



Building a Knowledge-Driven Society: Scholar Participation and Governance in Large Public Works Projects

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ABSTRACT Previous studies have found no relationship between scholar participation and public project performance. Building on the work of Lindblom (1977; 1990), I propose a model depicting scholars' roles in social organizations and governance. A study of thirty-two cases of large public works projects in China and seventeen projects in thirteen other countries shows a moderately positive relationship. The study further shows the greatest influence on project success occurs when participating scholars serve as information brokers and entrepreneurial activity organizers. Successful scholar participation occurred through five working principles: (1) there is dispersed and specialized knowledge production; (2) there is dispersed and asymmetric knowledge possession; (3) knowledge-driven volitions and consensus are criteria for knowledge; (4) the satisfaction of diverse and heterogeneous individual needs is realized through knowledge-driven institutional arrangements; and (5) there are multiple methods of knowledge application.^[1] In general, scholar participation seems to be more effective in projects in which there is low political intervention, and in village and county projects. The results of the study provide a theoretical and empirical foundation for further research on scholar participation in social organizations.

KEYWORDS experts, project performance, social governance, social organizations, working principles

INTRODUCTION

Studies from the public administration, social organization, management, and development fields are increasingly using the term *governance* (Frederickson & Smith, 2003; UNESCAP, 2009; Wang, Yin, & Zhou, 2012; Yang, 2009; Yang & Wu, 2009), but there is confusion about what it actually means. Business organizations see corporate governance as a system of structuring, operating, and controlling that serves shareholders and other stakeholders (O'Donovan, 2003). Emerging governance literature in public administration shows three classic

definitions (Frederickson & Smith, 2003). Lynn, Heinrich, and Hill (2000, 2001) defined governance as public administration and policy implementation, creating a cross-disciplinary framework to cover a broad area of government activity. Kettl (2000) equated governance to *managerialism*, the new public management movement. Other researchers, however, are viewing governance as 'a body of theory that comprehends lateral relations, interinstitutional relations, the decline of sovereignty, the diminishing importance of jurisdictional borders, and a general institutional fragmentation' (Frederickson & Smith, 2003: 226). That is, they see governance as an institutional arrangement or governing beyond the state (Swyngedouw, 2005; Taylor, 2007). Consequently, *governance* has also been widely used to define environmental and ecological actions, such as programs to combat desertification (Castro, 2010; Johnson, Mayrand, & Paquin, 2006; Stringer & Bauer, 2009; Yang, 2009, 2010; Yang & Wu, 2009) or to conserve water (Moench, Dixit, Janakarajan, Rathore, & Mudrakartha, 2003; Rogers & Hall, 2003). Involvement of non-governmental individuals or organizations in public administration and public affairs challenges traditional state-centred management and forms a new social organization and management system. The current study investigates the role of scholars in the governance of social organizations and in particular public works projects. It also addresses the question: 'Does scholar participation in the governance of public works projects contribute to performance'?

CONCEPTUAL BACKGROUND

Researchers have analysed the important role of non-governmental actors, such as business firms (Skuras, Dimara, & Vakrou, 2000), local individuals or communities (Reynolds et al., 2007), non-profit organizations, and international organizations (Betsill & Corell, 2008; UNCCD, 1994) in governing complex social organizations. However, the mainstream discourse concerning contemporary social governance has paid little attention, to the potential role of scholars (Chang, 1955; Stavrianos, 1998; Yang, 2007a,b; Yang & Wu, 2009) as independent and major social actors in management, especially in large public works projects that require knowledge input (Yang, 2009, 2010). According to Yang and Wu (2009, 2010), scholars are among the most important actors in desertification control programs (other important actors are the public, firms, governments, religious groups, and NGOs). Researchers have also deemed scholars as playing a significant role in non-profit social organizations (Cornforth, 2003; Gordenker & Weiss, 1995; Nelson, 1959). In particular, understanding the role of knowledge in social organization and management is key to understanding modern organizations and management (e.g., Argote, McEvily, & Reagans, 2003; Davenport, De Long, & Beers, 1998; Grant, 1996; Lindblom, 1977, 1990; Simon, 1945; Weber, 1922). But without understanding the role of scholars, who

possess extensive knowledge, how can we understand the role of knowledge? Thus, studying scholar participation in governance not only fills the gap in the existing literature of governing beyond the state, but also improves our understanding of the management of large public works projects, the non-profit sector, and the role of knowledge in organizational management in general. Scholar participation is an innovative governance arrangement that is ‘increasingly recognized as potentially significant terrains for fostering inclusive development processes’ (Swyngedouw, 2005: 1991).

Scholars bring comparatively more knowledge to projects than do other social actors because of their academic background (Yang, 2007a, b; Yang, 2009, 2010; Yang & Wu, 2009). Their knowledge, both scientific and cultural, is invisible capital that ‘plays an important role in the production and transaction process and provides structure to understanding’ (Yang & Wu, 2010: 109). For the purposes of this study, *scholars* include experts (Yang & Lan, 2010), academics, professors, researchers, stakeholders, and other individuals who have specialized expertise.

The main objective of this study is to explore whether scholar participation plays a role in the governance of large public works projects, and if so, whether their participation improves project performance. This study may also enhance our understanding of governance of other kinds of social organizations, events, and affairs.

The Role of Scholars in the Governance of Social Organizations

Because I define scholars in this study as individuals who have comparative knowledge advantages, my study of the role of scholars actually coincides with the study of the role of knowledge. I use Lindblom’s (1977) ideas about the crucial role of knowledge in society (Premfors, 1981) to analyze the role of scholars in the governance of public works projects. Lindblom, however, studied the problem from the perspective of knowledge, whereas I study the problem from the perspective of knowledge possessors. I use Lindblom’s framework of knowledge creation and application to identify and analyze five specific ways (referred to as working rules or principles) through which scholars influence the relationship between scholar participation and project performance.

