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Cheryl S.F. Chi, Tongji University, China
Yongqiang Chen, Tianjin University, China
Weiyi Shi, University of California, USA

Proceedings Editors

Paul Chan, The University of Manchester and Robert Leicht, The Pennsylvania State University



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MANAGING INSTITUTIONAL CHALLENGES IN INTERNATIONAL INFRASTRUCTURE PROJECTS

Cheryl S.F. Chi¹ Yongqiang Chen² Weiyi Shi³

ABSTRACT

The study examines how multiple and often conflicting institutional demands are managed in a case of an international infrastructure project, the Central Asia-China Gas Pipeline Project, employing archival analysis of project activities from project initiation to project closeout. As such, it deepens our understanding of institutional management in international infrastructure projects and sheds light on the interaction between technical management and institutional management in the discipline of project management. It demonstrates that international infrastructure projects are subjected to multiple institutional demands from the levels of government, firm, and the parent company of the project, that institutional management precedes technical management, and that they co-vary throughout project initiation to closeout and are mutually supportive and enabling. It also shows that institutional management and the institutional environment are mutually determined and, in the setting of international projects, collective actions and taken-for-granted responses are salient managerial activities of coping with multiple institutional demands. Directions of future research include the conditions under which collective strategies can successfully mobilized and the enabling aspect of institutions in the context of international projects that operate across various institutional spheres.

KEYWORDS: International projects, institutional management, institutional complexity, organizational responses

INTRODUCTION

International infrastructure projects such as the Channel Tunnel and Trans-Anatolian Natural Gas Pipeline operate across the confines of international borders. These projects are complex temporary organizations where stakeholders not only hail from diverse professional disciplines but also from different nations. These international projects face unique challenges in that project governance must now transcend stakeholders' diverging expectations about regulations, cultural norms, and routine practices, a set of elements we refer to collectively as institutions (Scott 2012). Yet only recently have scholars begun to explore these institutional challenges and consider the dynamic interactions between these projects and their institutional contexts.

A few empirical studies have shown that, in international projects, institutional differences produce cost and time impacts when project participants are unaware of these differences and, in turn, their actions deviate from the norms and practices taken for granted by their project partners (Orr and Scott 2008). These deviant acts induce surprises or exceptions unanticipated in conventional project management planning and scheduling, which lead to costly conflicts and delays (Mahalingam and Levitt 2007). In addition, cultural differences and

¹ Assistant professor, Department of Construction Management and Real Estate, Tongji University, cheryl.sfchi@gmail.com.

² Professor, School of Management and Economics, Tianjin University, symbolpmc@vip.sina.com.

³ Ph.D. Candidate, Department of Political Science, University of California, San Diego, weiyishi@gmail.com.

language barriers often hinder communication and collaboration (Chi and Levitt 2011). Empirical studies also demonstrate that local institutions, particularly political culture and industrial structure, have significant effects on project arrangement (Chi and Javernick-Will 2011). Complicating the issue further, the evolution of institutions is often endogenous to project management. Large, modern engineering projects are known to be rule changers that stretch the limits of existing regulations, laws, and standards (Miller and Lessard 2000, Scott 2012).

The majority of existing studies on project management, however, have focused on technical and strategic aspects of project management, treating institutional environments as given (Morris and Geraldi 2011). There has been a call for more research on how project management professionals may respond to the dynamic institutional context and competing institutional demands surrounding large, complex projects (Winter, Smith et al. 2006, Orr and Scott 2008, Chi and Javernick-Will 2011, Levitt 2011, Scott 2012). This shift of scholarly focus from the operational and strategic dimensions to the institutional dimension of project management aptly reflects the globalizing trend in today's engineering projects: as the territories of projects expand, our research needs to reflect the highly varied social and political environments in which international projects operate. Only then can our scholarship generate long-term and far-reaching values for real-world international project management.

Contributing to the growing institutional literature on project management, this study draws on insights from institutional theory to explore the role of institutional management in international project management. Specifically, it explores (1) what these institutional demands are; (2) what management activities are needed to address these challenges in order to successfully develop and deliver international infrastructure projects; and (3) identifies the relationship between these activities and the management of technical issues in an international infrastructure project. We have chosen to focus our efforts on infrastructure projects because they are one of the most typical forms of large international projects, but our insights are not limited to infrastructure development alone. This study deepens our general understanding of institutional management in large international projects and, in particular, s light on the interaction between technical management and institutional management in the discipline of project management.

LITERATURE REVIEW

Since the 1970s, when projects began to be viewed as open organizational systems (Söderlund 2011), managing institutional contexts naturally falls within the purview of project management (Morris 1982, Stinchcombe 1990). An increasing number of studies have stressed the importance of institutional context surrounding complex engineering projects (Grabher 2002, Engwall 2003, Winter, Smith et al. 2006) and international engineering projects (Miller and Lessard 2000, Mahalingam and Levitt 2007, Orr and Scott 2008, Chi and Javernick-Will 2011, Ruuska, Ahola et al. 2011). Embedded in a web of international and local participants, international infrastructure projects in particular are characterized by complex interfaces of institutional differences and significant social and political complexity (Orr, Scott et al. 2011). The impact of institutional complexity and differences on large and international projects is well established in empirical studies. Previous research has identified, for example, “optimism bias” and “strategic misinterpretations” (Flyvbjerg 2011), misunderstandings and conflicts (Mahalingam, Levitt et al. 2010), and excessive coordination difficulties (Chi and Levitt 2011, Ruuska, Ahola et al. 2011) which lead to cost overruns, delays, risks, and benefit shortfalls of large projects. Although institutional challenges are well documented, few studies have explored

practical approaches to respond to and mitigate these challenges. This line of inquiry remains woefully underexplored.

