

Article

Governing Value Creation in a Major Infrastructure Project Client Organization: The Case of Beijing Daxing International Airport

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Abstract: Major infrastructure projects (MIPs) are growing rapidly worldwide and have a “double-edged-sword” effect on the economy, society, and environment. Sustainability, therefore, has become a critical concern for MIPs. The sustainability of MIPs emphasizes the need to take the value creation view to scrutinize MIP practices, which calls for a deeper understanding of the value creation process of MIPs. Although research efforts have been devoted to understanding value creation in MIPs, scarce attention has been focused on the question of how a project client governs project activities, operational preparation activities, and their interplay to create value in MIPs. Based on an in-depth case analysis of the Beijing Daxing International Airport, we found that the project client adopted the three different governance arrangements of vertical blended integration, dynamic matrix integration, and continuous coupling to govern project activities, operational preparation activities, and their interplay, respectively; likewise, the hybrid values of project management value, business value, and public value were created. Following the results, we establish a conceptual framework for the governance of value creation in a project client organization of MIPs. This study not only contributes to the literature on project governance and project value, but also provides practical guidance for emerging MIPs worldwide.

Keywords: major infrastructure project; value creation; project client; governance; operational preparation; Beijing Daxing International Airport



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1. Introduction

In contemporary societies worldwide, major infrastructure projects (MIPs) are increasing rapidly in scale and number, with a predicted market of USD 6–9 trillion per year [1]. As “big solutions”, MIPs are usually initiated to promote economic development, create jobs, alleviate social conflict, and help with various crises in natural resources, energy, climate, and public emergencies [2–5]. Meanwhile, MIPs are also criticized for their severe consequences such as environmental pollution, immigrant resettlement, and biodiversity destruction [2,6]. Thus, sustainability has become a critical concern for MIPs [2,6,7].

The sustainability of MIP emphasizes the need to take the value creation view (i.e., maximizing project values and minimizing the negative impacts) [2] rather than the traditional product creation view (i.e., achieving the so-called iron-triangle objectives) to scrutinize MIP practices [8–12]. For example, Goldsmith and Boeuf [13] argued that despite the failure to achieve the iron-triangle objectives of keeping to time, cost, and scope, the Channel Tunnel was still an extremely successful megaproject because it acted as an important agent of change and created vast values (e.g., promoting urban and regional regeneration). However, MIPs are temporary endeavors characterized by large investment,

long duration, vast complexity, high strategic status, and profound impacts on the economy, society, and environment [14–16]. Those characteristics not only make MIPs straddle between value creation [17,18] and value destruction [19], but also render the theoretical premises and results of value creation in MIPs quite different from those in general project settings [20,21]. Thus, a deeper understanding of value creation is needed to promote the sustainability of MIPs [17,22].

The project client, as the main stakeholder of value creation in MIPs [23], is typically an infrastructure operational company [24] such as the Heathrow Airport Limited (formerly known as the British Airports Authority) [25]. The project client's core business does not aim to build MIPs but rather to provide services to customers, and MIPs are only of value when they support or extend the project client's core business [24]. When developing MIPs, the project client acts as both the project owner and the project operator [24]. More specifically, the project client not only acts as a project owner in charge of *project activities*, such as project proposal, planning, design, and construction, but also serves as a project operator responsible for *operational preparation activities*, such as the formulation of operational schemes, establishment of operational organizations, development of operational institutions, and testing and trials of systems, facilities, and procedures [26]. Moreover, project activities and operational preparation activities are highly interconnected, and only when both of them are well-integrated and accomplished can MIPs be put into operation successfully and create value. Therefore, in the context of MIPs, project clients need to effectively govern project activities, operational preparation activities, and their interplay in order to create value.

In recent years, research efforts have been devoted to value contents (i.e., what kinds of value can be created) [18,27,28] and value creation activities (i.e., how values are created) [20,29] in the context of MIPs, both of which are particularly relevant to value creation. However, those studies were mainly from an *inter-organizational* perspective, meant to explore value co-creation among stakeholders rather than an *intra-organizational* perspective that explores value creation within a single-organization project client. Additionally, they mainly focused on the project activities while neglecting the operational preparation activities. The inherent differences between project activities and operational preparation activities [25,30] require the project client to take distinct governance arrangements in order to organize project activities, operational preparation activities, and their interplay to create value. Thus, this study fills the gap by addressing the following research question: How does a project client govern project activities, operational preparation activities, and their interplay to create value in MIPs? More specifically, it includes four sub-questions: (1) How does a project client govern project activities in MIPs? (2) How does a project client govern operational preparation activities in MIPs? (3) How does a project client govern the interplay between project activities and operational preparation activities in MIPs? (4) What kinds of values can be created through those governance arrangements in MIPs?

The research question is answered through an inductive and longitudinal case study of the Beijing Daxing International Airport in China. The findings reveal that three different governance arrangements have been adopted to create hybrid values. The paper is structured as follows. Existing literature related to this topic is first reviewed, followed by the methodology. After presenting the findings of the case analysis, the conceptual framework is developed. Finally, conclusions and implications are presented.

2. Literature Review

2.1. Project Value

The original notion of value in project management scholarship could be dated back to the insightful distinction between project management success and project success in the 1980s [11,31,32]. Project management success was defined as the efficient delivery of artifacts (e.g., physical products, facilities) according to the iron-triangle criteria of keeping to time, cost, and scope, which was in accordance with the principal concern of the product creation view [8]. Project success connected projects to clients' needs [32] and

organizational strategies [31], which implied the original idea of value. In the late 2000s, with the rise of criticisms on the product creation view, some scholars explicitly emphasized the need to take value creation as the prime focus of projects [8], i.e., that projects were to be regarded as value creation processes for organizations [9]. Since then, under the influence of several factors such as the widespread underperformance of megaprojects [1] and sustainable development [2,6], project value and value creation have been receiving increasing attention [11,12]. Kerzner [33] argued that focusing on project value and value creation was one of the key differences between “Project Management 2.0” and “Project Management 1.0”.

Although little consensus exists on the definition of value in different disciplines [34–37], project management literature (e.g., [21,28,38]) has frequently adopted the viewpoint of Laursen and Svejvig [11] to define project value as “the quotient of benefits/costs where value is not absolute, but relative, and may be viewed differently by different parties in differing situations” (p. 737). This contingent definition shows that project value is a subjective, dynamic, and multi-dimensional concept [22,35,38]. More specifically, the perceptions of project value may be different among stakeholders and change over time [22]. Meanwhile, depending on project contexts, project value may include both tangible and intangible values [33], short-term and long-term values [21], and commercial and non-commercial values [39]. The subjectivity, dynamics, and multiplicity of project value indicate that different types of projects may have different value preferences and require different value creation frameworks.

2.2. Value and Value Creation in MIPs

As a kind of complex project, MIPs have both the potential to create vast value and the risk of causing a large value loss, which has provoked particular interest in the subject of its value and value creation. The question of what types of specific values can be created in MIPs (i.e., value content) comes first. Some scholars have focused on the value identified in the front end to guide the definition and initiation of MIPs. For example, Martinsuo, Vuorinen, and Killen [28] explored how stakeholders framed project value in the front end of infrastructure projects and distinguished five types of project values, i.e., financial, social, ecological, regional, and comparative values, that influence project funding decision. Zerjav, McArthur, and Edkins [27] studied the London infrastructure project ecology and explored how the multiplicity of value was manifested in front-end decision-making and the definition of MIPs. They identified three levels of project values—local, sector, and user values—that were beyond the traditional triple bottom line of economic, social, and environmental values. Liu, van Marrewijk, Houwing, and Hertogh [38] conducted an in-depth case study of a Dutch water infrastructure program and identified three sets of project values—commercial, intellectual, and collaborative values—co-created in the front end by the project client, market partners, and knowledge partners. Other scholars have attempted to connect different value types to types of stakeholders. For example, Eskerod and Ang [40] studied stakeholder value constructs by leveraging existing value frameworks [1,41] and through an in-depth study of the over 50-year-old Astoria-Megler Bridge in the US. They set up a value matrix comprising 5 types of stakeholders and 16 types of values and mapped the value preference of different stakeholders. In addition, in major international projects, especially in the oil and gas context, the In-Country Value has also been studied. For example, Vidal, Marle, and Dernis [4] proposed an In-Country Value strategy to create sustainable local values in major natural resource utilization projects.