Considering the role of knowledge in social organization, in *Politics and Market* Lindblom (1977) described two highly sophisticated models of humanitarian societies: an intellectually guided society (Model 1) and a preference-guided or volition-guided society (Model 2). Model 1 focused on the communist system of the Union of Soviet Socialist Republics (USSR); Model 2 analysed the market-oriented polycharchies in the United States (U.S.). Lindblom compared the two models and showed key differences along 12 dimensions: intellectual competence, theory, criterion for correctness, discovery or choice, elites, harmony, procedures, conflict

interaction, the trip and the arrival, mutual adjustment and pluralism, adaptation of analysis to interaction, and the value of analysis and initiative. In Lindblom's (1990) second book, *Inquiry and Change*, he compared two prescriptive models showing how scientists can best use knowledge for solving social problems: the scientific society (Model 1) and the self-guiding society (Model 2). He also systematically compared these two models along 15 dimensions.

Model 1 recognizes that intellectuals or scholars hold knowledge and thus play an essential role in understanding, managing, and resolving social problems. Model 2, on the other hand, emphasizes problem solving by experience. It suggests that, rather than being restricted to the intellectual elite, knowledge is dispersed throughout society. I consolidate Lindblom's dimensions for comparing the two models into five basic questions: (1) How is knowledge produced and protected? (2) How is knowledge owned? (3) How is knowledge tested? (4) What is known about the relationship of knowledge to people's needs? (5) How is knowledge applied? I develop an alternative framework that is less extreme than Lindblom's Models 1 and 2. To answer each question, based on blending elements of both models as well as my former field experiences and meta-analysis of many cases (e.g., Yang, 2009; Yang, Lan, & Wu, 2010; Yang & Wu, 2010), I formulate the five working principles as stated in Table 1, which I call Model 3. Principle 1 addresses Lindblom's first question by arguing that a few wise and informed intellectual leaders do not monopolize knowledge production as in Model 1, nor is it shared equally by all individuals as in Model 2. Although knowledge is widely dispersed, it is also highly specialized, and scholars play an important role in its specialized production. Principle 2 addresses Lindblom's second question by stressing that intellectual elites, who are simultaneously political elites, do not own knowledge exclusively as in Model 1, nor do all individuals own knowledge equally as in Model 2. Although knowledge possession is widely dispersed, it is also highly asymmetric, and scholars often have comparative knowledge advantages. Principle 3 addresses Lindblom's third question by highlighting that analysis-based or knowledge-driven volitions, rather than people's needs as in Model 1 or blind volitions as in Model 2, can be used to test knowledge. In response to Lindblom's fourth question, Principle 4 emphasizes that we cannot assume that people's needs have no underlying harmony as in Model 1, nor can we assume that harmony of needs is both undiscoverable and non-existent as in Model 2. Although individual needs are diverse and heterogeneous, knowledge-driven institutional arrangements can satisfy those needs. In response to Lindblom's fifth question, Principle 5 suggests that we cannot assume that intellectual elites diagnose or analyze problems, discover solutions, or make good decisions and then guide others as in Model 1, nor can we assume that problem-solving politics, market systems, and other analytical problem-solving methods can substitute for analysis as in Model 2. Rather, multiple knowledge-application methods can systematically resolve various problems. Table 1 provides a brief

Table 1. Five working principles of a knowledge-driven society (Model 3)

<p>Principle 1. There is dispersed and specialized knowledge production</p> <p>There is no perfect match between human intellectual capacity and the complexity of the problems needing solutions in the real world, but the mismatch is not gross. Knowledge can be produced by specialists, non-specialists, or by way of the interaction between both. While scholars play an important role in specialization of knowledge production, they could not produce all knowledge or perfect knowledge. Other social actors often participate in knowledge production, and collaborative and cooperative knowledge production among scholars and other social actors is common. Scholars who allow for or are able to accommodate dispersed and specialized knowledge production tend to be more successful in social organization and governance.</p> <p>Principle 2. There is dispersed and asymmetric knowledge possession</p> <p>Knowledge possession is widely dispersed and no intellectual elite can monopolize the interpretation and application of knowledge. Scholars, however, often have more knowledge than others and are important knowledge possessors.</p> <p>Principle 3. Knowledge-driven volitions or consensuses are criteria for knowledge</p> <p>Although all knowledge is tentative and inadequately tested, some knowledge may be better or more useful than others. Analysis-based or knowledge-driven volitions can be used as criteria to determine the robustness of knowledge. At the grass-roots level, almost-consensus and face-to-face communication methods are used. Furthermore, the experiment-extension method is often used to resolve new or complex problems.</p> <p>Principle 4. The satisfaction of diverse and heterogeneous individual needs is realized through knowledge-driven institutional arrangements</p> <p>Satisfaction of diverse and heterogeneous individual needs can be achieved by selectively use graduated incentives and penalties upon knowledge users. Social organization and governance that are able to institutionalize the use of these mechanisms tend to become more robust.</p> <p>Principle 5. There are multiple methods of knowledge application</p> <p>Federal organizational structure, multiple levels of institutional arrangements, and multiple methods are designed to use knowledge to systematically resolve various problems. Both knowledge-driven interactions and procedures are highly valued. Conflict and cooperation are positively or highly encouraged. Individuals are viewed as doers and achievers of democracy, and contradictory values, such as procedures and outcomes, and quality and efficiency, are well-balanced. Citizens' participation at all levels of institutional arrangements is mobilized, and scholar-participated governance and participatory governance of others such as various NGOs and religious groups are encouraged to balance the power of business interest groups. Furthermore, steady local scholar-entrepreneurship has been built, and steady external support (financial, technical, institutional, and spiritual) is guaranteed when lacking local self-supporting systems.</p>
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description of the five working principles and the role of scholars in each. I use Model 3's five working principles to understand the scholar's role in managing or governing public works projects. Thus, this research addresses a second research question: 'Are projects more successful if scholars abide by these principles?'

This research differs from previous studies (e.g., Yang, 2010; Yang et al., 2010; Yang & Wu, 2010) that focused on scholars' roles in combating desertification and failed to analyze their participation from a humanitarian society or social organizational perspective (Lindblom, 1977).