Conceptualization of Institutional Management

Institutional management can be viewed as responses to institutional demands. Scholars of institutional theory have suggested that, organizations are receptive to different institutional logics in various degrees and respond to institutional pressures in a patterned way (Greenwood, Díaz et al. 2010). Their responses to technical and institutional demands are fundamentally different. Scott and Meyer (1991) posit that technical environments evaluate organizations based on their “effective and efficient control of their production systems” while institutional environments evaluate organizations based on their conformity with rules, beliefs, procedures, and institutional requirements (p. 123). Technical environments subscribe a rationality that is based on mean-and-end prescriptions that are efficacious in producing targeted outcomes, while institutional environments subscribe a rationality that is underpinned by a “rationale”, an account that renders actions reasonable and acceptable by others. Institutional rules are often framed and supported with technical arguments in order to appear rational, which makes it difficult to distinguish technical and institutional demands in empirical cases. Nevertheless, the evaluation of conformity to institutional demands often focuses on specific procedures that are critical for receiving legitimacy rather than production outcomes.

In a similar vein, some scholars of project management attempt to identify the differences between institutional management and technical management. In general, they present four different views. First, the early work of Morris (1982) proposed a three-level framework of project management (i.e., institutional, strategic, and tactical levels), which was, many years later, refined (i.e., institutional, strategic, and technical) and further elaborated (Morris and Geraldi 2011). In the conceptual framework, strategic and technical management of projects focuses on the managerial work that directly performs the project tasks and moves the project forward, such as construction tasks, designing and planning, and selecting contractual types. Institutional management is, in Morris and Geraldi’s (2011) words, “concerned with improving success not of a specific project, but of projects within the enterprise’s own organizational environment . . . or the wider environmental context within which the project is located, or both” (p. 23). This definition indicates that institutional demands come from the rules created at the organizational levels of parent companies or fields, to govern projects in general. Given the fact that international engineering projects are often equipped with advanced technologies, institutional management focuses on dealing with the tension between the idiosyncrasies of project requirements and general institutional rules.

Second, a related view sees institutional management as acquiring legitimacy to support technical activities of projects. In this perspective, managing institutional challenges is viewed as dealing with issues related to the connection between the project and the wider social system rather than production coordination and production itself. According to Miller and Lessard (2000), institutional management serves to align project arrangements with their institutional contexts, or “anchor projects”, in order to ensure the project objectives are met and project benefits are realized (p. 24). Based on the analysis of sixty cases, the authors conclude that the goal of institutional management is to create three generic conditions for projects to overcome uncertainties and turbulences: stabilization of the long-term future to enable investment, flexibility to face turbulence, and enhancing the legitimacy of projects, participants, and

agreements (p. 25). As such, institutional management emphasizes financial and political skills rather than technical skills.

The third view sees institutional management as managing demands from the organizations (e.g., banks, communities, and regulators) or networks (e.g., the media and professional communities) that have influence on the project (Morris and Geraldini 2011). In other words, institutional management is viewed as managing the project’s stakeholders by categorizing them based on their power, interests, influence (i.e., the level of involvement), impact, and salience (i.e., power, urgency, and legitimacy), and developing engaging strategies accordingly (Project Management Institute 2013). However, institutional challenges facing international projects often go beyond stakeholder management. Most project participants face a “liability of foreignness” as they enter the host country for short-term work on a single project rather than establish a long-term operation (Orr and Levitt 2011). Unfamiliar host societal contexts generate “institutional exceptions” unforeseen by the project members, which have to be handled through a process of “ignorance, sensemaking, and response” (Orr and Scott 2008).

The fourth view sees acquiring institutional knowledge as a managerial strategy of mitigating institutional challenges used by international firms to fill the institutional voids (Khanna, Palepu et al. 2005, Orr 2005). The work of Javernick-Will and Scott (2010) categorizes institutional knowledge into three categories (i.e., regulatory, normative, and cultural-cognitive knowledge) and identifies fourteen main types of institutional knowledge that are important for international firms working on international engineering projects. Interestingly, among these firms, developers, engineering consultants, and contractors weight differently the importance of these types of institutional knowledge. Orr and Levitt (2011) argue that it is “the embeddedness of an entrant’s activities in local institutions and relations” that largely determines different local knowledge needed for different types of firms to perform their work. This argument provides an important insight for viewing international projects from the perspective of project lifecycle: the nature of institutional challenges facing these professional disciplines varies and the variances are likely to stem from project activities. This variation in turn signifies that the nature of institutional challenges will tend to vary over the phases of project lifecycle (e.g., planning, design, construction, and operation) due to the different project tasks performed at each phase.

The preceding discussion suggests the following hypotheses:

Hypothesis 1 (H1): institutional management lays the foundation for technical management. Therefore, institutional management precedes technical management.

Hypothesis 2 (H2): institutional management and technical management are concentrated in different phases of the project life cycle. For instance, the initiation stage relies heavily on institutional management while the construction stage relies heavily on technical management (see Morris 1982).

Table 1 summarizes the different elements of technical and institutional management from the four conceptualizations of institutional management.

Table 1 Comparison of Technical Management with Institutional Management

Elements	Technical Management	Institutional Management
Focus	Directly performing the project tasks and moving the project forward	Improving the success of projects The alignment between the project and the

	Production and production coordination	wider social system
Rationality	Mean-and-end prescriptions of producing outcomes	Rationales that make actions reasonable and acceptable to others
Evaluation	Production outcomes	Procedural conformity
Aims	Efficiency and effectiveness of production	Legitimacy
Needed skills	Technical skills	Financial and political skills
Knowledge management	Technical and engineering knowledge that often vary in different types of projects	Institutional knowledge that vary in different societal contexts

Organizational Responses to Institutional Demands

Early studies on organizational responses to institutional pressures focused on establishing that institutions do affect organizational behavior and often emphasized one kind of institutions over another (Scott 2014). Some studies have begun to shift the focus of attention to identifying the categories of organizational responses to institutional demands and to understanding the responses to “institutional complexity” or multiplicity of institutional logics (Greenwood, Raynard et al. 2011). Oliver (1991) draws on resource-dependence theory and outlines five types of strategic responses that are available to organizations to cope with institutional pressures: acquiesce, compromise, avoid, defy, and manipulate. Her framework emphasizes the self-interested, strategic perspective of organizations but underexplores the institutional effects on organizations’ choices of responses. Kraatz and Block (2008) summarize the line of studies on organizational responses to multiple and often conflicting institutional demands and identify four basic responses: (1) eliminate the multiplicity, (2) differentiate multiple demands and manage them separately, (3) rein and balance different demands, and (4) embrace the disparate demands and create a new institutional identity.

