, the framework is applied to specific projects in the Database. The same subjective scale is applied to specific projects with reference to: the specific sponsor firm, its abilities, priorities and strategies (as determined through interviews and industry literature); the legal structure of project (i.e. S-F JV, WOFIE, BOT, etc.); the project sector (i.e. road, power, or water); and the timing of the investment in the project’s life cycle (i.e. greenfield, from mid-construction, or after completion). The three values – total ownership, total risk-bearing, and total control – are aggregated from the component values addressing each aspect of each project.

Step 4: Synthesizing & Displaying Organizational Configurations

Once these values are assigned, they can be displayed at the micro-level as radial graphs and sub-graphs for each dimension. For each dimension, the values are combined by simple average until the “total” values for project level ownership, risk, and control are obtained.

Ownership values are assigned to each project considering the identity of peripheral contractors and the equity proportions in the project company.

Control values are assigned for each project aspect with reference to Jensen & Meckling’s decision framework of initiation, notification, ratification, implementation, and monitoring, then combined to yield a single control value for each aspect of each project. (Fig. 6) In Figure 6, the central graph shows the average control values for proposal, design, capital raising, contractor selection, building, and operation & maintenance.

Risk values are assigned to quantify the level of risk borne by the private foreign sponsor in the categories of demand, counter-party, expropriation, construction, operation, exchange rate, currency conversion, approval delay, and approval penalty

risks. (Fig. 7) Expropriation, approval delay, and approval penalty risks are combined to yield a Political Risk value; exchange rate and currency conversion risks are averaged to yield a Currency Risk value.

Synthesis of Internal Organization. Finally, the

radial graph values for ownership, risk, and control are averaged to yield three aggregate values – total ownership, total risk, total control – for each project. (Fig. 8) In addition, it is possible to apply the same procedure to specific project aspects, such as construction or O&M.