METHOD

Research Design and Data Acquisition

The lack of research on scholars' roles in the governance of public works projects prevented me from developing reasonable hypotheses addressing the research question. Therefore, I designed a three-step qualitative research plan (Miles & Huberman, 1994; Yin, 2009) to explore whether scholar participation in social governance contributes to project success and to isolate the specific roles scholars may play during participation. Drawing on a variety of data sources, I collected data on forty-nine famous public works projects across the globe (see Table 2).

In the first step, I did a field study in seven counties in arid areas in northwest China (Zhongwei, Jingtai, Minqin, Linze, Jinta, Guazhou, and Dunhuang) to gauge the significance of scholar participation and explore scholars' roles in the governance of combating desertification in arid areas from 1949 to present. Zhongwei is in Ningxia Province and the other six are in the Hexi Corridor in Gansu Province, so the seven counties are located near each other and share similar geological, geographical, climatic, and ecological conditions (control variables) (for detailed information, see Yang, 2009). Zhongwei is deemed to have been the most successful in combating desertification in China, while Minqin has suffered the most serious recent desertification. Thus, these seven counties, which show varying levels of scholar participation, are considered the best examples of modern Chinese efforts to combat desertification. I used this first step to gain a deep understanding of scholar participation in public works before I embarked on a large-scale data collection effort.

The data for this article came from a larger project that has already yielded two other articles (Yang et al., 2010; Yang & Wu, 2010).^[2] I first collected data from seven cases through a random-sampling survey (1,974 valid responses) and interviews (seventy-eight interviewees) from June 2006 to February 2008. Considering that many village farmers cannot read Chinese, I randomly distributed the survey questionnaires to county high school students who were able to help their family members, relatives, and neighbours. Because high school students often come from all county areas, I could use a random sample to represent the whole population. Leaders of various related organizations (such as governmental bureaus and desert control stations) recommended interviewees and I subsequently found volunteers in the county seat and rural villages. Considering that some respondents might be unqualified informants, I also relied on archival material (including county annals, governmental gazettes, research reports, government documents, and historical memoirs) from 1949 to 2007 to complement the survey and interview data. I focused strongly on process tracing and life story methods (George & Bennett, 2005; Plummer, 2001) to determine the causal relationship between scholar participation and project performance and to control the non-research variables.

Table 2. Comparison of the 49 public works project cases

Cases	Regime types	Fields	Spatial extents	Temporal extents	Scholar participation	Scholar roles				Project performance
						Role 1	Role 2	Role 3	Role 4	
The 32 Chinese cases										
The seven counties in the first step of the research										
Zhongwei, Ningxia	AR	CD	C	1949-2007	H	H	H	L	M	robust
Linze, Ningxia	AR	GD	C	1949-2007	H	H	H	M	M	fragile
Jingtai, Gansu	AR	CD	C	1949-2007	M	M	M	M	L	fragile
Guazhou, Gansu	AR	CD	C	1949-2007	M	M	M	M	M	fragile
Jinta, Gansu	AR	CD	C	1949-2007	M	H	H	M	L	fragile
Dunhuang, Gansu	AR	CD	C	1949-2007	H	M	M	L	L	failure
Mingqi, Gansu	AR	CD	C	1949-2007	L	H	H	H	L	failure
The five cases by changing coverage										
Hotan, Xinjiang	AR	CD	C	1949-2007	H	H	H	L	M	robust
Naiman, Inner Mongolia	AR	CD	C	1949-2007	H	H	H	L	M	robust
Aohan, Inner Mongolia	AR	GD	C	1949-2007	H	H	M	M	M	robust
Ejin Horo, Inner Mongolia	AR	CD	C	1949-2007	H	M	M	M	L	fragile
Yanchi, Ningxia	AR	CD	C	1949-2007	M	M	M	M	L	fragile
The three cases by changing spatial extents										
Songhe, Inner Mongolia	AR	CD	V	1949-2007	H	H	H	M	L	robust
Yulin, Shaanxi	AR	GD	PR	1949-2007	H	M	M	M	M	fragile
Zhangye, Gansu	AR	CD	PR	1949-2007	L	L	H	H	L	failure
The seventeen cases by changing fields and temporal extents										
The Village Governance System in Ancient China	AR	VG	HC	Pre-1905	H	H	H	M	H	robust
The Household Contract Responsibility System	AR	RE	HC	1978-2008	H	M	M	L	M	robust
The Farmers' Movement and Association	AR	RD	HC	1921-1949	H	H	H	L	L	fragile
The Farmers' Association and Land Reform	AR	RD	HC	1950-1953	M	M	M	L	M	fragile
The Rural Autonomy Movement	AR	RD	HC	1905-1911	L	L	H	H	L	failure
Tao's Xiaozhuang Normal School Experiment, Nanjing	AR	RU	V	1927-1930	H	H	M	L	L	failure
Yan's Rural Reconstruction Experiment in Ding County	AR	RD	C	1929-1937	H	M	M	L	L	failure
Liang's Rural Reconstruction Experiment, Zouping County	AR	RD	C	1931-1937	H	M	M	L	L	failure
The Movement of Local Autonomy	AR	RD	HC	1911-1949	L	L	H	H	L	failure
The Cooperative Movement	AR	RD	HC	1949-1956	L	L	L	L	L	failure
The Intellectuals' Ideological Remoulding Movement	AR	PM	HC	1951-1952	H	L	L	L	L	failure
The Anti-Rightist Movement	AR	RD	HC	1957-1958	H	L	L	L	L	failure

Table 2. (cont.)