Meanwhile, empirical studies show that organizations often respond to institutional influence with organizational changes including the change of identities and subsequent structural change (Hoffman 1999) and decision-making rules and procedures (Scott 2014). Organizations have the opportunity to device the meaning of compliance and mediates the institutional pressure especially when the law is characterized with ambiguity, procedural emphasis, and weak enforcement (Edelman 1992). Particularly, the state, as a powerful actor, plays an important role in enabling changes in institutional logics and, in turn, organizational behaviors (Greenwood, Díaz et al. 2010). For instance, in the infrastructure sector, the state can employ a repertoire of policy instruments to directly change operation rules and patterns (Chi and Chen 2012).

Scholars of project management have just begun to explore strategies to cope with institutional challenges in the setting of temporal, goal-specific project organizations. Orr and Scott (2008) apply Oliver’s typology (1991) in analyzing strategies to cope with institutional exceptions in twenty-three international engineering projects. They propose to include the sixth category of “education”, a strategy that involves teaching and learning unfamiliar institutional rules. Orr and Levitt (2011) identify three general strategies that firms use to cope with institutional challenges in foreign markets: increasing the supply of local knowledge, decreasing the need for local knowledge, and reducing potential impacts of local knowledge deficit. These studies, based largely on individual firm interviews, emphasize the importance of acquiring

sufficient local knowledge to successful institutional management, but capture only strategies that are wittingly and purposefully employed. Largely unexplored are the remaining two types of responses in the literature of institutional theory: taken-for-granted responses and collective responses by multiple organizations (Greenwood, Raynard et al. 2011).

Taken-for-granted responses are actions that are internalized by the actors and therefore are not immediately apparent to the actors themselves. As a result, these responses are difficult to be identified by the informants in interview approaches. More importantly, focusing on firm level strategies leaves out collective strategic responses of multiple actors. These concerted responses are not uncommon in managing the tension and conflict of multiple institutional demands in the setting of international projects (Miller and Lessard 2000). Collective responses have the potential to shape the institutional rules and demands (Scott 2014) and enact new ones (Miller and Lessard 2000). These responses are important to a more comprehensive understanding of institutional management at the project level.

The discussion suggests three additional hypotheses:

Hypothesis 3 (H3): institutional management and the institutional environment are mutually determined: while the environment shapes the level, type, and strategies of institutional management employed, the managerial activities also actively change the environment.

Hypothesis 4 (H4): in the context of large international projects, concerted actions of multiple project actors are organized to cope with multiple institutional demands. These actions are more likely to change the institutional rules than single actor's institutional responses.

Hypothesis 5 (H5): in the context of large international projects, taken-for-granted responses tend to be observed in actors' compliance with the institutional demands from their own institutional background such as their parent companies and governments.

In this paper we build on the conceptualization of institutional management and organizational responses in prior studies to explore strategic responses by project organizations to cope with institutional challenges in large international infrastructure projects.

RESEARCH METHODOLOGY

This study reports a case study of an international infrastructure project from project initiation to project closeout, employing archival analysis. Organizations create documents recording the events and factors that shape the trajectories of their development and activities. Project organizations are no exception. The trail of documents reveals organizational life and how it unfolds over time in a credible way (Ventresca and Mohr 2005). Therefore, the longitudinal archival analysis permits observation of the interactions of institutional management and technical management and how they change over the major phases of the project before its operation. This strategy is particularly useful for identifying organizational strategies that pursue or maintain legitimacy (Schneiberg and Clemens 2006).

Case Selection

The study selected the Central Asia-China Gas Pipeline Project (hereafter CAC) as our case for analysis. It is the largest among China's overseas gas pipeline projects. With a total length of 1,833 kilometers, it carries natural gas from the Turkmenistan-Uzbekistan borderline, passes through the middle of Uzbekistan, crosses southern Kazakhstan, and enters China's Xingjiang at Horgos. The project was proposed by the China National Petroleum Corporation (hereafter CNPC), the dominant player in China's oil and gas sector. It subsequently created a dedicated project company, Trans-Asia Gas Pipeline Company Limited (as "Zhong Ya" in Chinese, hereafter ZY). The ZY formed joint venture project companies with sponsor firms in

the two host countries, Uzbekistan and Kazakhstan, respectively. The ZY set up overseas project units in the joint venture companies to ensure the control of project progress. Under the pressure of the political and economic interests of four nations, the project successfully met the requirements of budget, quality, and particularly demanding schedule of 28 months. It was formally initiated in August 2007 and ready for operation in December 2009.

As a complex, international, large infrastructure project, the project's success in the face of demanding institutional requirements makes it a valuable "knowledge-intensive" case that has a large repertoire of tested strategies for us to explore (Starbuck 1992). The project traverses the territories of four countries with highly divergent political systems, stages of socioeconomic development, and cultural traditions. These differences and the institutional challenges they engender make CAC an ideal case for studying how project management interacts with its institutional contexts. In addition, existing case studies in the business literature are dominated by the experiences of multinational corporations and projects led by developed economies. The primary stakeholders in our case, however, are from China and other emergent or less developed economies. With China playing an increasingly important role in infrastructure development around the world, it is time we focus on a China-led project.

Moreover, the second author has experience working in the sector. The author and three students in the research team have closely worked with the project company. They provide the sector-specific knowledge, credible first hand data, and an accurate understanding of project activities reflected in the data.

Data Collection and Archival Analysis

Major Data Source

The main data used in the archival analysis is the file directory of a comprehensive set of formal project documents produced from project initiation to project closeout by project participants indicated in Figure 1. The directory, containing information on file number, issuing party/department, subject, date, and pages, provides a revealing shortcut to a total of 10,330 project documents. It codifies the issues that have been negotiated and the actions that have been taken in chronological order, showing a web of interactions beyond the narrowly defined project boundary.