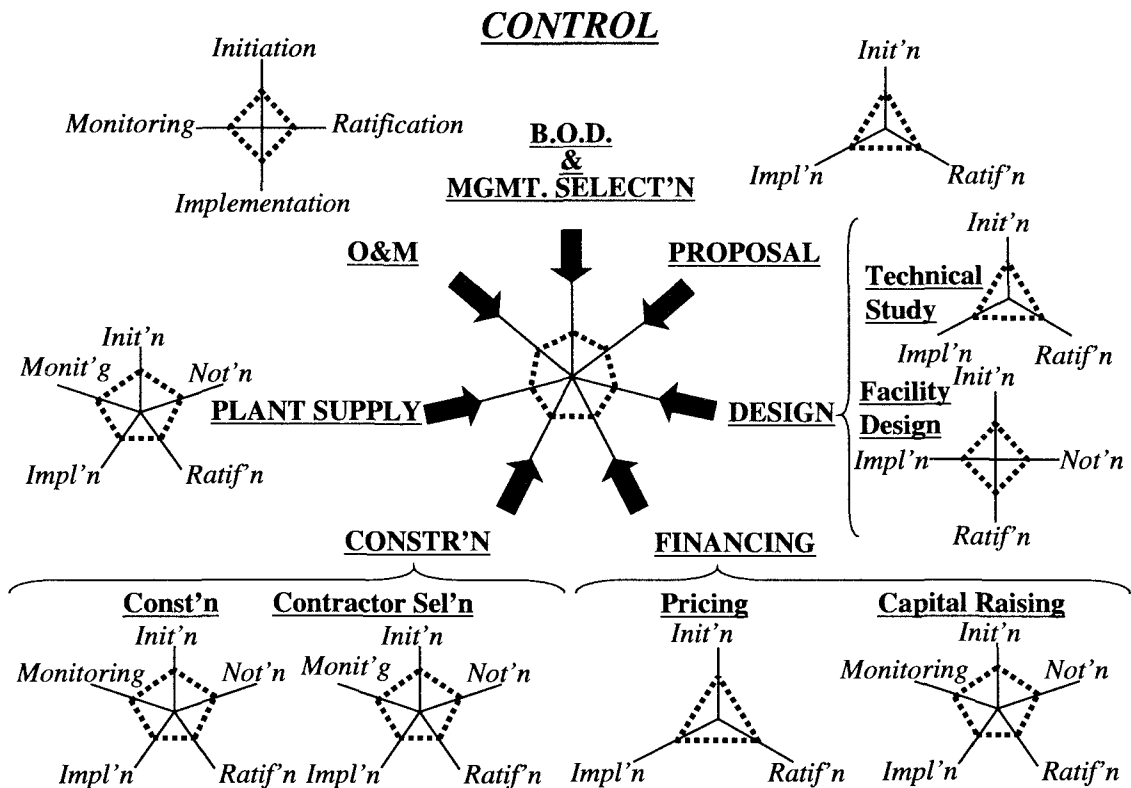


Figure 6 Control Diagram Components & Structure

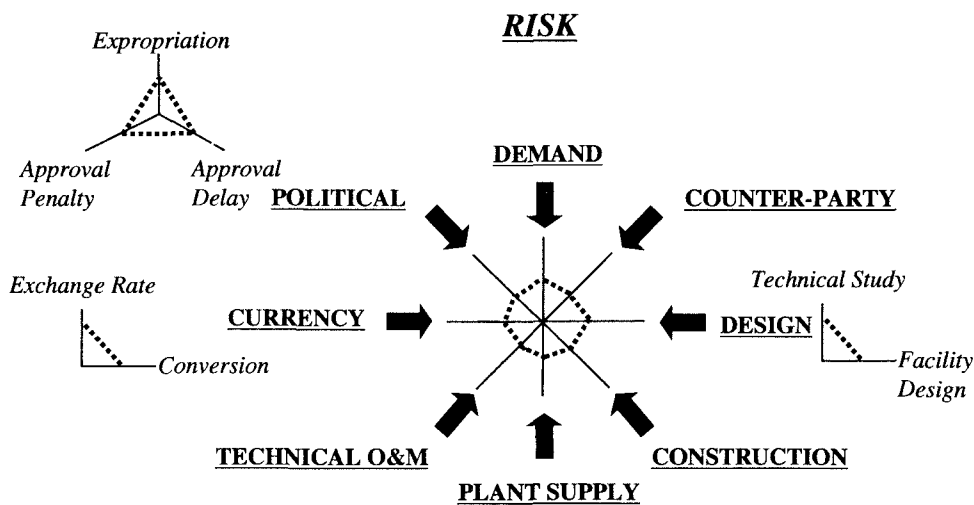


Figure 7 Risk Diagram Components & Structure

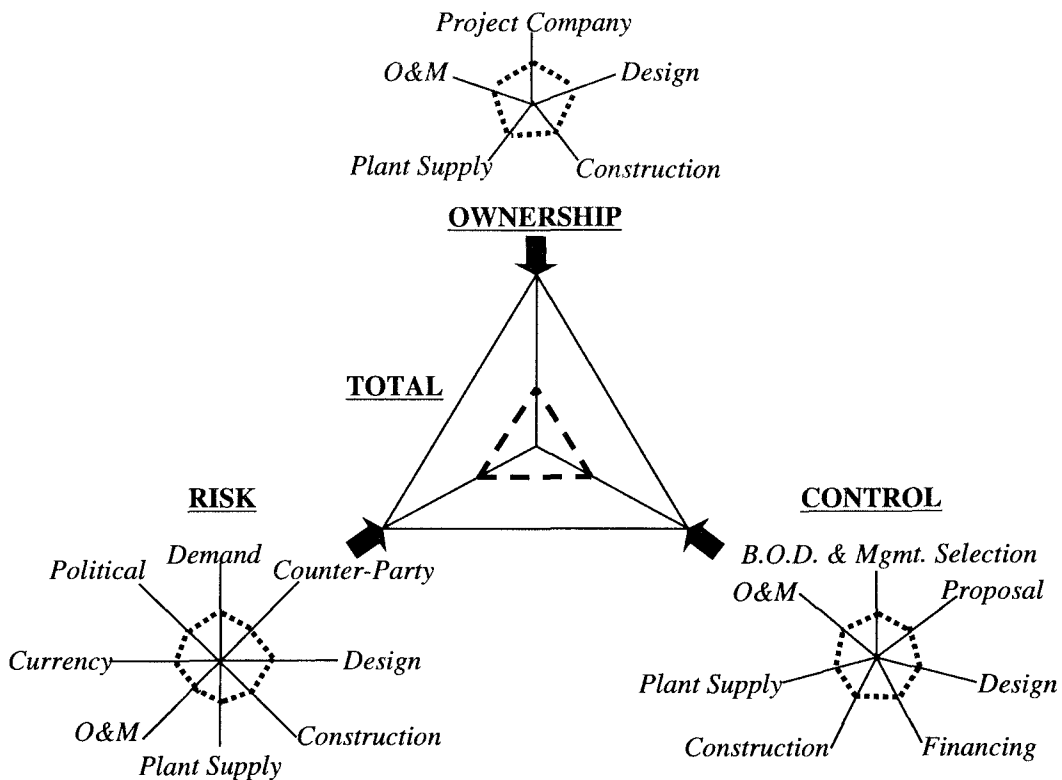