Cases	Regime types	Fields	Spatial extents	Temporal extents	Scholar participation	Scholar roles			Project performance
						Role 1	Role 2	Role 3	
The Great Leap Forward Movement*	AR	EM	HC	1958–1960	L	L	L	L	failure
The People's Commune Movement	AR	RD	HC	1958–1983	L	L	L	L	failure
The Four Cleanup Movement	AR	PM	HC	1963–1966	L	L	L	L	failure
The Great Culture Revolution	AR	PM	HC	1966–1976	L	L	L	L	failure
The Rustication Movement of Educated Youth	AR	PM	HC	1955–1978	L	L	L	L	failure
The seven non-Chinese cases									
The Negev Case, Israel	FD	CD	P	1948–2007	H	H	L	L	robust
The New Village Movement, South Korea	FD	RD	HC	1972–1980s	H	H	M	H	robust
People's Planning in Kerala, India	FD	RD	P	1970s–2007	H	H	M	M	robust
The Mona Reclamation Experimental Project, Pakistan	AR	CD	PR	1965–2007	H	M	M	M	fragile
The 'LUCDEME' Project, Spain	D	CD	P	1981–2007	H	M	M	M	fragile
Integrated Desert Development & Desertification Control, Turkmenistan	AR	CD	HC	1924–2007	M	M	M	L	fragile
The Vale Rangeland Rehabilitation Program, USA	D	CD	C	1962–2007	H	H	M	M	fragile
The Dust Bowl Case, USA	D	CD	P	1932–2007	M	M	M	L	fragile
The Gal Oya Irrigation Project, Sri Lanka	FD	IR	PR	1950–2007	M	M	M	L	fragile
The Gascoyne Basin, Australia	D	CD	P	1876–1980	M	L	H	L	failure
The Region of Coquimbo, Chile	FD	CD	P	1900–1980	L	L	H	L	failure
The Luni Development Block, India	FD	CD	PR	1900–1982	L	L	M	M	failure
The Turan Program, Iran	CD	CD	P	1975–1984	L	L	M	M	failure
The Greater Musayeb Project, Iraq	HR	CD	P	1953–1980	L	L	M	M	failure
The Eghazzer and Azawak Region, Niger	AU	CD	PR	1900–1970s	L	L	H	M	failure
The Oglat-Merteba Region, Tunisia	AU	CD	PR	1900–1980s	L	L	M	L	failure
The Golodnaya Steppe, Uzbekistan	AU	CD	P	1869–1980	L	L	M	L	failure

Notes: Regime Types: D, full democracy; FD, flawed democracy; HR, hybrid regime; AR, authoritarian regime. Fields: CD, combating desertification; VC, village governance; RU, rural education; RE, rural economic development; RD, rural economic development; EM, economic movement; PM, political movement; IR, irrigation. Special extents: HC, the whole country; P, province or state; PR, prefecture; C, county; V, village. Scholar participation: H, high; M, middle; L, low. Roles: Role 1, Information broker; Role 2, entrepreneurial activity; Role 3, advocates for local affairs; Role 4, governmental representatives. * Some readers might consider it to be a political movement, but it is also an economic campaign to transform China to a strong modern society from a weak agrarian economy based on the methods of agriculturalization, industrialization, and collectivization (Yang, 2009). I deem it a public works project on the economy.

In the second step, I investigated twenty-five additional Chinese public works projects by analysing various archives and published materials to determine whether the findings from the seven counties could be replicated. I selected cases that showed typical, similar, or different governance. Among these twenty-five, eight were anti-desertification projects to test generalizability in combating desertification in extremely arid, semi-arid, and semi-humid areas by changing coverage (or sampling density or intensity), which means 'proportion of the study area or duration actually sampled' (Wu, 2007: 118). The eight projects were in five counties: Hotan in Xinjiang; Yanchi in Ningxia; and Ejin Horo, Aohan, and Naiman in Inner Mongolia; and in three villages or prefectures: the Songhe Village in Minqin County; the Zhangye Prefecture, which has Linze County under its jurisdiction, in Gansu Province; and the Yulin Prefecture in Shaanxi Province. I investigated these eight additional cases to test generalizability by changing spatial extents. Thus, I covered fifteen desertification-control cases. Although this does not cover all the areas of desertification control in modern China and does not necessarily represent a random sample, it represents most of the prominent cases of desertification-control.

Furthermore, I included seventeen cases other than anti-desertification to ensure generalizability by changing fields and temporal extents. Spatial or temporal extent refers to spatial or temporal span of a phenomenon (Wu, 2007), while fields refers to particular problem domains (such as combating desertification and improving irrigation) (Yang, 2009). These cases do not represent a random sample, because they omit many important public works projects in modern China, but I tried to cover the most important public works projects that included scholar participation in political, economic, and social domains from 1905 to 2008, on the basis of existing archives and published materials (Yang, 2009).

In the third and final step, I studied seventeen cases from thirteen countries based on archives and published materials to compare the findings from China and to consider cultural influences on institutions of governance (Avruch, Black, & Scimecca, 1991; Held, McGrew, Goldblatt, & Perraton, 1999). The cases covered the six continents and major civilizations: Israel, Pakistan, Spain, Turkmenistan, Chile, Iran, Iraq, Niger, Sri Lanka, South Korea, Tunisia, Uzbekistan, and Australia. India and the U.S. yielded two cases each. Although most of the seventeen cases dealt with anti-desertification programs, some came from other fields. For example, the cases from India and South Korea dealt with rural development, and the case from Sri Lanka was an irrigation project. Also, I covered the cases at the county, prefecture, provincial, and national levels from 1869 to 2007. Again, this list does not include all the important public works projects, nor does it represent the best available typological classification. Although it might be deemed a convenience sample, I covered all the important cases I could find in the existing archives and published documents during a four-year literature study (2005–2008).

In summary, the study includes thirty environmental projects, including anti-desertification and irrigation, and nineteen non-environmental projects such as village governance, rural education, and rural economic development.