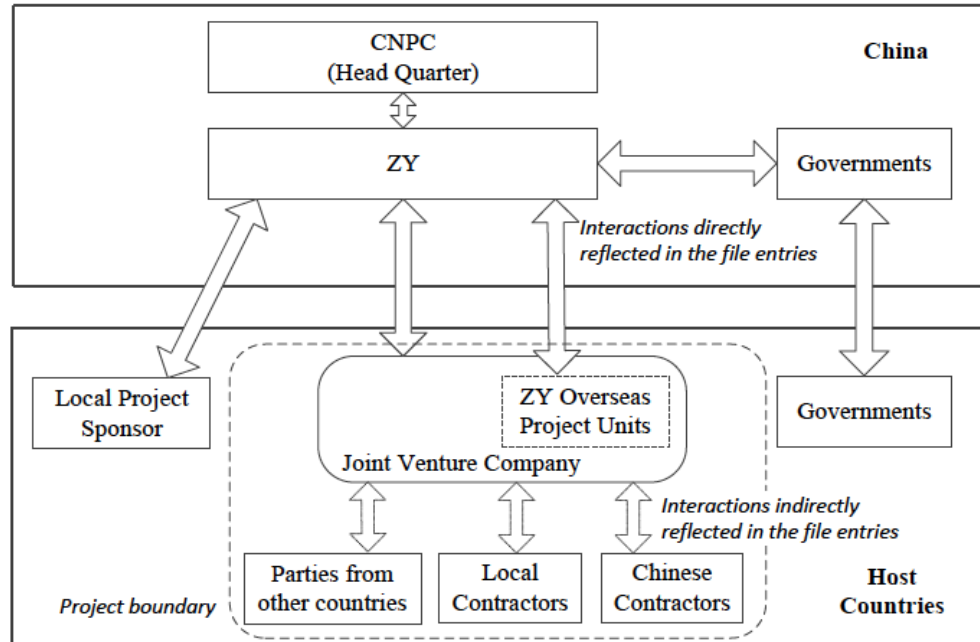


Figure 1. Project participants covered in the project documents

We obtained a usable set of 5,116 file entries through three filtering steps.

1. We eliminate the file entries that are duplicates (i.e., the same documents filed by different units/departments in the project) or have vague subjects by which the issues and activities are unrecognizable.
2. Since our level of analysis is project organizations, we follow Pfeffer and Salancik (1978) in defining the institutional environments of the case are “enacted” by the focal project. We thus exclude the file entries of corporate routine reports because they reflect managerial requirements that are specific to the parent company and exist with or without the project (e.g., training and contributing to corporation journals). Therefore they are outside of the research focus.
3. We apply the aforementioned definitions of institutional management and technical management in a strict way in which we eliminate entries that are not easily fit in either category.

In the first round of analyzing the document entries, we identified 75 project activities such as feasibility study, preliminary design review and approval, route design, and cost estimate, etc. We arranged these entries into a database. For each entry, we indicate to which of the 75 activities it belongs. Then, following Miles and Huberman (1994), we developed the coding scheme (see Table 2) according to both the definitions in Table 1 and the content of the document entries. Based on the coding scheme, we hand-coded each document entry, indicating whether it related to technical management or institutional management.

To ensure the coding scheme reflects and covers actual activities recorded in the document entries, we triangulated the code list with the analysis of key word frequencies and none-verb configurations of the entire entries to see whether or not these analyses demonstrated similar clusters of activities. In addition, we conducted three rounds of small-scale trial coding and intensive group discussions led by the authors to sharpen the definition of institutional

management in the context of the case before we undertook the full-scale coding and inter-rater analysis. Two coders consistently participated in all rounds of coding while other group members had coded partially to be familiar with the data and project process in order to ensure the effectiveness of group discussions. Finally, we created a longitudinal database of project activities unfolding over the course of project initiation, planning, construction and closeout, which facilitates an objective quantitative analysis.

One key issue of using project document entries in analyzing institutional management is that the project document itself is a formal communication tool and also a carrier of institutional elements (Scott 2014). Many documents such as reports, requests, and applications are part of compliance of institutional procedures. The way we dealt with this duality of project documents is to look at both the activity indicated by the document and the activity performed by the document (e.g., reporting, application, and confirmation). To do this, we sharpened our coding criteria in Table 2.

Table 2 Coding Scheme

No.	Definitions	Example Entries (translated from Chinese)
1	<p>Rules:</p> <p>1) Institutional Management: Rule setting activities prior to the implementation of the task indicating in the entry. These activities often take place at the higher level of organizational hierarchy compared to the level carrying out the technical tasks;</p> <p>2) Technical Management: activities carrying out the task in accordance with such pre-set rules.</p>	<p><i>“The Meeting Minute of the discussion regarding office expenses sharing of preliminary design cooperation between [two Chinese designer firms] in the CK Gas Pipeline Section”</i></p> <p><i>“Application for confirmation of expenses concerning modification of Uzbekistan’s feasibility study”</i></p>
2	<p>Mobilization:</p> <p>1) Institutional Management: temporarily assigning of personnel or experts to negotiate, discuss, communicate, and coordinate matters;</p> <p>The short-term assignment of high rank managers (e.g., the general president and vice president of the ZY and the general manager and vice manager of Overseas Project Unit);</p> <p>Requests for specific personnel from the companies under the CNPC sent by the ZY;</p> <p>Requests for invitation letters as part of the procedure through which the assigned personnel enter the host country;</p> <p>2) Technical Management: assigning staff to perform longer-period tasks aiming at accomplishing tasks and improving efficiency;</p>	<p><i>“Appointment letter of two experts to participate in the review meeting of the Communication SCADA System ITB documents of the CU Gas Pipeline Section”</i></p> <p><i>“Notification of the appointment of the four staffs [their names] to set up the ZY Company Committee”</i></p> <p><i>“Request for the four staffs [their names] of [the company name] to support the ZY until the end of the Year 2009”</i></p> <p><i>“Matters concerning the invitation letters of [the name of the staff] to Kazakhstan”</i></p> <p><i>“Report on assigning two staffs [their names] to work on the China-Kazakhstan Pipeline Project Sections”</i></p>
3	<p>Institutional Management: When the documents titles include the word or phrases like ‘assist’, ‘request for support’, ‘request for approval’, ‘request for instructions’ (from the higher rank authorities) etc., they are considered</p>	<p><i>“Letter on National Energy Administration assisting CAC Project in commodity inspection of construction equipment and materials”</i></p>