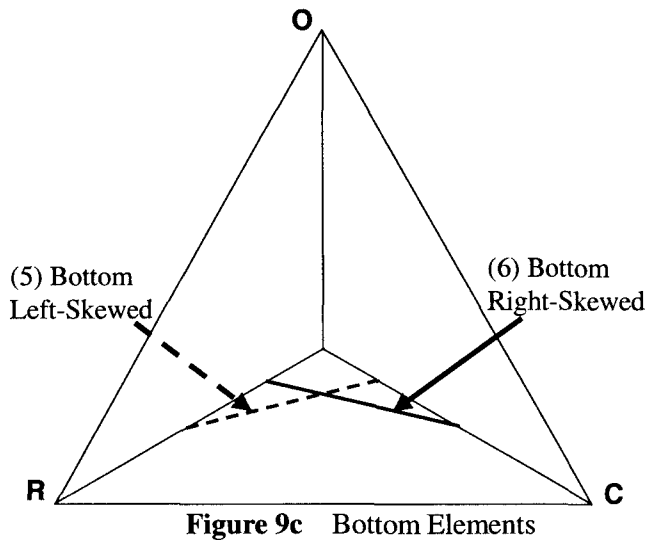
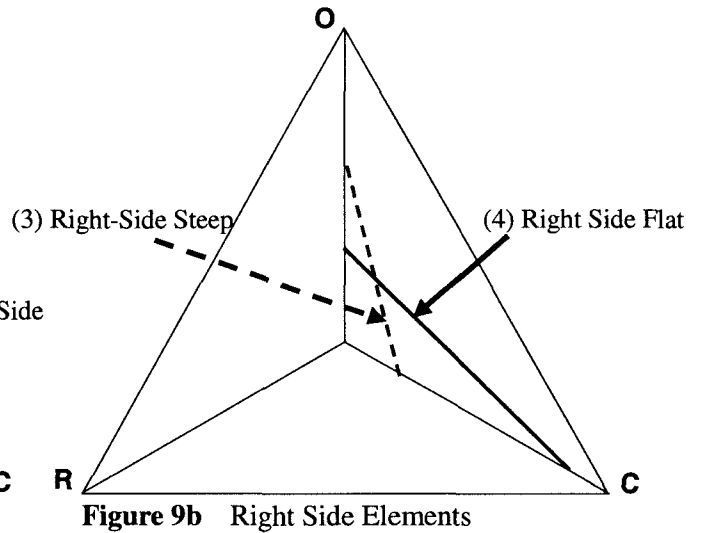
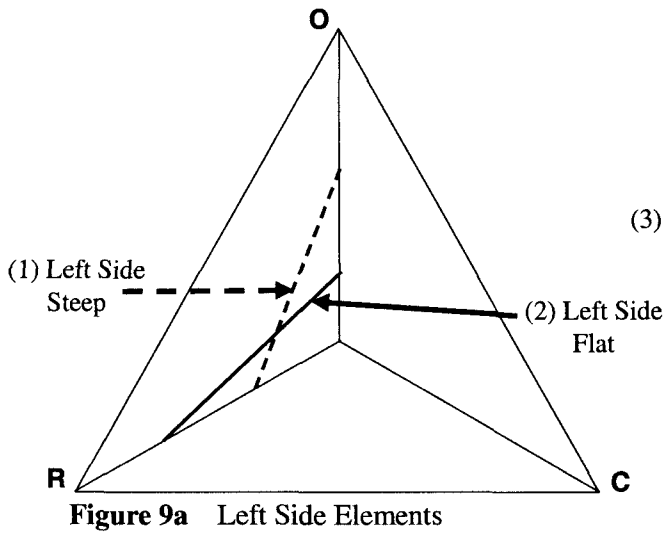
Figure 8 Total Ownership, Risk, & Control Configuration Components & Structure