Prior literature has also discussed the question of how values are created in MIPs (i.e., value creation activities), but the research works primarily took an inter-organizational perspective to explore value co-creation among stakeholders. For example, Lehtinen, Peltonkorpi, and Artto [29] studied a city district renewal megaproject in Finland and explored how actors in a megaproject jointly created value. They theorized the research on organizational platforms and found that megaproject actors created value through jointly planned and governed design principles and through value-leveraging activities. Vuorinen and

Martinsuo [21] took a stakeholder's perspective to explore the value-oriented stakeholder influence strategies in infrastructure projects and identified four types of stakeholder influence strategies (i.e., communicating, complaining and resolving disputes, setting rules and supervising the project, and using decision-making authority) that were connected to three kinds of project values (i.e., environmental and social value, financial value, and systemic value). Miterev, Jerbrant, and Feldmann [20] focused on the difference of overall organization design in different value processes (i.e., value definition, value creation, and value capture) in the context of programs. Based on a longitudinal case study of a program in the transportation sector, they explicated the dynamics of alignment between organization design and value processes and suggested that different value processes required distinct program organizational arrangements.

Although those studies largely contributed to the understanding of value and value creation in MIPs, three main limitations exist. First, with few exceptions [21], studies on value content and value creation activities are detached, namely, that those studies focused on either value content (e.g., [27]) or value creation activities (e.g., [29]). This study argues that compared with a static value content analysis, a more fine-grained value creation framework linking value creation activities and value content is needed to promote a deeper understanding of value creation in MIPs.

Second, little attention has been paid to value creation within a single organization in the context of MIPs, especially the project client who is the core stakeholder of value creation [23]. The self-evident differences between *intra-organizational* activities and *inter-organizational* activities in MIPs prevent an automatic transfer of the theoretical results of an inter-organizational value co-creation to the value creation within a single-organization project client.

Third, existing research on value creation in MIPs typically focuses on project activities while ignoring the operational preparation activities. More specifically, existing research assumes that value creation in MIPs only lies in project activities, which might be suitable for general projects with limited or negligible operational preparation activities but not for MIPs. A typical negative example is the chaos that occurred on the opening day of Heathrow Terminal 5 [42]. Owing to unsuccessful operational preparations, numerous flights were canceled and thousands of bags were lost, which caused vast value destruction, especially the intangible value of reputation. Thus, from the intra-organizational perspective of the project client, both project activities and operational preparation activities need to be governed effectively to create value.

2.3. Project Client and Governance in MIPs

In the context of MIPs, project clients generally act as both project owners and project operators [24] responsible for project finance, development, implementation, and operation. Thus, project clients have natural incentives to show concern for both the short- and long-term values created by MIPs [23]. Governance, briefly defined as institutional arrangements, is widely acknowledged and regarded as the key mechanism for value creation in nearly all types of organizations [34,43,44], and the project client organization is no exception. Existing literature has built some governance frameworks from an organizational strategy perspective. For example, Too and Weaver [45] synthesized existing studies and built a nested governance framework for aligning project deliverables with organizational strategy. They proposed four key governance elements, namely, portfolio management, project sponsorship, project management office, and projects and program support. Müller [46] established a multi-level organizational governance framework that comprises project governance, governance of projects, broad-level governance of projects, and corporate governance. However, those governance frameworks were set in the context of project-based organizations (e.g., contractors) and are applicable to general projects but not operation-based organizations (e.g., project clients of MIPs) and MIPs. Moreover, those studies also neglected the governance of operational preparation activities in MIPs.

Indeed, since the chaos that occurred on the opening day of Heathrow Terminal 5 [42], attention has been paid to the transition from projects to operations in the context of MIPs. For example, Whyte et al. [47] studied the case of the London 2012 Olympic and Paralympic Games and used the analogy of the baton pass in a relay race to analyze the process of handing over digital data, from the project delivery team to the operators. Zerjav, Edkins, and Davies [25] analyzed the assembly of the project capabilities required to manage the transition from the project to operational outcomes in the case of London Heathrow Terminal 2. Whyte and Nussbaum [48] theorized the transition from more temporary, goal-oriented, and evolving forms of organizing to more permanent, ongoing, and routine forms of organizing. However, although the transition process is of vital importance, project activities and operational preparation activities are indeed intertwined and interconnected over the entire process, from project concept to project opening.

Furthermore, the inherent differences between project activities and operational preparation activities pose a significant challenge to their governance. Projects typically perform innovative, one-off, and non-repetitive tasks, whereas operations undertake routine, ongoing, and repetitive tasks [30]. Project environment is turbulent and fast-changing, whereas operation environment is stable and predictable [30]. Project activities may dissolve when project output is delivered, whereas operation is an ongoing process of providing goods or services to customers [25]. Those differences require project clients to take distinct governance arrangements to organize project activities, operational preparation activities, and their interplay.

To sum up, this study takes an intra-organizational perspective to explore how a project client governs project activities, operational preparation activities, and their interplay in order to create value. It not only differentiates the different governance arrangements for project activities, operational preparation activities, and their interplay, but also identifies what specific values are created by project clients.

3. Methodology

3.1. Research Design

Following the popular tradition in existing project value and value creation research (e.g., [17,20,23,27]), this study adopted an inductive and longitudinal single-case study approach to explore how a project client governs project activities, operational preparation activities, and their interplay in order to create value in MIPs. There are two reasons why this approach was applied. First, the research question is a typical how-type question driven by contemporary and dynamic phenomena, which is very suitable for an inductive case study approach [49]. Second, although many research efforts have been devoted to project value and value creation [11,12], and some of them are partially related to the topic, to our knowledge, there are no studies systematically investigating this research question, and there is a lack of plausible existing theories with which to frame the research [20]. A longitudinal single-case study approach can take advantage of rich case data to be able to conduct an exploratory study and contribute to theory building through the in-depth deconstruction of those case data.

The setting for this research is the Beijing Daxing International Airport (BDIA), which is a large international aviation hub integrating multiple transportation facilities such as the airport, metro, highway, and high-speed railways. There are two reasons why this case was chosen. First, BDIA was named as one of the New Seven Wonders of the World by the Guardian newspaper and has become a landmark infrastructure in China, which indicates the notable and widely recognized complexity and representativeness of BDIA. Moreover, BDIA was the newest infrastructure project in the air transport industry (opened on September 2019) and was highly praised by the government and the public, indicating BDIA as the newest and most successful example of MIPs. Second, as one of the largest airports built in the world, BDIA cost more than CNY 450 billion (approximately USD 70.5 billion) and covered an area of 27 square kilometers. It is positioned as “a new powerhouse for national development” and has a strong potential for vast value creation for

many direct and indirect stakeholders. Thus, according to the principles of the single-case study approach [49,50], BDIA is a typical example of MIPs and provides excellent contexts for research on value creation in MIPs.

Indeed, BDIA is a complex program consisting of more than ten project clients, including the airport project client, the metro project client, and the high-speed railway project client. In this study, we focused on the airport project and its client—Capital Airports Holdings Limited (CAH)—due to the following reasons. First, the aviation transportation network of BDIA included the air transportation network and the ground transportation network, which were connected by the airport project. As its client, CAH was required not only to be in charge of the airport project but also to coordinate other projects as a whole, including the metro, highway, high-speed railway, etc. Thus, the airport project was regarded as the core project, and CAH acted as the core client in BDIA. Second, the airport project of BDIA cost over CNY 80 billion (approximately USD 12.5 billion), and included a 700,000-square-meter terminal and four runways, with the capability to handle 72 million passengers and 2 million tons of cargo per year. As one of the largest airports in the world, the airport project of BDIA involved extensive complex project activities and operational preparation activities. Third, the client—CAH—is one of the largest airport operation enterprise groups in the world. It has rich airport operational experience and has established a mature airport operational mode. Selecting CAH as the focal client enabled us to conduct a rich and in-depth study of the governance of value creation and offered the potential to establish a more inclusive framework for value creation within the client of an MIP.