No.	Definitions	Example Entries (translated from Chinese)
	activities of legitimacy-seeking	<p><i>(General Administration of Customs)</i></p> <p><i>“Document of legal support on the first outward transport of Pipeline Bureau’s construction equipment and materials”</i></p> <p><i>“Request the Head Quarter¹ for supporting the technical clarification of steel pipes”</i></p> <p><i>“Request for approval of ‘the bidding strategies of the communication system of China-Uzbekistan joint venture company and SCADA system’”</i></p> <p><i>“Request for instructions regarding the proposal of the route modification rounding City J and extending transportation”</i></p>
4	<p>Interface Management:</p> <p>1) Institutional Management: negotiations between parties regarding defining working interfaces and dividing work loads;</p> <p>2) Technical Management: coordination of technical working interfaces (few in the data);</p>	<p><i>“Matters on dividing working interfaces between the ZY and Company AMH²’s outward transportation pipeline”</i></p> <p><i>“Re-defining working interfaces and comparison of workload variations between [the Chinese Contractor] and ZEROMAX (the host country contractor)”</i></p> <p><i>N/A</i></p>
5	<p>Institutional Management: Acquiring local institutional knowledge including laws, regulations, and requirements from host countries;</p>	<p><i>“Regarding the collected Laws and Proposals of Uzbekistan”</i></p>
6	<p>HSE (Health Safety and Environment) Management:</p> <p>HSE system has been institutionalized in the energy sector and governed by a set of regulations. Although HSE has a dimension of managing project image and gain legitimacy from wider public, it also directly impacts productivity and efficiency. Therefore, in this study we adopted strict definitions of institutional management and categorized HSE documents as technical management.</p>	<p><i>“Notification of taking strengthening measures to guard against violence assault”</i></p>
7	<p>Contracting:</p> <p>1) Institutional Management: In this case, contracting activities involve figuring out who would sign a contract, which levels of leader would sign, how many copies to sign, whether to include the contract in the filing system, etc.;</p> <p>Changes of contracts that trigger negotiations or disputes and require approvals upon updated agreements between parties from different countries;</p>	<p><i>“Request the Head Quarter for approval of the contract value exceeding \$15 million in China-Uzbekistan Gas Pipeline Project Section”</i></p> <p><i>“Regarding the mode of signing CU/EPC/05A communication system contract”</i></p>

No.	Definitions	Example Entries (translated from Chinese)
	<p>Contract closeout activities that verify the completion of a contract and resolve open items between parties from different countries. These activities can be highly institutionalized between organizations in the same institutional settings but often become matters of negotiation in international projects.</p> <p>2) Technical Management: Administering a contract including verifying the conditions of payment and fulfilling the payment obligations.</p>	
8	<p>Accommodation and meals on site:</p> <p>1) Institutional Management: requesting for assistance from the higher-level authorities to arrange accommodation and meals on site in host countries (as defined in definition 3).</p> <p>Entertainment and cultural activities arranged by the parent company are categorized as institutional management.</p> <p>2) Technical Management: activities of actually arranging accommodation and meals on site. Although these activities are not directly linked to technical tasks of projects, they are standardized part of project work.</p>	<p><i>“Request for the Head Quarter’s assistance in accommodation arrangements of staffs of preliminary design from the Project Management Team of China-Kazakhstan Gas Pipeline Project Section”</i></p> <p><i>“Regarding accommodation expenses of the inspection of [the Inspecting Company] on site.”</i></p>
1.	The Head Quarter indicates the CNPC in this case.	
2.	Company AMH was a natural gas company newly created by the CNPC to manage the work in Turkmenistan.	

Supplementary Data Sources

The supplementary data include two project documentary books (Lu and Ji 2014, Sun and Lv forthcoming) and project files archived at the ZY. In addition, 65 open-ended interviews, a total of 73.6 hours, were conducted with the Chinese managers in the parent company and the ZY who had participated in the CAC asking them about the challenges and their responses to the challenges. Among these, 55 interviews were video recorded with consent and transcribed within 24 hours after the interview was conducted (Eisenhardt 1989). These supplementary materials further validate and elaborate the decisions and processes underlying the project activities recorded in the project documents, which verify our categorization of these activities.

FINDINGS

Tight Interactions between Institutional Management and Technical Management

Among the total of 5,116 entries in our data set, 2261 (44%) are institutional management activities and 2855 (56%) are technical management activities. Institutional management, as expected, was enacted earlier (in January 2007) than technical management (in March 2007). Since the official launch of CAC, the ZY was created to be in charge of the project and negotiations over bilateral agreements and contracts were enacted across the level of nations, firms, and projects, as illustrated in one excerpt from internal documents of the ZY:

“[translated from Chinese] 10 to 23 April 2007, [the group leader’s name] led the negotiation group dedicated to China-Turkmenistan project section, to negotiate with the President of Turkmenistan and the affiliated Turkmenistan National Oil and Gas Resources Utilization and Management Agency. In this negotiation, all the terms of the ‘Production Sharing Contract of the [project name] in Turkmenistan’ were determined. On July 17th, under the witness of President Hu Jintao and Turkmen President Gurbanguly Berdimuhamedow, the CNPC signed ‘Natural Gas Purchase and Sale Agreement’ and ‘Production Sharing Contract of the [project name] in Turkmenistan’ with Turkmenistan’s National Oil and Gas Resources Utilization and Management Agency and Natural Gas Company KCN, respectively, in Beijing.”

However, the case shows a positive correlation between institutional management and technical management throughout the project initiation, design, and construction phases, as presented in Figure 1.