Ultimately, three-axis triangle (radial) graphs are used to display project-level organizational configurations. The triangular format is well suited to showing intermediate configurations of ownership, risk and control. Viewed from the perspective of the private sponsor on an infrastructure project, a range of intermediate configurations can be assembled out of components with different traits:

- (1) **Left Side Steep**: (Fig.9a) The sponsor limits its risk-bearing for the project compared to its total ownership of project cash flows.
- (2) **Left Side Flat**: The sponsor bears a greater

portion of project risks than its total ownership of project cash flows.

- (3) **Right side steep**: (Fig.9b) The sponsor's control over the project is disproportionately less than its ownership of total project cash flows.
- (4) **Right side flat**: The sponsor exerts more control than its share of project ownership.
- (5) **Bottom Left-skewed**: (Fig.9c) The sponsor bears a greater portion of project risks than its total effective control on the project.
- (6) **Bottom Right-skewed**: The sponsor limits its risk-bearing for the project compared to its effective control.



Combining these components, specific triangular configurations appear. For example:

- (1) **Hard left-skewed & right side steep.** (Fig.10a) Some projects combine steep right sides with hard left skewed triangles – that is, the sponsors have little control, but bear high risks.
- (2) **Left-skewed & right side flat.** Some of the projects are skewed left, but have flatter right sides. That is, the sponsors' control is strong relative to ownership, but risks are significantly greater than both.
- (3) **Balanced.** (Fig.10b) Finally, there are balanced triangles. Regardless of the level of sponsor ownership, risk, and control, the three values

are roughly equal. Simply speaking, this seems like a fair deal.

Other configurations and degrees of slope in different directions are possible depending on the organizational structure of a particular project and sponsor. The degree of skew in any direction is a visual measure of the balance between the ownership, risk, and control over all aspects of a project.