3.2. Data Collection

As a third-party consulting agency with rich experience in project schedule controlling for major airport projects, the authors' team was invited to help the client formulate BDIA's integrated schedule plan of project activities and operational preparation activities in May 2018; the team was then stationed on site to control the schedule according to the agreed plan until BDIA opened in September 2019, which lasted for 17 months. During this time, we found that the project client (CAH) needed to govern not only the project activities but also the operational preparation activities and their interplay to ensure project opening. After a preliminary analysis of existing case data at that time, we found that those governance arrangements were not guided by the iron-triangle criterion but by the values. Then, we turned to the literature on project governance and value and found that both project governance studies and project value studies in the context of MIPs neglected the operational preparation activities. Thus, we formulated the research question and started to systematically collect the case data. The friendly and trustful relationship between the authors' team and the project client, i.e., CAH, enabled the data collection process to be very smooth and ensured the authenticity of the data [49].

The data collection of this study involved three stages. In stage 1, from May to September 2018, on account of the need to formulate the integrated schedule plan, the authors initially collected the primary information and documents of BDIA and interviewed the key department leaders and staff within CAH. In stage 2, from October 2018 to September 2019, in order to conduct schedule control, the authors participated in various meetings hosted by CAH every week and selectively interviewed senior leaders, department leaders, and staff within CAH every month. In stage 3, from October 2019 to July 2021, after BDIA opened, the authors successively collected a total of over 600 files composed of various archives and meeting minutes from CAH, which covered periods ranging from project concept to project opening. Meanwhile, the authors conducted four semi-structured interviews with senior leaders of CAH about the governance of project activities and operational preparation activities as well as the value created. The 17-month participation and observation, abundant archive data, and three-stage open-ended and semi-structured interviews provided us with rich data to understand and analyze the governance of value creation within CAH.

Table 1 lists the empirical data on BDIA collected for this study. First, project documents are comprehensive case data, such as the feasibility study report and the project summary report, which provide the overall and summative information of BDIA. Second, the meeting minutes are the official minutes of the main meetings for BDIA hosted within CAH from 2010 to 2019, including the minutes at the Group level, the minutes related to project activities, and the minutes related to operational preparation activities. Those minutes record the main decisions of BDIA's key issues and provide a process-based dynamic picture of BDIA.

Table 1. Empirical data overview.

Data Type	Data Items	Number of Data Points	Descriptions
Project documents	Feasibility study report	1012 pages	—
	Approved documents of preliminary design	17 documents	Involving the schemes, key technical parameters, and investment arrangements of each subproject of BDIA
	Project pocketbook	390 pages	A detailed summary of BDIA, from site selection to project opening
	Manual of airport operation	1060 pages	A detailed manual to guide airport operation
	Project summary report	138 pages	An official summary about the values, processes, achievements, experiences, and implications of BDIA
	Other documents	58 documents	Involving organizations, institutions, schemes, etc.
Minutes of meetings	Minutes at the Group level: General manager meetings of CAH	30 meetings	The time ranged from 2011 to 2018
	Minutes at the Group level: Steering committee of BDIA in CAH	47 meetings	A total of 47 meetings were held by this committee from November 2014 to September 2019
	Minutes related to project activities: The commander-in-chief meetings at the Headquarters	234 meetings	A total of 234 meetings were held from 2010 to 2019
	Minutes related to operational preparation activities: Meetings hosted by various operational organizations within CAH	86 meetings	Involving airport management companies and professional management companies
Interviews	Stage 1: Department leaders and staff	18 interviews	The number of people in each interview ranged from 1 to 3
	Stage 2: Senior leaders, department leaders, and staff	44 interviews	The number of people in each interview ranged from 1 to 4
	Stage 3: Senior leaders	4 people	473 minutes

Third, the interviews of this study can be divided into three stages. In stage 1, in order to formulate the integrated plan, we interviewed 18 department leaders and staff of the project organization and the operational organization within CAH. Those interviews were open-ended and involved the main duties, work, and difficulties of each department. In stage 2, in order to formulate the monthly report for schedule control, we selectively interviewed senior leaders, department leaders, and staff every month. The interviews were mainly focused on the delayed work and the main difficulties of BDIA. Although the interviews in stage 1 and 2 were not originally designed for this study, they provided a lot of important information concerning governance arrangements and the value created,

especially when the interviewees introduced the department duties and explained the reasons for the delayed work and the main difficulties. The interviews in stage 3 were semi-structured and specifically designed for this study. After reading through existing case data and reviewing the literature, we formulated an interview protocol with 31 semi-open-ended questions aiming to get a full understanding of the governance of value creation. The protocol involved two types of questions, i.e., those on the key issues that were not shown in existing case data and the comprehensive questions about governance and value. Considering that the governance of value creation was considered to be relatively higher-level activities, we only interviewed the senior leaders of the client. We interviewed them one by one and stopped after the fourth interview because we found that we had gathered enough information to conduct this study. Each interview lasted for 92–183 minutes, and the interview procedures were the same, but the contents were slightly different due to the different roles of the interviewees.

Overall, the three types of case data (i.e., project documents, meeting minutes, and interviews) not only provide sufficient information about BDIA but can also be cross-validated or triangulated to ensure data consistency [49].

3.3. Data Analysis

With the assistance of the qualitative analysis software *QSR Nvivo 11*, the rich data were analyzed through the well-known “Gioia method” [51], which had been widely used for inductive theory building in organizational and institutional research [52,53], the megaproject context [25,54], and in project value analysis [27]. The Gioia method provides a systematic analytical process for developing new constructs and establishing dynamic grounded theory models with “qualitative rigor” [51]. More specifically, it involves a two-stage coding strategy and a model development process.

The first stage is open coding, where we focused on identifying empirical categories (1st-order categories) that described the governance arrangements adopted by the client, i.e., CAH, and the value created through those governance arrangements. We first read through the case data and classified them in chronological order (front end, construction, and close-out). After that, we were able to get an overall impression of the governance of value creation within CAH and found some initial features. For example, the governance of project activities was static, while the governance of operational preparation activities was dynamic; the values created by these governance arrangements were multiple. Then, we open-coded the specific contents of governance arrangements and project value through the careful examination of these data in the software *QSR Nvivo 11*. Indeed, those three types of case data (i.e., project documents, meeting minutes, and interviews) provided abundant information about BDIA, but we mainly focused on the information related to governance (e.g., organizational structures and changes, decision procedures and authority, coordinating mechanisms, management strategy, and modes) and values (e.g., the overall objectives). We read the case data line by line and labeled the governance elements and the value elements. When developing these concepts (labels), we tried to use practical terms to keep as much original information as possible. After that, we grouped these concepts into different first-order categories. For example, the project summary report states: “. . . extensively inspecting and carefully selecting a group of key personnel with rich airport construction and operation experience from the three sectors of construction, operation, and professional service within CAH in order to plan and promote the preliminary work of BDIA”. An interviewee also emphasized that the Headquarters was composed of people with rich airport construction and operation experience. Meanwhile, the prior positions of the leadership of the Headquarters provided by the organizational formation document further validated this information. Thus, we developed the category “hybridizing different people with project experience and airport operation experience”.

The second stage is the collapse of these practice-oriented categories (1st-order categories) into theory-oriented constructs (2nd-order themes and 3rd-order aggregate dimensions) [25]. In the 2nd-order coding of themes, we analyzed the similarities, differences,

and relationships among those categories and merged similar categories into themes. In the 3rd-order coding of aggregate dimensions, we extensively engaged with the literature on project governance and value and constantly compared emerging themes and aggregate dimensions with theoretical ideas, thus abstracting and aggregating those themes into theoretical constructs. Notably, when there was a disagreement in the understanding of specific coding or a logical inconsistency in the link between 1st-order categories, 2nd-order themes, and 3rd-order aggregate dimensions [25], the data were revisited and relevant concepts were recoded. In other words, the coding in this stage was an iterative and cycling process between raw materials, concepts, categories, themes, and dimensions and the relevant literature [51].

The final stage is the building of an inductive model [51] based on above constructs to explain the practical phenomena or to answer the research question. Borrowing the well-known “yin and yang” thought in Chinese ancient philosophy, we developed a dynamically unified model for the governance of value creation within the project client organization of MIPs.

4. Case analysis

4.1. Brief Introduction of the Client: CAH

CAH is a large state-owned enterprise group dedicated to airport infrastructure operation; it manages 53 airports across the 7 provincial administrative regions of Beijing, Tianjin, Hebei, Jiangxi, Jilin, Inner Mongolia, and Heilongjiang in China. Based on the operation of those airports, CAH's businesses involve airport integrated management, airport professional service management, airport economic zone development, and technological innovation. With the support of functional departments, the Group (CAH) integrates those businesses at the macro level; its subsidiaries and branches are respectively responsible for the operation and management of different businesses or sub-businesses at the micro level. As shown in Figure 1, the subsidiaries and branches of CAH can be divided into two categories: (1) airport management companies responsible for the integrated management of airport operations; (2) professional management companies responsible for professional service management of airport operations and airport economic zone development.