Measurement

Independent variables. The independent variables in this study are scholar participation and scholar roles (actual involvement in public works projects by individual scholars or scholar organizations). The measurement of scholar participation for the seven counties was based on the field data, but for the other forty-two cases measurement was based on detailed discussions of process tracing (George & Bennett, 2005) and life stories (Plummer, 2001) through archives and published documents. For example, survey respondents in the seven counties evaluated actual scholar participation or involvement by choosing from six item-response choices (*very important, important, general, non-essential, makes things worse, and do not know*). Then I recoded three levels of scholar participation: high, middle, and low, on the basis of the respondents' survey responses. For the other forty-two cases, I similarly coded scholar participation levels. Based on the results from analysis of various archives and published materials, I assigned a *high* if I found strong evidence supporting adequate scholar participation, and a *low* if I found adequate evidence supporting low scholar participation or found no evidence supporting scholar participation; otherwise, I assigned *middle*. Certainly, this coding is relative rather than absolute. For the first ten cases, I worked with a collaborator in coding levels of scholar participation. Using the procedure developed in the first ten cases, I coded the remaining thirty-two cases. Furthermore, I asked two research assistants to work together to recode all forty-two cases.^[3] Their coding mostly matched my initial coding. For cases showing different results, we discussed and resolved our disagreements. I used this procedure to code the other major research variables in the study including the four roles of scholars, project performance, and the five working principles.

Scholar roles. Yang and colleagues (Yang, 2009, 2010; Yang et al., 2010; Yang & Wu, 2009) described four specific roles that scholars play in resolving various social dilemmas (such as desertification control): serving as information brokers between governments and other stakeholders (Role 1); providing entrepreneurial services such as organizing farmers or citizens (Role 2); advocating for local affairs on their own behalf (Role 3); and representing government (Role 4). Using the same coding procedure used for scholar participation, two research assistants and I coded the forty-nine cases in terms of high, medium, and low levels in each of these four roles. For the seven original cases, we first evaluated the four scholar roles by using the percentages indicated by survey respondents. We then recoded the three levels: high, middle, and low. For the other forty-two cases,

based on the results of analysing the various archives and published materials, where there was strong evidence showing that one role was played, we assigned *high* for the role; if we found strong evidence indicating that the role was not performed well or that other contrary roles were played, we assigned *low*; otherwise, we assigned *middle*.

Project performance. We evaluated the dependent variable from three aspects: (1) the governance result of the project; (2) the resilience degree of the project (Fiksel, 2006; Folke, Carpenter, Elmqvist, Gunderson, Holling, & Walker, 2002); and (3) the degree of sustainability of the project (WCED, 1987). We coded project performance as *successful*, *semi-successful*, and *unsuccessful*. For example, when a project significantly slowed desertification, it was deemed *successful*. When desertification became more rapid, the project was coded *unsuccessful*. Those projects falling in between were coded *semi-successful*. For both finished and continuing projects, if the institutions initiating the projects showed ability to survive more than thirty years (about one generation)^[4] (also see Ostrom, 1990: 179), we presumed that they had survived shocks such as major economic and political changes, droughts, floods, and external intervention, and were therefore *resilient* and *sustainable*. If the institutions initiating the finished project had survived less than thirty years and there was no available information to indicate that they had survived shocks, we presumed they were *irrelevant* to the topics of resilience and sustainability because we could not determine their resilience or sustainability from the available information. If they survived less than thirty years and information showed that they had not survived shocks, we characterized them as *unresilient* and *unsustainable*. If the institutions had not existed for thirty years, we indicated that we could not determine their resilience or sustainability at present. Finally, using the same coding methods and procedures as for scholar participation and the four scholar roles, two research assistants and I coded project performance into four categories: When the result was successful and the institution was resilient (or not relevant) and sustainable (or not relevant), it was *robust*. When the result was semi-successful and the institution was resilient (or not relevant or unknown) and sustainable (or not relevant or unknown), it was *fragile*. When the result was semi-successful or failed and the institution was unresilient and unsustainable, it was coded *failure*.

Mediators. Based on a qualitative coding procedure similar to coding the levels of scholar participation, two research assistants and I used the five working principles to code the cases. For each case, we indicated which of the five principles clearly applied (coded *yes*), which applied in a weak form (*weak*), and which clearly did not apply (*no*) (see Table 3). Based on the results of the field studies and analysis of various archives and published materials, if we found strong evidence supporting that one principle had been adequately applied, the cases were assigned a *yes* for the principle; if we found strong evidence supporting that the principle was not applied

Table 3. Comparison of satisfaction of the five working principles

Cases	Scholar participation	Principle 1	Principle 2	Principle 3	Principle 4	Principle 5	Project performance
The thirty-two Chinese cases							
Zhongwei, Ningxia	H	yes	yes	yes	yes	yes	robust
Hotan, Xinjiang	H	yes	yes	yes	yes	yes	robust
Naiman, Inner Mongolia	H	yes	yes	yes	yes	yes	robust
Aohan, Inner Mongolia	H	yes	yes	yes	yes	yes	robust
Songhe, Inner Mongolia	H	yes	yes	yes	yes	yes	robust
The Village Governance System in ancient China	H	yes	yes	yes	yes	yes	robust
The Household Contract Responsibility System	H	yes	weak	weak	weak	weak	robust
Linze, Ningxia	H	yes	weak	weak	weak	weak	fragile
Jingtai, Gansu	H	no	yes	weak	weak	weak	fragile
Ejin Horo, Inner Mongolia	H	weak	yes	weak	weak	weak	fragile
Yulin, Shaanxi	H	weak	yes	weak	weak	weak	fragile
The Farmers' Movement and Association	H	yes	yes	yes	yes	yes	fragile
The Farmers' Association and Land reform	H	weak	weak	weak	weak	weak	fragile
Tao's Xiaozhuang Normal School Experiment, Nanjing	H	yes	weak	weak	weak	no	failure
Yan's Rural Reconstruction Experiment in, Ding County	H	yes	weak	weak	weak	no	failure
Liang's Rural Reconstruction Experiment, Zouping County	H	yes	weak	weak	weak	no	failure
Dunhuang, Gansu	H	weak	weak	no	no	no	failure
The Intellectuals' Ideological Remoulding Movement	H	no	no	no	no	no	failure
The Anti-Rightist Movement	H	no	no	no	no	no	failure
The Great Culture Revolution	H	no	no	no	no	no	failure
Guazhou, Gansu	M	weak	weak	weak	weak	weak	fragile
Jinta, Gansu	M	yes	weak	weak	weak	weak	fragile
Yanchi, Ningxia	M	weak	weak	weak	weak	weak	fragile
The Rustication Movement of Educated Youth	M	no	no	no	no	no	failure
The Four Cleanup Movement	L	no	no	no	no	no	failure

Table 3. (cont.)