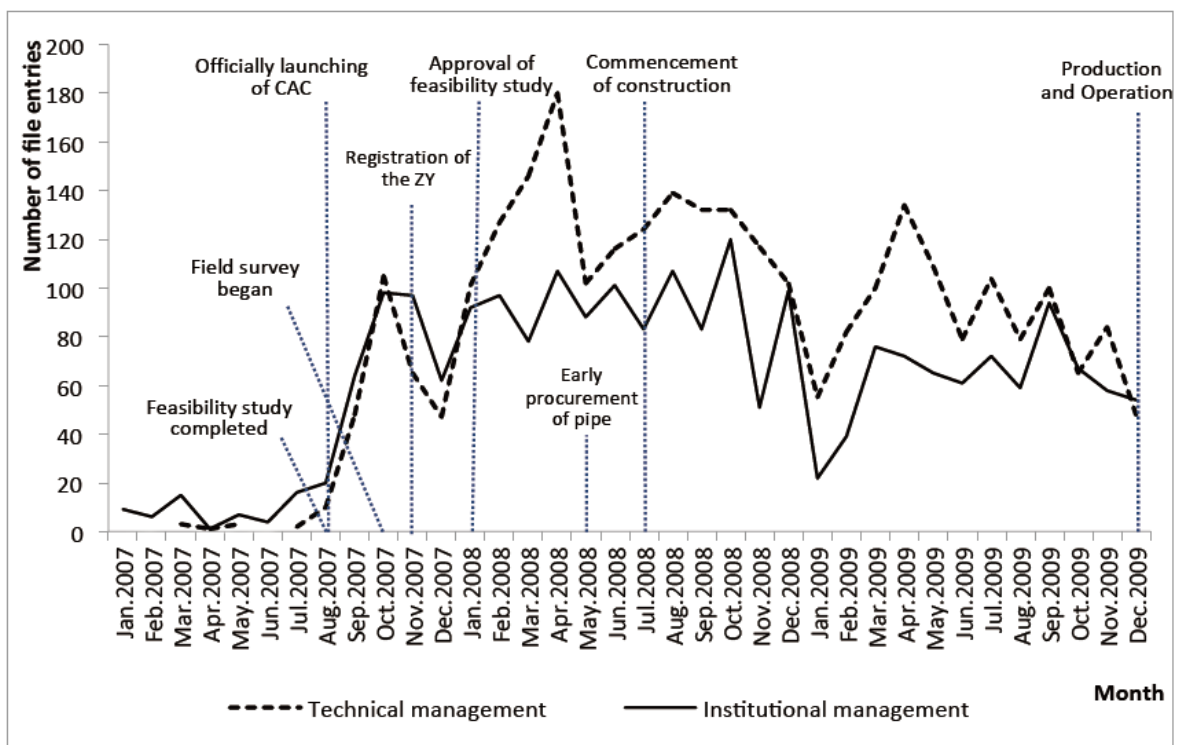


Figure 1 The number of file entries of technical management and institutional management from project conceptualization to completion

A possible explanation to this correlation is that the project phases were overlapping due to the demanding schedule of the project. An excerpt from an internal document of the ZY is illustrative:

“[translated from Chinese] . . . at the early preparation stage, they implemented ‘four concurrencies, three advances’, meaning that applying for feasibility approval while establishing joint venture project companies, securing the supply of pipes while developing pipe transportation plan, performing preliminary design while preparing tender packages, bidding while mobilizing equipment; conducting survey and feasibility studies before the registration of

project companies, initiating preliminary design and tendering preparation before the feasibility study approval, purchasing 720,000 tons of steel pipes (total required pipes were estimated 820,000 tons) and mobilizing 1,500 plus sets of equipment before signing the contract [with the Chinese supplier and contractor]”

Further examination reveals tight interactions between technical management and institutional management in project activities in the international setting. In the 75 project activities identified in the study, 56 activities (75%) such as feasibility study, route design and optimization, estimating, human resource management, and purchasing, were comprised of various combinations of technical management and institutional management. Figure 2 presents selected activities with the ratio of institutional management ranging from 100% (i.e., joint venture formation) to 10% (i.e., pipe manufacture).

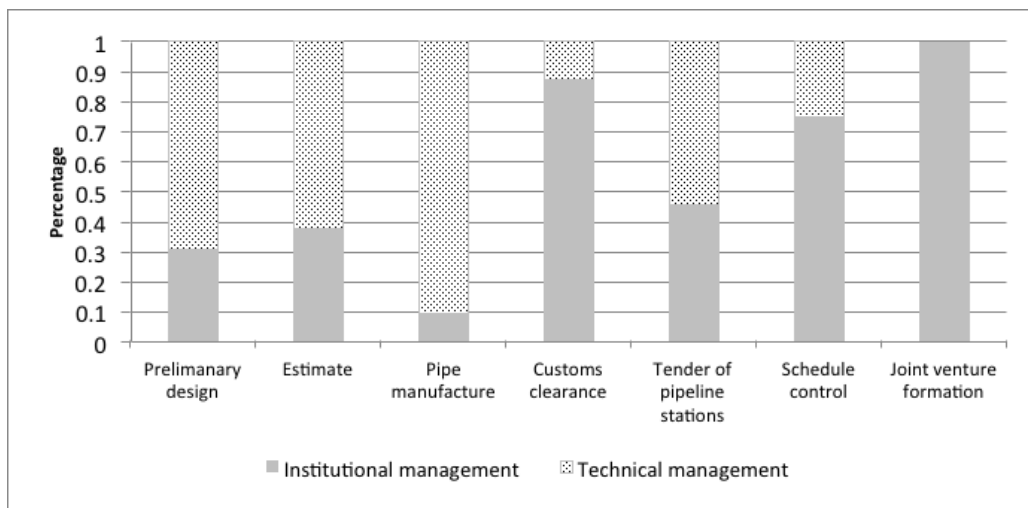


Figure 2 The ratio of technical management and institutional management in selected project activities

That the formulation of joint ventures consists entirely of institutional management is not surprising. A large literature indicates that institutional environments not only shape firms’ decisions to form joint ventures in foreign countries but also the specific arrangements of these ventures (Lu 2002, Yiu and Makino 2002, Roy and Oliver 2009). However, our project documents and interviews reveal that, even the seemingly highly technical tasks (e.g., steel pipe production and welding) involve substantial institutional management activities. In an international project, technical tasks require negotiating between different production processes, approaches, and standards before they can be performed and inspected. Without obtaining shared agreements among key project participants from different institutional backgrounds on the process and method with which a task should be performed (legitimacy), the process and method cannot be implemented (efficiency).