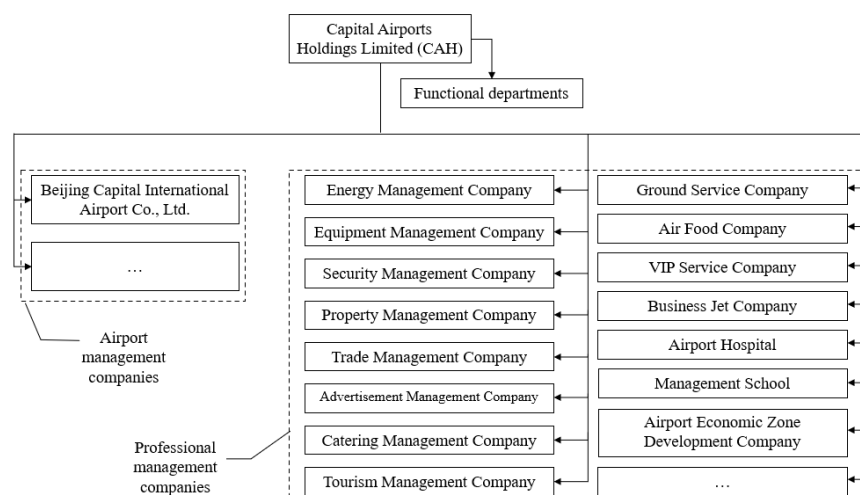


Figure 1. Organizational structure of CAH (simplified version). Notes: (1) Only the subsidiaries and branches closely related to the activities of BDIA are listed. (2) For ease of understanding, some professional management companies have been renamed based on their businesses.

We take the Capital Airport, which is the first and an existing large aviation hub in Beijing, as an example to present the final operational mode of airport infrastructure. The Beijing Capital International Airport Co., Ltd. (for ease of understanding, hereinafter referred to as Capital Airport Management Company) is the airport management com-

pany responsible for the integrated management of the operation of the Capital Airport; professional management companies collaborate with (and some of them sign contracts with) the Capital Airport Management Company in order to take responsibility for the professional service management of the Capital Airport operations. For example, the Energy Management Company is responsible for the maintenance and management of the Capital Airport's energy facilities. Thus, from the perspective of CAH, the final operational mode of the Capital Airport is an "intersection" of the airport integrated management and professional service management, which involves the Capital Airport Management Company and various professional management companies.

BDIA is a newly built aviation hub with a similar scale to the Capital Airport, and its final operational mode is also similar to that of the Capital Airport. However, CAH, as an operation-based enterprise, faced considerable challenges in ensuring the smooth delivery of BDIA, which is a typical MIP with vast internal and external complexities. Furthermore, during BDIA's development and implementation process, the operational schemes of BDIA needed to be formulated and continuously deepened to guide project planning, design, and implementation activities. The operational structure of BDIA also needed to be gradually established to ensure its successful operation after opening. Consequently, CAH faced complex and intertwined project activities and operational preparation activities when developing BDIA.

4.2. Governance Dimensions and Value Creation of BDIA

This subsection presents the results of the data analysis on the governance of project activities, operational preparation activities, and their interplay, and the hybrid values created through those governance arrangements, as shown in Table 2.

Table 2. Data Structure.

1st-Order Categories	2nd-Order Themes	3rd-Order Aggregate Dimensions
Selecting elite leaders from the whole Group to form the leadership of the Headquarters	Capable project organization	Governance of project activities: vertical blended integration
Hybridizing different people with project experience and airport operation experience		
Maintaining the stability of the Headquarters’ core leaderships		
Responsible for all project activities within CAH	Integrated management strategy	
Coordinating other projects and external stakeholders		
Collaborating with many internal operational organizations		
Only major issues needed to be reported to the Group	Full empowerment	
The Headquarters had a high degree of discretion on project activities		
A combination strategy to manage contract interfaces		
Capital Airport Management Company utilized its rich airport operation experience to help the Headquarters carry out the front-end study of BDIA	Knowledge support	Governance of operational preparation activities: dynamic matrix integration
Professional management companies provided professional suggestions for the formulation of project schemes and the feasibility study report		
Professional management companies parallelly intervened in BDIA to deepen the operational schemes of respective businesses		
Professional management companies parallelly conducted respective operational preparation activities related to organizations, institutions, and people	Parallel planning	
Operational Readiness Office only integrated non-aviation businesses		
Daxing Airport Management Company integrated all the businesses and operational preparation activities of professional management companies	Gradual integration	

Table 2. Cont.

1st-Order Categories	2nd-Order Themes	3rd-Order Aggregate Dimensions
General Manager meeting acting as the top integration and coordination platform in the front end	Top integration and coordination	Governance of the interplay between project activities and operational preparation activities: continuous coupling
Establishing a steering committee led by the General Manager of CAH to integrate and coordinate all issues of BDIA in the construction and close-out phases		
Functional departments integrated and coordinated special issues		
The two organizations, the Operational Readiness Office and the Headquarters, were overlapped as “one organization with two titles”	Organizational and staff overlap	
The staff of the Daxing Airport Management Company and the Headquarters were overlapped		
Front end: the Headquarters interacted with the Capital Airport Management Company and several professional management companies	Whole-process interaction	
Construction: the Headquarters interacted and collaborated with all professional management companies		
Close-out: the Headquarters interacted and collaborated with the Daxing Airport Management Company		
Constraints of cost and schedule	Project management value	Hybrid value creation
Quality and safety requirements		
Operational value: maximizing operational income and minimizing operational costs	Business value	
Enterprise development value: building brands and innovating management modes		
Economic and social value	Public value	
Ecological value		
Industry value		

4.2.1. Governance of Project Activities: Vertical Blended Integration

1. Capable project organization

Acknowledging that BDIA was a complex endeavor with a large investment, long duration, and high uncertainty and risk, CAH established a capable project organization—Beijing New Airport Construction Headquarters (hereinafter referred to as Headquarters)—to be responsible for the planning, design, and implementation activities of the airport project in 2010. When establishing this temporary Headquarters, particular attention was paid to the selection of leaders and staff.

First, CAH selected elite leaders from the whole Group to form the leadership of the Headquarters. More specifically, the commander-in-chief role in the Headquarters was concurrently served by the general manager of CAH, and the position of the first deputy commander was assumed by a deputy general manager of CAH. All the remaining members of the leadership were also senior leaders of the Group or its subsidiaries and branches. These elite leaders were equipped with all-around capabilities to lead project activities.

Second, when selecting those elite leaders, CAH proposed a principle of hybridizing different people with project experience and airport operation experience. For example, when the Headquarters was established in 2010, except for the commander-in-chief, three of the remaining seven senior leaders came from operational organizations (i.e., the Capital Airport Management Company and the Equipment Management Company), and four came from or had worked in the China Airport Construction Group Co., Ltd., which was originally affiliated with CAH and was the only enterprise in China that could provide one-stop services for airport projects, including consultancy, planning, and design. Meanwhile, the selection and recruitment of departmental leaders and staff also followed this principle. This hybrid configuration of leaders and staff with both project experience and airport operation experience ensured that the Headquarters had sufficient experience, knowledge, and skills to implement project activities.

Third, from the project front end to project opening, the leadership of the Headquarters underwent several adjustments, but the core members remained unchanged. For example, when the Headquarters was established in 2010, there were eight senior leaders; six of them remained until the project opened in 2019. The stability of the core leadership members of the Headquarters guaranteed the continuity of project management institutions, processes, methods, and routines.

Thus, by selecting elite leaders, hybridizing different people with project experience and airport operation experience, and maintaining the stability of the Headquarters' core leaderships, CAH was able to establish a capable project organization to lead and manage project activities.

2. Integrated management strategy

BDIA was a complex program comprising of many interconnected projects and involved many heterogeneous stakeholders. Facing the challenge of managing complicated project interfaces and complex stakeholder relationships, CAH adopted an integrated management strategy to make the Headquarters act as the only project organization within CAH to be responsible for project activities. More specifically, the Headquarters was not only required to integrate all project activities of the airport project but was also required to coordinate other projects (including the aviation fuel project, air traffic control project, airline base project, subway project, highway project, and high-speed railway project) and external stakeholders.