<i>Cases</i>	<i>Scholar participation</i>	<i>Principle 1</i>	<i>Principle 2</i>	<i>Principle 3</i>	<i>Principle 4</i>	<i>Principle 5</i>	<i>Project performance</i>
The Movement of Local Autonomy, the Republic of China	L	no	no	no	no	no	failure
The Cooperative Movement	L	no	no	no	no	no	failure
The Great Leap Forward Movement	L	no	no	no	no	no	failure
The People's Commune Movement	L	no	no	no	no	no	failure
The Rural Autonomy Movement, Qing Dynasty	L	no	no	no	no	no	failure
Minqin, Gansu	L	weak	no	no	no	no	failure
Zhangye, Gansu	L	no	no	no	no	no	failure
The seventeen non-Chinese cases							
The Negev Case, Israel	H	yes	yes	yes	yes	yes	robust
The New Village Movement, South Korea	H	yes	yes	yes	yes	yes	robust
People's Planning in Kerala, India	H	yes	yes	yes	yes	yes	robust
The Mona Reclamation Experimental Project, Pakistan	H	weak	weak	weak	weak	weak	fragile
The 'LUCDEME' Project, Spain	H	weak	weak	weak	weak	weak	fragile
The Vale Rangeland Rehabilitation Program, U.S.	H	yes	weak	yes	yes	yes	fragile
Integrated Desert Development & Desertification Control, Turkmenistan	M	weak	weak	weak	weak	weak	fragile
The Dust Bowl Case, U.S.	M	yes	weak	yes	yes	yes	fragile
The Gal Oya Irrigation Project, Sri Lanka	M	weak	weak	weak	weak	weak	fragile
The Gascoyne Basin, Australia	M	no	no	no	no	no	failure
The Region of Coquimbo, Chile	L	no	no	no	no	no	failure
The Luni Development Block, India	L	no	no	no	no	no	failure
The Turan Program, Iran	L	no	no	no	no	no	failure
The Greater Mussayeb Project, Iraq	L	no	no	no	no	no	failure
The Eghazer and Azawak Region, Niger	L	no	no	no	no	no	failure
The Oglat Merteba Region, Tunisia	L	no	no	no	no	no	failure
The Golodnaya Steppe, Uzbekistan	L	no	no	no	no	no	failure

or that other contrary principles were applied, they were assigned a *no*; otherwise, they were assigned a *weak*.

Additional project information. Based on analysing the various archives and published materials, two research assistants and I also identified the forty-nine projects in terms of regime type, field, spatial extent, and temporal extent using the same coding procedures as stated above. The Democracy Index 2006 (Kekic, 2007) identifies four regime types: full democracies (Australia and the U.S.), flawed democracies (Chile, India, Israel, South Korea, and Sri Lanka), hybrid regimes (Iraq), and authoritarian regimes (Iran, Pakistan, and Turkmenistan). Table 2 shows the regime types, fields, spatial and temporal extents, levels of scholar participation, scholar roles, and project performance in the forty-nine cases.

RESULTS

The Roles of Scholar Participation in Social Governance

The study found different levels of overall scholar participation in the governance of these forty-nine public works projects, with high levels of scholar participation in twenty-six projects, medium levels in eight projects, and low levels in fifteen projects. We found a moderate-to-good relationship between overall scholar participation and project performance ($r = 0.61, p < 0.01$, see Table 4), which is contrary to reports of no systematic relationship in previous studies (Yang, 2009; Yang et al., 2010; Yang & Wu, 2010) based on smaller samples.

In addition to overall scholar participation, involvement in specific roles may also contribute to project performance. The data in Table 2 show the number of high-scoring projects for each of the four scholar roles: Role 1 (20 projects), Role 2 (14 projects), Role 3 (7 projects), and Role 4 (2 projects). This finding replicates previous study results by Yang and Wu (2009), using a different sample. The results of a non-parametric correlation analysis (Spearman) showed a significantly positive

Table 4. Inter-correlation values for scholar participation, the four scholar roles, the principles 1 to 5, and project performance by a non-parametric correlation analysis (Spearman)

	Scholar Participation	Role 1	Role 2	Role 3	Role 4	Principle 1	Principle 2	Principle 3	Principle 4	Principle 5
Scholar participation	–	0.76**	0.73**	-0.45**	0.30**	0.67**	0.76**	0.69**	0.69**	0.62**
Project Performance	0.61**	0.77**	0.88**	-0.22**	0.51**	0.76**	0.90**	0.92**	0.92**	0.99**

** $p < 0.01$ (2 tailed).

correlation between Roles 1, 2, and 4, overall scholar participation, and project performance (see Table 4). The negative coefficients of Role 3 indicated that if scholars focused on their own concerns, their advocacy activities are associated with weaker scholar participation and poorer project performance. But the highest coefficient between Role 2 and project performance suggested that although Role 1 was the most significant role of scholars in project management, Role 2 was the most influential on project performance. Furthermore, because the scholars' role as information brokers (Role 1) often depends more on their human capital (knowledge and information), while their role as entrepreneurial activity organizers (Role 2) often relies more on their social capital (Yang, 2009, 2010; Yang et al., 2010; Yang & Wu, 2010), these findings also reveal the importance of scholars' human and social capital.

Results on the Five Working Principles

Table 3 provides information on overall levels of scholar participation, levels of working principles found in each project, and project performance. The results of a non-parametric correlation analysis indicated that the five principles were positively correlated with both overall levels of scholar participation and project performance (see Table 4). The results also showed that the correlation coefficients between the five principles and project performance (r ranges from 0.76 to 0.99) were higher than the coefficients between these principles and overall levels of scholar participation (r ranges from 0.62 to 0.69). This suggests that these principles may have more influence on project performance than on overall levels of scholar participation. In other words, robust project management with scholar participation shared the five common working principles, despite the differences among the project settings described above (Table 2).