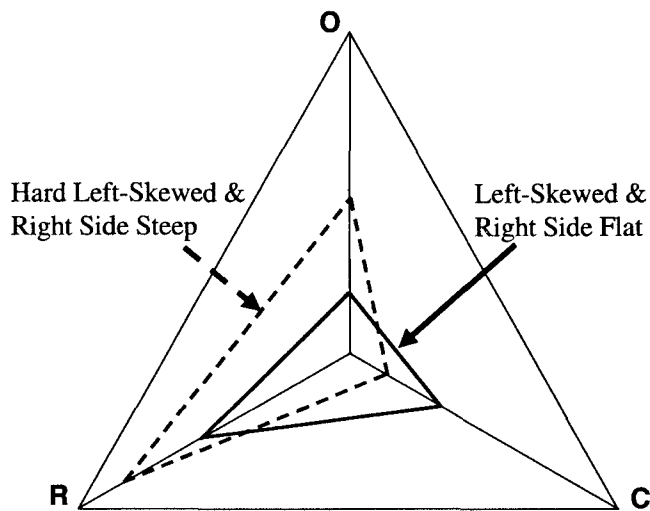


Figure 10a Skewed Configurations

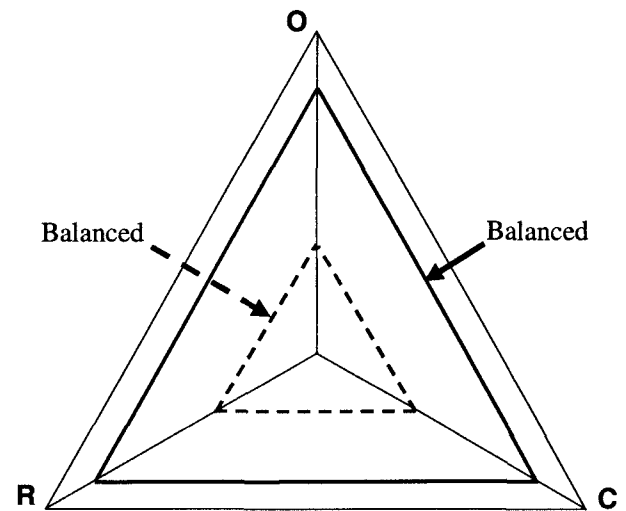


Figure 10b Balanced Configurations

Step 5: Patterns & Implications for Performance

The research applied the conceptual framework to the projects in the Database, yielding sets of graphs which could be graphically compared based on their “total triangles”. Grouping projects based on their “total triangles” reveals the following broad patterns in organizational structure:

1. The configurations for projects financed with limited recourse foreign bank loans are typically skewed to the right. In part, this is because these deals are usually power and water projects, where off-take contracts reduce demand risk, and where foreign plant suppliers and Export Credit Agencies (ECAs) are often involved. However, the same is found on one of the two major project financed toll roads.

The thorough risk mitigation and allocation measures on these projects are linked to the governance structures and constraints introduced by foreign commercial banks. The banks require Beijing and ECA involvement to reduce political risks, as well as enforceable turnkey contracts to reduce and / or allocate peripheral contract risks. The ECAs encourage use of foreign plant suppliers and contractors.

Where the projects are official BOTs, control and ownership by the sponsor are further enhanced while political risks are reduced.

These projects give private foreign sponsors

the opportunity to take ownership over peripheral contract revenues and clearly control all aspects of a project. This is an attractive prospect for major Western developers with both financial and technical priorities and abilities.

2. Another set of right-skewed configurations arises where the main sponsor is a domestic, semi-private enterprise, such as an H share or municipal government, operating in its home jurisdiction. Here, the political risks borne by the sponsor are low, while its ownership and control over all project aspects are high.

The lower risks and higher control should reduce the rates of return demanded by the sponsor, thereby lowering the project’s direct cost of capital. The cost of capital should also reflect the evaluation of the H share company by the equity market in Hong Kong.

The high control does not guarantee efficient management, since H share managers are traditionally bureaucrats; however, according to anecdotal evidence and surveys, H share managements are gradually “commercializing” under the influence of the international equity market.

3. Most projects financed with equity by passive investors are skewed left to varying degrees.

Of these, sampled projects combining steep right sides with hard left skewed triangles – where sponsors have low control and high risks – include the Binzhou water projects, the

Zhongshan power project, and the Yanwei Expressway.

Some of the projects are skewed left, but have flat right sides – that is, the sponsors' control is strong relative to ownership, but risks are significantly greater than both. This is a hazardous situation for a sponsor, although it has obtained more project-level decision rights to manage its risks. Examples above include the Nanhai power project and Boca Tigris Bridge.

In contrast to the right-skewed configurations of the H shares, most red chip-sponsored projects are left-skewed, similar to foreign passive investors.

4. Most S-F JV projects feature foreign sponsor control limited to varying degrees. Of the projects shown above, the steepest sloping right sides are found for sponsors on the Yanwei Expressway, Cili Misty Mountain Hydro and Aixi, Shunde Sheng and Guangzhou Northern Ring Road, Yueyang Water, Zhongshan Power and Binzhou Water and Nanjing Water. For better or worse, the private sponsor's effective control over the project is disproportionately less than its equity investment.