First, taking CAH as the organizational boundary, the Headquarters needed to coordinate a large number of external stakeholders, including central ministries (e.g., the National Development and Reform Commission, the Ministry of Finance, the Ministry of Natural Resources, the Ministry of Ecology and Environment, and the Ministry of Water Resources), local governments (e.g., the Government of Beijing Municipality, the Government of Hebei Province), military agencies (e.g., the Air Force, the Central Theater Command), and other project clients (e.g., the metro project client, the high-speed railway project client). Although the government established multi-level steering committees to integrate project activities, and while CAH (the Group) also provided essential assistance, the Headquarters, as the implementer of project activities, participated in almost all kinds of formal coordination meetings and held frequent informal communications with related organizations. The Headquarters specially established external communication and coordination mechanisms to coordinate external stakeholders.

Second, the Headquarters needed to collaborate with many internal operational organizations within CAH to promote project planning, design, and implementation activities. The airport project of BDIA included many interrelated subprojects where the planning, design, and implementation activities were closely related to respective operational schemes formulated by different operational organizations within CAH (see the section of "governance of operational preparation activities" below). For example, in February 2017, CAH set up a Cargo Business Development Office to study CAH's cargo development strategy and the cargo operation mode of BDIA. The Headquarters needed to collaborate with the Cargo Business Development Office to ensure that the planning and design of the cargo facilities met the requirements of future operation. Moreover, project financing schemes also affected project activities. For example, in November 2012, CAH established an Investment Promotion Office to relieve financial pressure by attracting social investment. The Investment Promotion Office successively attempted to attract social investment for many subprojects such as airport communication systems, parking buildings, air food facilities, and aircraft maintenance facilities. The Headquarters was not only required to collaborate with the Investment Promotion Office to formulate the investment promotion scheme (the Headquarters established a special team for this task in June 2015) but was also required to consult the winner of the bid on the planning and design scheme of related facilities.

In addition, in the implementation stage, CAH (the Group) decided to add some new projects to promote and support the overall business development, including projects such as the education park project; in the close-out phase, a large number of market

user organizations (e.g., retail, catering, and advertising enterprises) and government user organizations (e.g., Customs, Border Inspections) entered the site to conduct such project activities as secondary decoration and special equipment installation. Those project activities were also integrated and managed by the Headquarters.

The integrated management strategy not only allowed the Headquarters to take a systematic perspective to integrate the planning, design, and implementation activities of all (sub) projects, but it also reduced the organizational interface problems and coordination challenges.

3. Full empowerment

The Headquarters was given full empowerment by the Group (CAH) to manage those project activities. On the one hand, only major issues such as the airport's overall planning, annual investment plans, baggage system bidding, terminal construction bidding, major changes, and over-budget issues needed to be reported to the Group (CAH). On the other hand, the Headquarters had the discretion in most bidding and procurement activities, including consultation, design, construction, supervision, and equipment. The Headquarters also had the discretion to develop various project management institutions that involved bidding, cost, risk, quality, schedule, and safety.

The Headquarters adopted the design-bid-build (DBB) model to manage the airport project. More specifically, the Headquarters separately packaged the consultation, planning, design, construction, supervision, and equipment and selected market suppliers through competitive bidding, invited bidding, or direct entrustment. A total of more than 700 contracts were directly managed by the Headquarters. The Headquarters adopted a combination strategy of regional integrated management, professional integrated management, and functional support to deal with the challenge of contract interfaces caused by the DBB model. For example, three regional engineering departments, i.e., the Terminal Engineering Department, the Airfield Engineering Department, and the Supporting Engineering Department, managed the contract interfaces in respective areas; two professional engineering departments, i.e., the Mechanical and Electrical Equipment Department and the Weak Power and Information Department, managed the contract interfaces in respective specialties; and ten functional departments, e.g., the Finance Department, the Planning and Contract Department, handled the contract interfaces within their respective functions and also provided support for these engineering departments. The interface problems across areas, specialties, and/or functions that could not be resolved through friendly negotiations between departments were handled by the senior leaders of the Headquarters (e.g., chief engineers).

In summary, the project activities were governed through an integrated management strategy supported by a capable project organization with full empowerment. A capable project organization guaranteed the project capabilities required for implementing an integrated management strategy, and full empowerment provided the project organization with essential discretion to implement the integrated management strategy. Those three governance elements are inherently unified, and we theorize this governance arrangement as a vertical blended integration.

4.2.2. Governance of Operational Preparation Activities: Dynamic Matrix Integration

For BDIA, the operational preparation activities were carried out in parallel with project activities, but the governance arrangement of operational preparation activities was quite different from that of project activities and was dynamic over different project phases of the front end (April 2010–November 2014), construction (December 2015–June 2018), and close-out (July 2018–September 2019).

1. Knowledge support

The front-end activities of BDIA revolved around the formulation of two reports, i.e., the pre-feasibility study report and the feasibility study report, which were the basis for front-end decision-making and obtaining financial support. The former was jointly

approved by the State Council and the Central Military Commission in December 2012, and the latter was approved by the National Development and Reform Commission in September 2014. The Headquarters was in charge of the formulation of the two reports, whose contents included the schemes, scales, budgets, and main technical parameters of each subproject of the airport project. Although the Headquarters selected a professional consulting company from the market for assistance in formulating the two reports, CAH wanted to make the schemes of the airport project fully absorb the operational experience and learn from the lessons of the Capital Airport. Thus, it arranged for the Capital Airport Management Company and several professional management companies to provide knowledge support for the Headquarters.

On the one hand, the Capital Airport Management Company established a specialized team in March 2011 to assist the Headquarters in carrying out the front-end study of BDIA based on its rich airport operation experience. The specialized team was led by the general manager of the Capital Airport Management Company, with 10 senior managers serving as deputy team leaders, and consisted of 12 professional groups, i.e., the organizing and coordinating group, the overall planning group, the financing research group, the human resources group, the safety management group, the passenger service group, the air traffic command and coordination group, the airfield business group, the terminal business group, the public area business group, the weak power and information group, and the business development group. Different groups helped the Headquarters study the respective operational schemes, thus guiding it with the formulation of the project schemes and the two reports. During the front-end phase, the operational schemes that were studied under the assistance of this specialized team included the terminal planning scheme, the airfield planning scheme, the public area planning scheme, and passenger procedure and service scheme, to name a few.

On the other hand, several professional management companies provided professional suggestions for the formulation of the project schemes and the feasibility study report in the front end. For example, in December 2011, the Equipment Management Company submitted a report on the equipment selection, installation, and maintenance of BDIA to the Headquarters, including the baggage system, boarding bridge system, elevator system, and weak power system. Meanwhile, when formulating the feasibility study report, the Headquarters not only turned to professional management companies (e.g., Energy Management Company, Ground Service Company) to collect their historical operational information but also invited them to provide professional suggestions for the schemes.

Therefore, in the front-end phase, the operational organizations within CAH, including the Capital Airport Management Company and several professional management companies, provided knowledge support to the Headquarters to ensure that the project schemes were in accordance with the requirements of operational schemes.

2. Parallel planning

Although the feasibility study report defined the schemes of each subproject of the airport project, their contents did not meet the construction requirements. After the approval of the feasibility study report, detailed designs for each subproject were needed. Meanwhile, respective operational schemes were also required to undergo constant deepening in order to guide the detailed design of each subproject, especially professional businesses' operational schemes such as energy, security, air food, and aircraft maintenance.

Compared with airport management companies, professional management companies had more advantages in terms of experience and capability to formulate and deepen those operational schemes of professional businesses. Thus, based on business lines, CAH parallelly arranged various professional management companies to deepen the operational schemes of respective businesses. For example, in August 2015, the Airport Hospital proposed a scheme for the emergency facility, and the Management School studied the training business of the whole Group. In December 2015, the Energy Management Company formulated the overall operational mode/scheme of the energy business of BDIA and proposed to assist the Headquarters in constructing the energy facilities according to the principles

of “whole-process participation, management assistance, and technical support”. In June 2016, the Security Management Company proposed to collaborate with the Headquarters to construct the security facilities according to the principles of “deep participation, close cooperation, professional support, and technical support”. Meanwhile, the Equipment Management Company, the Ground Service Company, and the Air Food Company started to study the operational scheme of their respective facilities and businesses. In April 2017, the Trade Management Company, the Advertisement Management Company, and the Property Management Company started to study the operational scheme of their respective businesses. In May 2018, the VIP Service Company, the Catering Management Company, and the Tourism Management Company started to study the operational scheme of their respective businesses.