Additional Findings on Project Settings

Among the ten cases in democratic countries (including full and flawed), project performance in three cases (30 percent) was robust, in four cases (40 percent) fragile, and in three cases (30 percent) a failure. Among thirty-two cases in China, project performance in seven cases (21.88 percent) was robust, in six cases (18.75 percent) was fragile, and in nineteen cases (59.38 percent) was identified as a failure. However, among the seven cases in the other undemocratic countries (including hybrid and authoritarian regimes), project performance in two cases (28.57 percent) was fragile, and in five cases (71.43 percent) was a failure. Given the small sample size, we should not over-interpret these findings.

In the thirty environmental projects (including anti-desertification and irrigation), six were robust (20 percent), thirteen were fragile (about 43.3 percent), and eleven were failures (36.7 percent). However, in the nineteen non-

environment projects, four were robust (about 21.1 percent), two were fragile (about 10.5 percent), and thirteen were failures (68.4 percent). Furthermore, among the nine non-environmental Chinese projects with high political intervention during 1949 to 1977, eight were failures (88.9 percent), and one was fragile (11.1 percent).

Among the seventeen cases at the village and county levels, five were robust (about 29.4 percent), seven were fragile (about 41.2 percent), and five were failures (about 29.4 percent). Of the sixteen cases at the prefecture and provincial levels, two were robust (12.5 percent), five were fragile (31.25 percent), and nine were failures (56.25 percent). Among fifteen cases at the national level, three were robust (20 percent), three were fragile (20 percent), and nine were failures (60 percent). Overall, there were more failed than successful projects in the national and provincial than county or village level public works projects.

DISCUSSION

Importance of Overall Scholar Participation and Scholar Roles

Although previous studies (Yang, 2009; Yang et al., 2010; Yang & Wu, 2010) suggested that no systematic relationship occurs between overall scholar participation and project performance, this study extends previous results by including more international case studies and finds moderately positive relationships. One possible reason that previous studies found no relationship might be that their case samples were too small. The moderate correlation coefficient suggests that many other factors influence project performance in addition to overall scholar participation. Certainly, this relationship should be further examined.

The finding on the order of significance of the four types of scholar roles suggests that, in general, the four types of scholar roles are important for project success, with a positive correlation between Roles 1, 2, and 4 and overall scholar participation and project performance. The results suggest that entrepreneurial scholars may be particularly effective in facilitating project success. However, the results also suggest that scholars who focus attention on their own advocacy (Role 3) may detract from project success. Overall, the findings confirm the importance of scholars' human and social capital.

Further Explanations of the Five Working Principles

The positive correlation between the presence of the five working principles and overall scholar participation as well as project performance suggests that these principles are important factors influencing overall scholar participation and are also important design principles for developing a robust project managerial system. Thus, these principles provide us a new map to understand overall scholar

participation in governance, to improve project performance, to transform fragile and failing project managerial systems to more robust systems, and to design new robust governance institutions.

Principle 1 indicates that knowledge production is widely dispersed, but not produced equally. Specialization in knowledge production (Brusoni, Prencipe, & Pavitt, 2001) is important for the advantages of labour division or specialization (Durkheim, 1960; Romer, 1987; Smith, 1965), economies of scale (Christensen & Green, 1976; Krugman, 1980; Murray & White, 1983), economies of scope (Murray & White, 1983; Teece, 1980), individual diversities, the limits of human nature, and the complex attributes of knowledge (Yang, 2009). Our study provides empirical support for the benefits of specialization in knowledge production and reveals that scholars as well as others play major roles in knowledge production. Furthermore, the study finds that collaborative and cooperative research and knowledge production (Fischer, 2000) are important for robust project management. For example, people in Naiman effectively applied collaborative and cooperative research and knowledge production through local participation, community-based governance, farmers' voluntary participation, and local and international collaboration. In the People's Planning Program in Kerala, India, collaborative research included a new expert, defined broadly as the *wise farmer* in addition to the civil engineer (Fischer, 2000).

Principle 2 stipulates that all individuals own knowledge, but not all knowledge is equally owned. On the one hand, most individuals' knowledge is relatively incomplete and frequently contradictory, and its possession is widely dispersed. On the other hand, a few individuals have considerably more knowledge than others. The study empirically supports these arguments; although in the forty-nine cases knowledge was widely produced and possessed, scholars often had more knowledge than others and were vitally important possessors of knowledge.

Before knowledge can be applied to problem solving, it is crucially important that it is tested (Lindblom, 1977). Principle 3 suggests that institutions or policies can be tested through analysis-based or knowledge-driven volitions. The study finds that knowledge-driven volitions are often applied in robust project management; in particular almost-consensus and face-to-face communication methods are often used at grass-roots levels. For example, in the Chinese case of the Household Contract Responsibility System, eighteen knowledgeable farmers first contracted land to individual households on the basis of consensus (Yang, 2009). In the New Village Movement (the Saemaul Movement) in South Korea, the Saemaul leaders, as scholars, sought 'the support of influential elders in the community', and then 'they took the matter to a general assembly meeting in the village hall' (Turner, Hesli, Bark, & Yu, 1993: 80). The study suggests that the experiment-extension method was often applied to resolve new or complex problems. Using this method, social actors first experiment in relatively small areas or zones, and then extend gradually to broader areas after they gain experience. For example, this method

played a significant role in combating desertification in the seven Chinese counties. In the People's Planning Program in Kerala, India, the Left Democratic Front (LDF) also undertook a number of experiments that were gradually extended to broader areas (Fischer, 2000; Ramachandran, 2000).