Sometimes this situation is intentional: many passive financial investors regard PRC infrastructure investments as high yield bonds, concentrating only on the balance of risk and return while ignoring direct management control. They have little project management expertise, and pass off control to the local governments while they concentrate on raising capital. If possible, they would rather not expend resources on project micro-management.

In contrast, there are situations where the sponsor wants control but cannot get it. AES, an American firm with experience developing and operating power facilities around the world, was unable to negotiate high levels of control on many of its early PRC projects.

5. Projects with flatter right sides, indicating that the sponsor is exerting more control than its ownership would imply, include Shajiao B,

GSZ Superhighway and Boca Tigris Bridge, Shanghai BFG, Nanhai Power, and Nanchang Water.

In addition, there are a few balanced triangles. Examples include Jiangmen West River Power, Jingyuan II, Chengdu Ring Expressway, and Lianjiang Water.

Of these, Hopewell, PSEG, and Suez Lyonnaise des Eaux are active investors which have succeeded in taking strong control over partly-owned joint ventures. The latter two firms are technically advanced international operators.

S-F JVs with high or balanced control in their configurations and active sponsors have the potential to directly introduce efficient management techniques to local infrastructure facility development, operation, and service provision.

A sample of configurations for five power projects in the Database is displayed in Figure 11. The sampled projects are in the power sector, and include:

- Shajiao B. Project company: EJV. Capacity: 700MW. Investment size: US\$540m. Limited recourse financing with ECA backing.
- Laibin B. Project company: WOFIE (BOT). Capacity: 700MW. Investment size: US\$616m. Limited recourse financing with ECA backing. China's first official "BOT" project executed according to the BOT Guidelines.
- Puqi. Project company: WOFIE. Capacity: 600MW. Investment size: US\$500m. Limited recourse financing with no ECA support.
- Jingyuan II. Project company: EJV. Capacity: 600MW. Investment size: US\$326m. Limited recourse financing with no ECA support, but with support from China's State Development Bank (SDB).
- Cili Misty Mountain Hydro. Project company: CJV. Capacity: 69MW. Investment size: US\$30m. Financed with direct, private equity, later refinanced in a package of projects with the AES Chigen bond.

The five projects are currently either under construction or operation, and the public and private stakeholders claim high satisfaction with performance on all but the Cili project.