Repertoire of Institutional Management

We found two general kinds of institutional management. The first kind is compliance with the demands of existing institutions. These demands come from three institutional levels: the CNPC, the Chinese government, and the host countries. Management activities under this category

include informing the project team of the regulatory rules that it needs to comply with, and the internal review and approval processes of the parent company based on which the project asked for additional resources and support. Particularly interesting findings are that a sophisticated set of rules and protocols in controlling, supporting, and monitoring projects like the focal case has already been developed *within* the parent company of the case. For instance, the procedures and rules of risk management, HSE management, and reporting of major incidences existed in the parent company and the ZY. This differs from the sectors that are relatively market-oriented like the housing sector, in which the government devises governing rules and regulations.

The second kind of institutional management is changes of existing institutions to support the project. Managerial activities under the second category include the following five types:

1. Creating new rules, agreements, organizations, and regulations:

Within the parent company, the CNPC, new rules and guidelines were developed based on the project experience. At the level of firms, new firms were created and new agreements were crafted and signed in the process to meet all relevant parties' interests and conditions. One example at the firm level is the contractual terms of project financing tailored to meet all parties' interests. China Development Bank won the bidding of project finance and began the negotiation with the project representatives. In the context of financial crisis in 2008, the bank carefully crafted the terms of financing \$11 billions USD while the host country representatives attempted to guard their benefits from the project. All parties hired top lawyer teams and negotiated for over three months before signing the contract (Lu and Ji 2014 pp. 185-193).

At the national level, in addition to governmental agreements crafted and signed, new rules and standards that impacted the oil and gas sector were created. For instance, the president of Uzbekistan issued Presidential Decree to exempt the compulsory foreign exchange settlement and exempt some legal procedure to allow equipment mobilization. Moreover, in 2007 Turkmenistan granted the CNPC permission to develop the gas fields supplying gas for the project, which was the first time such permission was granted to a foreign company. In honor of the completion of the project on December 14, 2009 as promised by the Chinese parties, Turkmen President Gurbanguly Berdimuhamedow declared the day a holiday of the worker of the oil and gas industry.

2. Seeking government support:

One salient example is the transportation of pipes, the most crucial material in the project. In order to acquire needed pipe materials within limited time, the ZY purchased the majority of pipes from 30 steel plants and pipe producers distributed in 14 cities in China. Shipping these pipes to the jobsite required coordination of 32,067 railcars and 12,233 trucks domestically and corresponding transportation in the host countries, which would be impossible without government support in terms of the transportation arrangement of national railways and customs application and clearance across national borders (Lu and Ji 2014). The CNPC enacted an government taskforce led by National Energy Administration and joined by the Ministry of Foreign Affairs, Ministry of Finance, (former) Ministry of Railways, Ministry of

Commerce, General Administration of Customs, and State Administration of Taxation, which formed an organizational mechanism that flexibly responded to novel challenges facing this case.

3. Negotiating differences in regulatory rules of home country and host countries:

A representative example is the negotiation of the technical standards of steel pipes. The seemingly highly technical issue turned out to be quite institutional in nature. The host countries required using straight-seam welded steel pipes for high pressure natural gas pipelines. However, China mostly used spiral welded steel pipes. As a result, China had weak production capabilities of straight-seam welded steel pipes. Since the steel pipes were the core material of the project that accounted for a large part of project costs and their supply was on the critical path, purchasing the pipes from outside of China would induce significant political, financial, and contractual risks for the project. Therefore, the ZY proposed to use spiral welded steel pipes instead. However, the host countries rejected the proposal because they trusted their technical standards and superiority developed through a long history of building natural gas pipelines (from interviews). In response, the ZY utilized the institutional knowledge that Russia was perceived by the host countries as the technical authority in this field and invited 20 representative experts to China to verify the technical reliability and viability of spiral welded steel pipes. Russian experts' recognition of the technology altered the attitude of the host countries and they eventually accepted the technical alternative (Lu and Ji 2014).

4. Mobilizing personnel within the network of the CNPC to support the project;

5. Technical innovations:

One example is the innovation of welding technique that reduces labor force on site. In February 2009, Uzbekistan demanded to change the pipeline route to connect to one of its own natural gas fields, which created additional demand for welders. Under the limitation of labor visas quotas issued by the host country and qualified Chinese welders, the ZY organized a task team to revise the welding technique and resulted in a new technique that boosted efficiency by about 50% (Lu and Ji 2014 p. 261).

DISCUSSIONS

The divide of technical management and institutional management is analytically useful, but an understanding of the relationship between technical management and institutional management is fundamental for a holistic view of international project management. From the detailed analysis of longitudinal project documents, we provide support for H1 that institutional management begins earlier than technical management. We find limited support for H2 that institutional management and technical management are concentrated in different phases of the project life cycle. Instead, we find that, international projects like the focal case involve the amount of institutional management nearly the same amount of technical management. The majority of project tasks consists both institutional management and technical management and these two types of management have a significant level of correlation throughout the phases of project initiation, design, and construction.

This entangled relationship became apparent to us when we developed the coding scheme. The development of the coding scheme serves as a process of analysis (Corbin and Strauss 2008) in which we identified different natures of the activities indicated in the document entries through the theoretical definitions and conceptualization of institutional management. For instance, the ZY assigned personnel to the host countries for different types of tasks. Some of them were sent to negotiate the terms of agreements and some were to push the review and approval processes and other tasks. Therefore, these assignments could not be conflated into “staff mobilization” normally planned according to the project workload. This finding also offers an explanation for the observation made by prior studies that contractors, designers, and developers need different types institutional knowledge (Javernick-Will and Scott 2010, Orr and Levitt 2011).

Moreover, our analysis shows that institutional management and the institutional environment are mutually determined, as suggested in H3. Institutional management of large international projects can transform the existing institutional landscape. Institutional theorists have observed that creating new organizations is a powerful institutional change; these organizations gain a life of their own and become self-sustained (Dobbin and Sutton 1998, Scott 2014). In our case, each of the newly created project firms accumulated experience and developed their own rules and management styles over the course of the project. We observed that these transformations also percolated to the national and industry levels. When managed well, institutional challenges and lengthy negotiations can be turned into reciprocal relationship among project parties and nations. This transformation is consistent with the strategy of embracing institutional demands and creating a new identity (Kraatz and Block 2008). In our case, all of the three host countries continue to work with China in developing the oil and gas sector. Turkmenistan even institutes a new holiday memorizing China’s contribution. Events like this signal a transformation of national relationships and herald structural changes in a sector that was originally closed to foreign entities.