Principle 4 argues that based on knowledge-driven institutional arrangements, individuals' expected benefits should be realized, and their confidence in this realization can be reinforced as the program develops. The study indicates that robust project management satisfied and combined the various needs of different social actors. For example, the policies of avoiding the use of firewood, turning to methane gas, and planting desert-living cistanche to combat desertification in Hotan, Xinjiang, not only protected the environment but also enhanced farmers' income (Yang, 2009). The New Village Movement in South Korea improved villagers' living conditions and incomes, while governmental officials received awards and salary enhancements (Kim, 2000; Park, 1998), and even the president gained more popular support (Turner et al., 1993). Furthermore, the study found that robust projects often had a federal mechanism of differing and graduated awards and sanctions. For instance, in the Dust Bowl case in the United States, farmers in thirty-nine western Kansas counties were first given 60 percent of the money necessary to list their fields in advance, and then 40 percent after the work was satisfactorily completed.

Principle 5 suggests that to understand and resolve complex problems systematically and scientifically requires multiple methods of knowledge application. In one robust project, a federal structure was built with multiple levels and methods of governance. Both knowledge-driven interactions and procedures were highly valued; both conflict and cooperation among various social actors were highly encouraged. Furthermore, the public, individuals, farmers, herders, scholars, firms, and various NGOs were all deemed as doers and achievers of democracy, and contradictory values such as procedures and outcomes, and quality and efficiency, were well-balanced. Citizen participation at all levels of institutional arrangement was mobilized, and scholar-participated governance and participatory governance of other social actors was encouraged to balance the power of government and business interest groups. For example, in Naiman, organizations such as laboratories, field experiment plots, and forestry centres formed a federal organization of desertification control, strengthened by support from Tongliao city, provincial governments, Lan Zhou, the United Nations, and others. In the New Village Movement in South Korea, at the individual level, residents in the community contributed voluntarily to the project, primarily by donating hours of labour and sometimes by sharing investment costs. At the village level, villages were classified into phases such as underdeveloped (basic), developing (self-helping), and developed (self-managing) before 1974, and the developing/self-sustaining group or the developed/self-sustaining group in 1974 (Turner et al., 1993). Furthermore, the study suggests that both steady local

scholar-entrepreneurship and steady external supports were important to robust project management. For example, in Naiman, the stories of local self-taught scholar Ligao Bao (Li, 2005) and other local field-based scholars and leaders of forestry centres and reservoirs, such as Shan Li (Sun & Buhe, 2000; Wang, 2003) and Zhe Li (Xu & Wang, 2007), indicated that steady local scholar entrepreneurship was also built during the process of desertification control. In Israel's Negev case, building Ben Gurion University guaranteed steady local-scholar entrepreneurship. Four kinds of external support were important to robust project management: financial, technical, institutional, and moral (Campbell, 1992). For combating desertification in Hotan, Xinjiang, scholars' participation, governmental support, and support from various NGOs, UNEP, and other organizations guaranteed its steady external financial, technical, and institutional supports (Xinhua News Agency, 2007). Particularly, because this region is in a minority area, governmental financial support was often stronger than in other areas.

In summary, the study's findings in relation to the five principles provide a new perspective to the study of the role of knowledge and scholars in the governance of social organizations. Although the empirical data of the study support these principles, their complexity means that more empirical research is needed. The study reveals that Model 3 indeed is an alternative model for a humanitarian society; while Model 1 'derives from buoyant or optimistic view of man's intellectual capacities', and Model 2 is based on 'a more pessimistic view' (Lindblom, 1977: 248), Model 3 prefers a middle view. Considering that the study finds higher robust rates of environmental project performance in China and the democratic countries, for low political-intervention projects, and at village and county levels, this new model might be more robust in countries with traditionally more scholarly participation and democracy for resolving complex environmental problems in low political-intervention projects, and at lower levels in hierarchical systems.

CONCLUSION

Society's growth and survival depends on knowledge. In this study, we analyze forty-nine cases of large public works projects around the world and find that scholars who have knowledge and information play significant roles in social governance, through their roles as information brokers between governments and other stakeholders, as entrepreneurial activity organizers for farmers or citizens, and as government representatives. The study further reveals that successful scholar participation in projects was accompanied by five common working principles that contributed to the success of the project. These findings do not mean I advocate replacing a volition-guided society or an intellectually guided society with a knowledge driven society in all social organizations. The three models can harmoniously co-exist. Which is more suitable for a society depends on traditions,

culture, and the level of the society's development. For example, a knowledge-driven society may be more suitable in modern China because of its time-honoured Confucian tradition, which also explains why the study found many cases of robust project management in Chinese social organizations despite China's reputation as an authoritarian regime. The study's modest contribution is that it introduces a middle ground model of scholar participation in the governance of social organizations along with five working principles, providing some bases for future theoretical and empirical studies on this new model of a humanitarian society.

NOTES

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- [1] I reported these five principles previously in the abstract of my dissertation (Yang, 2009), but did not further explain or systematically study them in Yang (2010).
- [2] The survey and interview studies in the seven counties in northern China provided a large dataset. In Yang et al. (2010), we systematically reported the result of the survey and interview studies in the seven counties to identify key factors for the success of scholar participation in combating desertification in northern China, while in Yang and Wu (2009) only a small part of the survey data was used to examine the validity of the four roles of scholars from a game theoretical analysis. In Yang and Wu (2010), combined with 23 other case studies in China and around the world, part of the survey and interview data in the seven counties was used to identify major design principles for successful scholar participation in combating desertification and to examine the generalisability of the findings from the seven counties in northern China. In the current study, combined with the other 42 global cases in both environmental (including desertification) and non-environmental projects, I use part of the survey and interview data to measure the significance of scholar participation, project performance, and the five working principles of Model 3 in the seven Chinese counties.
- [3] I thank a reviewer for this suggestion.
- [4] The Chinese saying '30 years is one generation' is from *Shuowen*, the original Han dynasty dictionary by Shen Xu. Shiji Jijie, in *The Collection of Annotations to Historical Records*, reports that Confucius said, '30 years is one generation.' Ostrom (1990: 179) also deemed that institutions 'capable of surviving for 30 or 40 years' are robust.

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