During this process, professional management companies acted as the operators and users to deepen the operational schemes of respective professional businesses in order to guide project design. Meanwhile, they conducted operational preparation activities such as the establishment of operational management organizations, the development of operational management institutions, and the reservation of talents.

Parallel planning on the basis of business lines prompted professional management companies to conduct operational preparation activities earlier and to utilize their professional knowledge and experience in innovating on the operational schemes of respective professional businesses. Taking the security business as an example, the Security Management Company pointed out that the traditionally scattered management mode of security had potential operational risk and thus proposed an integrated operational scheme for security management in BDIA.

3. Gradual integration

As mentioned above, BDIA adopted a similar operational mode to that of the Capital Airport, i.e., an airport management company was required to be in charge of the integrated management of airport operation. The airport management company of BDIA was the Daxing Airport Management Company, which was a large new company (no. of employees exceeded 1000 when BDIA opened in September 2019) affiliated with CAH. The predecessor of the Daxing Airport Management Company was the Operational Readiness Office, established in August 2016. At that time, the Operational Readiness Office was seriously understaffed, and it was not capable of carrying out related operational preparation activities until May 2017 when nine groups were internally established. Indeed, many professional management companies had been involved in BDIA earlier than the Operational Readiness Office (see the section of “parallel planning” above).

The Operational Readiness Office needed to be responsible for the operational preparation activities that could not be conducted by professional management companies, such as activities in the aviation business. Furthermore, it also started to integrate partial businesses of professional management companies, such as the non-aviation business conducted by four professional management companies (Trade Management Company, Advertisement Management Company, Catering Management Company, and Tourism Management Company). However, the integration scope and degree were relatively low, and the relationships between the Operational Readiness Office and professional management companies were closer to parallel collaborations.

In July 2018, the Operational Readiness Office was renamed the Daxing Airport Management Company, with many new staff added and the organizational structure improved. It officially became the airport management company of BDIA that integrated all the businesses and operational preparation activities of professional management companies. For example, the “Integrated Schedule Plan of Project Activities and Operational Preparation Activities”, formulated in September 2018, clearly stipulated that Daxing Airport Management Company took on the management responsibility of the operational preparation activities of professional management companies. The integration of professional management companies’ businesses and operational preparation activities into the Daxing Airport Management Company was completely accomplished in the six large trials from July to

September 2019. Those trials were led by the Daxing Airport Management Company, involved all professional management companies, and were to test all the facilities, systems, equipment, procedures, emergency plans, staff's familiarity, and total factor synergy in the scenario of formal operation.

In summary, the governance of operational preparation activities was a dynamic process. In the front-end and construction phases, CAH parallelly arranged for the Capital Airport Management Company and professional management companies to provide knowledge support, formulate operational schemes, establish operational management organizations, develop operational management institutions, and reserve talents. In the close-out phase, Daxing Airport Management Company was formally established to integrate all businesses and operational preparation activities. From the perspective of CAH, the final governance mode of operational preparation activities was a matrix integration comprising the integrated management business and the professional management businesses of airport operation. Thus, we theorize this governance arrangement as a dynamic matrix integration.

4.2.3. Governance of the Interplay between Project Activities and Operational Preparation Activities: Continuous Coupling

1. Top integration and coordination

As the top integrator of project activities and operational preparation activities, the Group (CAH) integrated and coordinated those activities in following ways. First, in the front-end phase, the general manager of CAH concurrently served as the commander-in-chief of the Headquarters, implicitly promoting the status of the Headquarters as coordinator of other organizations within CAH. Additionally, the project activities and operational preparation activities were integrated and coordinated through the general manager meeting, which was the highest-level meeting within CAH. In the construction and close-out stage, the general manager of CAH no longer served as the commander-in-chief of the Headquarters but led the newly established steering committee of BDIA in CAH. This steering committee not only involved all senior leaders of the Group (CAH) but also covered all the subsidiaries and branches through a dynamic participation mechanism. From November 2014 to September 2019, the steering committee acted as the highest integration and coordination platform for BDIA within CAH to study and make decisions on major issues in project activities and operational preparation activities. It held a total of 47 meetings and deliberated 388 issues, effectively integrating and coordinating the project activities and operational preparation activities.

Second, the functional departments of the Group (CAH) also integrated and coordinated special issues in project activities and operational preparation activities. For example, the Human Resources Department generally considered the human resource requirements for BDIA in all subsidiaries and branches, the Strategic Development Department largely considered the organizational forms of professional management companies for BDIA and their development strategies, and the Safety and Quality Department comprehensively considered the operational safety of both the Capital Airport and BDIA.

2. Organizational and staff overlap

As a large new company responsible for the integrated management of BDIA, Daxing Airport Management Company experienced a long period of cultivation and had a close relationship with the Headquarters. Its predecessor—Operational Readiness Office—was not an independent organization but was rather incorporated into the Headquarters as “one organization with two titles”. Externally, the Headquarters conducted operational preparation activities in the name of the Operational Readiness Office. Internally, a department was added into the existing organizational structure of the Headquarters to be responsible for specific operational preparation activities. Thus, two organizations of the Headquarters and the Operational Readiness Office were highly overlapped.

In July 2018, the Operational Readiness Office was renamed the Daxing Airport Management Company and separated from the Headquarters to become an independent

organization. However, the Headquarters and the Daxing Airport Management Company still experienced an overlap in staff, including senior leaders, department leaders, and department employees: (1) the commander-in-chief of the Headquarters concurrently served as the general manager of the Daxing Airport Management Company; (2) multiple senior leaders and department leaders served at both organizations; and (3) several staff members of the Headquarters were transferred to the Daxing Airport Management Company to handle airport operations.

The Headquarters and the Daxing Airport Management Company were the core organizations respectively responsible for the project activities and operational preparation activities of BDIA. They overlapped in organization and staff, not only reducing organizational interface and coordination problems, but also effectively promoting the coupling of project activities and operational preparation activities. Moreover, organizational and staff overlap somewhat ensured the smooth transition from projects to operations, with BDIA taking only 87 days to complete the transition process.

3. Whole-process interaction

Within CAH, the project activities were always under the control of the Headquarters, whereas the operational preparation activities involved many operational organizations. During the whole process of BDIA, the Headquarters continuously interacted with those operational organizations. More specifically, in the front-end phase (April 2010–November 2014), the operational organizations represented by the Capital Airport Management Company and several professional management companies provided knowledge support and professional suggestions for the Headquarters to jointly formulate project schemes. In the construction phase (December 2015–June 2018), each professional management company acting as an operator and/or a user successively intervened in BDIA. They not only deepened the operational scheme of respective businesses and carried out respective operational preparation activities related to organizations, institutions, and people, but they also collaborated with the Headquarters on the detailed design and implementation of related facilities. In the close-out phase (July 2018–September 2019), the Daxing Airport Management Company collaborated with the Headquarters on many tests, trials, and the handover of equipment, facilities, and assets.

Whole-process interaction did not only make project activities and operational preparation activities mutually adapt and couple together, but it also allowed the project organization and operational organizations to collaboratively innovate on those project schemes and operational schemes, thereby creating value.

In summary, the interplay between project activities and operational preparation activities was governed through top integration and coordination, organizational and staff overlap, and whole-process interaction. These three governance mechanisms integrated all levels and types of organizations within CAH to couple all project activities and operational preparation activities, which echoed the strategic initiative proposed by CAH—gathering the strength of the whole Group to ensure BDIA's high-quality opening. We theorize this governance arrangement as continuous coupling.

4.2.4. Hybrid Value Creation

Through the governance of project activities, operational preparation activities, and their interplay, CAH created the hybrid values of project management value, business value, and public value.