As suggested in H4, the mobilization of collective actions as a strategy to cope with institutional demands is salient. In our case, the CNPC as the dominant player in the Chinese oil and gas sector possessed rich knowledge of domestic institutions and the institutions of the host countries. It was able to mobilize collective actions among Chinese government agencies, Chinese partner companies, and even Russia experts. The task group of governmental agencies and the network of Chinese contractors and suppliers prove to be responsive and powerful in coping with idiosyncrasies of the focal project. Under what conditions and through what mechanisms the collective actions can be mobilized is a worthy empirical question.

Our case observes a type of institutional management is taken-for-granted compliance to existing rules, as suggested in H5. It includes the overseas units and the ZY following the rules of the CNPC, the contractors and suppliers agreeing to mobilize their resources in the absence of formal contracts, and the personnel who were transferred from other CNPC related companies immediately relocating to the focal project. We consider these activities as taken-for-granted responses because of the ways in which the actors comply with the rules and requirements without questioning or negotiation. In addition, the fact that these requirements were not brought up by our interviewees indicated that they did not see these requirements as challenges. Nevertheless, this type of responses we capture in the archival analysis is not trivial. It signals the cognitive and normative aspects of legitimacy grounded in shared social values and cultural accounts (Suchman 1995), which facilitate quick coordination and project responsiveness. As institutional theory suggests, institutions are not only the social rules but also the “platform of

social action” which enable collective actions to be quickly organized (Scott 2014: 93). The enabling aspect of institutions deserves further exploration.

One surprising observation in our case is that institutional management and technical management are mutually supportive and enabling. Prior studies suggest that institutional management supports technical management by creating supportive conditions for technical work and project success (Miller and Lessard 2000). In our case, elevating Russia’s authoritative position of technical capabilities to solve the issue with the technical standards of steel pipes is illustrative of this proposition. However, we also observe the reverse relationship at work: technical solutions can also land support to cope with institutional demands. International projects inevitably face political risks in host countries, particularly in emerging markets (Miller and Lessard 2001, Henisz and Zelner 2010). Our case is no exception. As illustrated in the strategy of technical innovation, satisfying Uzbekistan’s demands to change the pipeline route was important for the project long-term stability but it threatened the project completion date that China promised Turkmenistan. Technical solutions offer a way to resolve the interdependency of the demands and manage them separately (Kraatz and Block 2008).

Comparing our observations with the typology of institutional responses of Kraatz and Block and that of Oliver, it becomes apparent that in international projects, managing institutional demands requires moving beyond Oliver’s framework. “Acquiesce, compromise, avoid, defy, and manipulate” can still be observed in our case. But focusing on these alone tends to give attention only to one strategic responses to single dominate institutional demand and ignore other institutional aspects that are in play or opportunities presented by complementary institutions (e.g., being recognized by Russian experts leads to being recognized by experts in Kazakhstan and Uzbekistan) (Kraatz and Block 2008, Greenwood, Raynard et al. 2011). In the context of international projects where multiple institutional demands from different institutional levels coexist, it is important to address the core effects of the responses on institutional conflicts and multiplicity in order to fully explain why the responses work. As suggested by Kraatz and Block (2008), “institutionally-adept organizations are often able to simultaneously meet the expectations imposed by various institutional spheres in which they operate”. Addressing institutional complexity in international projects enables us to explore the sources of the responsiveness of project organizations.

CONCLUSION AND IMPLICATIONS

Through the detailed analysis of longitudinal project documents, our attempt to capture the role of institutional management in international projects gains both quantitative and qualitative supports. The analysis at the level of projects permits us to capture responses to multiple institutional demands from the levels of government, firm, and the parent company of the project, as indicated by Morris and Geraldi (2011). This approach takes into account the managerial activities of taken-for-granted, conforming responses and collective responses to institutional requirements, two underexplored types of institutional management. More importantly, it demonstrates the importance of this more holistic view to the project owners and sponsors who need to oversee the project throughout the project lifecycle.

One limitation of our research approach is that document entries are snapshots of and proxies for project documents. Project documents can provide fuller information to improve our coding accuracy. To mitigate the issue we have adopted strict criteria of coding, eliminating the entries that we have difficulties to label. Unless we expect that certain underlying institutional management activities are systematically more difficult to label than technical management

activities, the omission of vague entries will not bias our results. Another limitation is that the project is a novel one involving many first-time attempts and political challenges. The project teams led by the ZY never worked with their counterparts in the host countries. The project goals were partially determined and shaped by political considerations. As a result, it is likely that the managerial work of institutional demands in this project would be more than that in typical international infrastructure projects. That said, the political nature of the project also makes it a knowledge-intensive case ideal for observing institutional management.

This case study deepens our understanding of institutional management within international infrastructure projects and contributes to the line of studies on organizational responses to institutional multiplicity. It empirically demonstrates that a high percentage of management activities were dedicated to coping with institutional demands, conflicts, and voids throughout various stages of the project including initiation, design, and construction. Particularly, it shows that the project's management activities have transformed its institutional environments at the firm, national, and even intergovernmental levels. The institutional impact of project management illustrates that institutional environments should not be treated as given. Rather, they are an integral part of project management.

Our discipline needs to pay more attention to institutional management. This study sheds lights on what types of institutional demands need to be managed and when institutional management tends to occur and intensify in order to develop and deliver international projects successfully. Contrary to existing literature, we find that institutional and technical management co-vary instead of serving as complements, and they can support each other in performing project tasks and coping with institutional pressures. Future research can explore the specific conditions and mechanisms of mobilizing collective actions and technical innovations in coping with multiple institutional demands, and strategies and organizational arrangements that can be employed to manage different types and levels of institutional demands. Particular attention should be paid to the adaptive aspect of institutions that enables collective actions to be organized in short time, and the endogenous process of institutional transformation in international projects. In addition, comparative case studies on the on-going extension pipeline projects should be conducted to observe whether or how learning and established partnership affects institutional management in the projects.

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