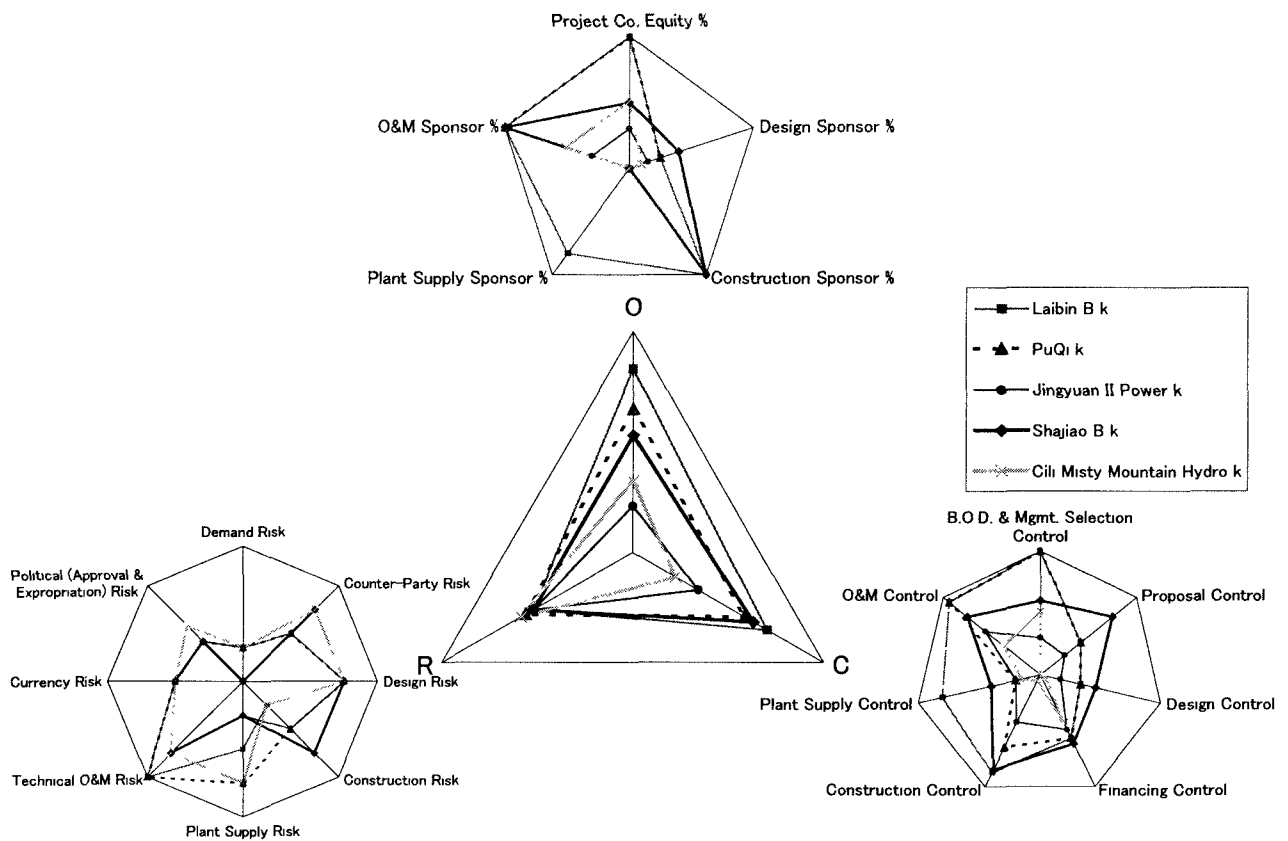


Figure 11 Sample Configurations (Laibin B, Puqi, Jingyuan, Shajiao B, Cili)

4. CONCLUSIONS

The research develops and applies a conceptual framework to comprehend project-level internal organization of PRC privately financed infrastructure. The proposed conceptual framework includes three dimensions: ownership (residual claims on positive income), risk (residual responsibility for negative income), and control (effective authority and ability to influence decisions). Application of the framework to the project Database indicates:

- Many private sponsors exert little control except over financing and financial monitoring: in terms of design, construction, and operation, most effective control remains with local governments. However, even in its passive form, the potential for profit and loss, bankruptcy and competition in privately financed infrastructure promotes improved project-level monitoring and efficiency compared to conventional alternatives.
- Where passive direct investors relinquish management control and rely on local guarantees, they essentially underwrite credit risks of the local government and its projects. In effect, the investments become high-yield municipal debt backed by foreign sponsors in order to access international capital markets. Similar benefits could be achieved by local governments at lower cost if municipal revenue bonds are legalized.
- S-F JVs with active sponsors can directly introduce efficient management techniques to local infrastructure facilities. Active sponsors address financing needs and improve project-level governance and incentives as much as passive investors, and also boost technical and management efficiency and quality of service. However, it is difficult for these sponsors to install project-level organizational structures with appropriate ownership, risk, and control levels to make their full contribution to

management improvement.

d) Official BOTs provide a framework for active sponsors backed by foreign bank loans and Export Credit Agency (ECA) credits to compete on the basis of price. Their project-level configurations create incentive and governance structures representing the best framework for efficient development and operation of PRC privately financed infrastructure; however, for numerous reasons official BOTs are not

welcomed by local governments.

e) The configurations of ownership, risk, and control on “H share”-sponsored projects are strong. In this light, H-shares and their projects present possibilities for gradual efficiency and financing improvement, as former bureaucratic administrators adjust their management practices to meet the rigorous demands and performance evaluations of international equity markets.

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