1. Project management value

Project management value refers to the delivery of project products in accordance with predefined cost, schedule, quality, and safety criteria. In the case of BDIA, the feasibility study report approved by the National Development and Reform Commission in September 2014 set rigid constraints on the cost (CNY 80 billion, approximately USD 12.5 billion) and schedule (5 years) of the airport project. Meanwhile, existing laws, regulations, and standards clearly stipulated the quality and safety requirements for MIPs, which were also

applicable to BDIA. Furthermore, owing to the high strategic status and wide social impact of BDIA, the governmental agencies and officials specifically set higher quality and safety criteria for BDIA. For example, in February 2017, President Xi Jinping proposed the goals of building an “Excellent Project, Model Project, Safe Project, and Incorrupt Project” for BDIA.

Indeed, from the very beginning of BDIA, CAH realized that the creation of project management value would be challenging due to the internal and external complexity of BDIA, and the failure of project management value creation would inevitably damage other values. Thus, CAH established a capable project organization with full empowerment to implement an integrated management strategy to ensure that the project organization had sufficient knowledge, capabilities, discretion, and flexibility to integrate, coordinate, and manage different subprojects, thereby creating project management value. Finally, BDIA did not only achieve the goal of zero safety accidents and zero quality defects, but it also achieved the schedule objective (opened in September 2019) and saved more than CNY 3 billion. It should be mentioned that the main reason for the cost saving was the increase of the project capital. During the close-out phase, BDIA was rated as a national major project, and its capital was increased from 50% to 60%, thereby reducing interest expenses. However, even if this factor was removed, the cost of BDIA would not overrun.

2. Business value

CAH was a large enterprise group, and its subsidiary—Capital Airport Management Company—was a listed company. Accordingly, it had the inherent pursuit of business value. BDIA not only largely expanded the business capacity of CAH but also provided an important opportunity for the enterprise transformation of CAH. Consequently, two types of business values—operational value and enterprise development value—were created for CAH.

In terms of operational value, CAH sought to maximize the income and minimize the operation and maintenance costs of BDIA. For income maximization, one example is that CAH arranged for the Capital Airport Management Company to assist the Headquarters in formulating project schemes based on the operational experience of and lessons learned from the Capital Airport. It particularly emphasized the convenience and travel experience of passengers in order to attract more passengers, thereby increasing aviation and non-aviation revenues. The operational results showed that despite the impact of COVID-19, the non-aviation revenue of BDIA exceeded that of the Capital Airport in 2021, and the passenger throughput of BDIA in 2021 reached 16.1 million (the predefined objective was 45 million in 2025), indicating a positive potential for operational value creation. Another example was the cargo business, which had been a weakness of CAH. CAH specifically set up the Cargo Business Development Office to innovate the cargo operational mode of BDIA and promote the reform of the Group’s cargo business, thereby increasing income. For cost minimization, one example is that the Equipment Management Company advised the Headquarters to select the equipment based on the principle of lifecycle cost minimization. Another example is that the Energy Management Company proposed an integrated management mode for the energy management of BDIA. Compared with the traditional scattered management mode, the integrated management mode can effectively improve management efficiency and reduce operation and maintenance costs.

For the enterprise development value, CAH seized the opportunity provided by BDIA to vigorously promote the development of professional management companies. When arranging for professional management companies to formulate and deepen the operational schemes of respective businesses, CAH (the Group) repeatedly pointed out that each professional management company should take this opportunity to optimize its organizational structures and innovate its management mode. Taking the Security Management Company as an example, CAH (the Group) pointed out that the airport security brand of the Security Management Company had been widely recognized in the airport industry at home and abroad, and that the Security Management Company should further study business innovation, management mode innovation, and brand development.

In addition, the stock price of the Capital Airport Management Company provided further support to the potential of business value creation (including operational value and enterprise development value). For example, when BDIA was approved by the National Development and Reform Commission on 22 November 2014, the price was HKD 4.712 (approximately USD 0.604), increasing to HKD 6.542 (approximately USD 0.838) on 22 January 2015. When the BDIA opened on 25 September 2019, the price was HKD 6.662 (approximately USD 0.853), increasing to HKD 7.482 (approximately USD 0.958) on 25 November 2019. Furthermore, during the whole process of BDIA, the stock price of the Capital Airport Management Company increased from HKD 2.379 (approximately USD 0.305) on 31 December 2010 to HKD 6.662 (approximately USD 0.853) on 25 September 2019.

3. Public value

As a typical MIP, BDIA had a fundamental goal of creating public value for society. The public value created by BDIA was manifested by its economic and social value, ecological value, and industry value. (1) Economic and social value: Located at the intersection of two economic development axes of “Beijing-Tianjin” and “Beijing-Baoding-Shijiazhuang”, BDIA can serve the national strategy of the Coordinated Development of the Beijing-Tianjin-Hebei Region and support Beijing’s “four centers” construction—National Political Center, Cultural Center, International Exchange Center, and Science and Technology Innovation Center. (2) Ecological value: BDIA was devoted to building a green airport by widely adopting green technologies, strongly advocating energy savings and emission reduction, and comprehensively controlling water, air, and noise pollution. In BDIA, the proportion of national three-star green buildings exceeded 70%, the utilization rate of renewable energy exceeded 16%, and the collection rate of the runoff of the rain reached 100%. (3) Industry value: BDIA was not only a benchmark in the history of civil aviation development in China but also the flagship airport for building a “Four Characteristics Airport” (Safe Airport, Green Airport, Smart Airport, and Humanistic Airport) initiated by the Civil Aviation Administration of China. Moreover, it significantly enhanced the status of civil aviation in the national transportation network.

Although those public value goals of BDIA were derived from the existing laws and regulations as well as the particular demands of governmental agencies and officials, CAH, as a state-owned enterprise, was inherently required to accomplish those goals and create public value. For example, to build a “Humanistic Airport”, CAH planned and constructed five theme gardens (Silk Garden, Tea Garden, Pastoral Garden, Porcelain Garden, and Chinese Garden) in the terminal building.

In summary, three types of values—project management value, business value, and public value—were created by CAH. Meanwhile, those values were not created separately by a specific governance arrangement but through their combination. Thus, we theorize this as hybrid value creation.

5. Conceptual Framework

This study investigated how a project client governed project activities, operational preparation activities, and their interplay to create value in the context of MIPs. Following an in-depth analysis of BDIA, we found that the project client adopted three different governance arrangements, i.e., vertical blended integration, dynamic matrix integration, and continuous coupling, to govern project activities, operational preparation activities, and their interplay, respectively. Accordingly, the hybrid values of project management value, business value, and public value were created through the interaction of those three governance arrangements. Following the findings, we proposed a conceptual framework for the governance of value creation in a project client organization of MIPs, as shown in Figure 2.

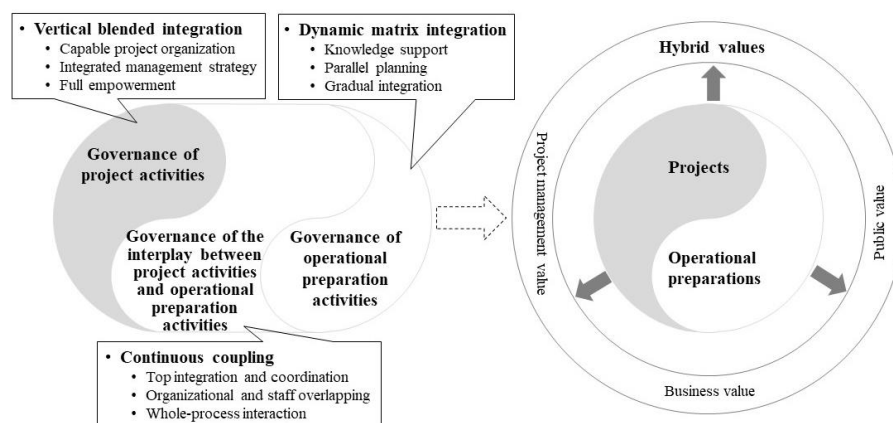


Figure 2. A conceptual framework for the governance of value creation in a project client organization of MIPs. Notes: The left part represents the three different governance arrangements adopted to govern project activities, operational preparation activities, and their interplay; the right part indicates that hybrid values are created when project activities and operational preparation activities are well-integrated through those governance arrangements.

5.1. Vertical Blended Integration vs. Dynamic Matrix Integration

Vertical blended integration focuses on the adoption of an integrated management strategy supported by a capable project organization with full empowerment. MIPs generally consist of many temporally and spatially interconnected subprojects, and their project activities are also intertwined. It reduces the effect of a traditional separation management strategy and requires an integrated management strategy [55] in which the project organization acts as the general integrator of project activities [56]. The project organization can deconstruct and reconstruct the planning, design, and implementation activities of all subprojects from a system perspective and “blend” all project activities, depending on the contexts and characteristics of the MIPs.

Implementing an integrated management strategy requires the project organization to be equipped with sufficient project capabilities [57,58]. In the case of BDIA, CAH “pieced together” a project organization with sufficient capabilities, not only by selecting elite leaders and hybridizing different people with project experience and airport operation experience, but also by maintaining the stability of the core leaderships to ensure the continuity of project management institutions, processes, methods, and routines, which were the “building blocks” of the project capabilities [59]. The Headquarters not only needed to coordinate such external stakeholders as governmental agencies, other project clients, and the public, but was also required to collaborate with many operational organizations and manage a large number of market suppliers. By contrast, in the case of the London 2012 Olympics and Paralympics Games, the general integrator of all project activities—the Olympic Delivery Authority—was unable to recruit staff with sufficient experience, skills, and knowledge. Thus, it had to outsource the activities of managing suppliers and contracts to a delivery partner through competitive bidding [56].

Moreover, implementing an integrated management strategy requires the project organization to be granted with matched authority. In BDIA, the Headquarters gained full empowerment from CAH, which not only ensured the Headquarters with essential discretion to coordinate external stakeholders, collaborate with internal operational organizations, and manage contracts, but also prevented excessive intervention and pressure from its parent organization—the Group (CAH).

Dynamic matrix integration describes how the project client dynamically governs operational preparation activities in which related businesses’ relationships are gradually changed from parallel collaboration to matrix integration during the project lifecycle. More specifically, in the front-end and construction phase of BDIA, CAH’s subsidiaries and branches—the Capital Airport Management Company and professional management

companies—were parallelly and successively involved in BDIA and acted as project operators and users to provide knowledge support, formulate respective business operational schemes, and conduct respective operational preparation activities related to organizations, institutions, and people. In the close-out phase, CAH formally set up the Daxing Airport Management Company to integrate all businesses and operational preparation activities, thus forming the matrix integration relationship.

As mentioned above, existing literature on project management generally focused on project activities [30], while business management studies mainly focused on formal operation activities [60]. Thus, a theoretical gap exists in the governance of operational preparation activities, and this study takes a tentative step to fill the gap. The construct—dynamic matrix integration—proposed in this study not only reveals the process dynamics of governing operational preparation activities but also shows the final governance mode, namely, matrix integration, which echoes the M-form organization of an enterprise group in business management studies [60].

Remarkably, noticeable differences exist in the governance arrangements of project activities and operational preparation activities, namely, vertical blended integration and dynamic matrix integration. First of all, the governance arrangement of project activities is static during the project lifecycle and is characterized by the vertical structure of “CAH (the Group)—project organization”, whereas the governance mode of operational preparation activities is dynamic and characterized by the matrix structure of “CAH (the Group)—Daxing Airport Management Company + professional management companies”. Second, within CAH, the governance boundary of project activities is the project organization, namely, the first-level contractors are external market actors. By contrast, the governance boundary of operational preparation activities is the first-level suppliers (professional management companies), namely, the second-level suppliers are external market actors.

The reasons for those differences may lie in the following aspects. First, from the perspective of capability [59], although the project client can establish a capable project organization for the integrated management of the project activities, as an infrastructure operational company, it lacks the capabilities, knowledge, and resources required for such specific project activities as planning, design and construction. Thus, the project client has to outsource those specific project activities to market actors. By contrast, the capabilities, knowledge, and resources required for operational preparation activities constitute the core capability of the project client and are separately reserved in different operational organizations within the project client. Thus, the project client can internally maintain the responsibility of professional management. Second, from the perspective of industry development, many excellent project contractors and suppliers exist in the Chinese construction industry market, but the suppliers of airport operation, especially outstanding suppliers, are very limited. Thus, CAH has to set up many professional management companies to support airport operations. Third, from the perspective of the inherent differences between project activities and operational preparation activities [25,30], the former is featured with uncertainty and interconnectedness, whereas the latter is characterized by stability and professionalism. The governance arrangement of the vertical blended integration has the advantage of flexibility and discretion to cope with emerging issues and changing needs, whereas the governance arrangement of the dynamic matrix integration is more advantageous in performing stable and routine activities [61].

5.2. Continuous Coupling

Continuous coupling represents the situation where the project client continuously couples project activities and operational preparation activities as a whole during the project lifecycle. In the case of BDIA, CAH coupled the project activities and operational preparation activities through top integration and coordination, organizational and staff overlap, and whole-process interaction. Top integration and coordination acted as the highest-level coupling mechanism within CAH, which not only helped solve the inter-organizational problems between the project organization and the operational organizations

but also coupled project activities and operational preparation activities at the strategic level. Organizational and staff overlap was the secondary coupling mechanism that could significantly reduce the interface problems between the two core organizations and couple project activities and operational preparation activities at the tactical level. Whole-process interaction represented the continuity of coupling that promoted mutual adaptation and balance between project activities and operational preparation activities.

The findings in this study indicate that from a value creation perspective, the operational preparation activities should be governed and coupled with project activities during the whole process, from project concept to project opening, rather than a limited time window, e.g., the transition process from projects to formal operations [47]. More specifically, from the perspective of value creation, the planning, design, and implementation activities of MIPs need to be conducted in accordance with respective operational schemes, but those operational schemes are highly professional and cannot be formulated at high quality by the project organization. Thus, operational organizations are required to get involved in the project during the front-end stage. Moreover, the respective operational schemes are also highly complex and cannot be completely formulated in the front end but need to be continuously deepened. The paces of each subproject are inconsistent, and continuous coupling between project activities and operational preparation activities is required during the project lifecycle.

5.3. Hybrid Value Creation

Hybrid value creation describes the creation of multiple values through the combined actions of vertical blended integration, dynamic matrix integration, and continuous coupling. In the case of BDIA, those values included project management value, business value, and public value.

Project management value reflects the product creation view that focuses on the delivery of project products in accordance with predefined cost, schedule, quality, and safety criteria. Although this product creation view has been criticized after the occurrence of the value idea [9], we argue that a value creation view should contain the product creation view instead of discarding it. In the case of BDIA, the cost and schedule constraints and the quality and safety requirements were always the prominent value objectives pursued by the project client. Furthermore, prior empirical literature showed that project management value was still one important type of value in the eyes of practitioners [22].

Business value describes the contribution of MIPs to their clients' business development, including operational value and enterprise development value. Operational value represents the balance between operational income and operational costs. Although not all MIPs can earn direct income, such as with free bridges, they still pursue the minimization of operational costs. Enterprise development value is a new finding of this study. MIPs do not only largely expand project clients' operational capabilities to create operational value, but they also provide an opportunity for promoting enterprise transformation, thereby creating enterprise development value.

Public value considers the contribution of MIPs to society. Creating public value is a typical feature of such quasi-public goods as MIPs. In the case of BDIA, project client pursued such public values as economic and social value, ecological value, and industry value, which are supported by existing studies [27,28]. The government, on the one hand, provides public funds for the project client to create public value; on the other hand, it strictly supervises the usage of public funds and the realization of public value goals.

6. Conclusions and Implications

With the original intention of creating value through the development of MIPs, project clients face significant complexity challenges and are prone to suffer vast value loss. This study takes a tentative step toward exploring how the project clients of MIPs govern project activities, operational preparation activities, and their interplay to create value. Based on an in-depth analysis of BDIA, this study reveals that the project client adopts three distinct

governance arrangements, i.e., vertical blended integration, dynamic matrix integration, and continuous coupling, to create hybrid values, i.e., project management value, business value, and public value.

This study contributes to project governance and project value creation literature in several aspects. First, the main contribution of this study is that it extends existing project governance studies, from general projects and project-based organizations to MIPs and operation-based organizations such as project clients. The findings revealed that the project clients of MIPs should take respective governance arrangements to organize project activities, operational preparation activities, and their interplay, namely, vertical blended integration, dynamic matrix integration, and continuous coupling, which constitute an integral governance framework within the project client of MIPs. This governance framework goes beyond the prevailing multi-level view for project governance [45,46] and echoes the systematic view, with an emphasis on the integration and coupling process [62]. Second, this study extends the practical foundation of MIPs' value creation, from project activities to operational preparation activities. In other words, both project activities and operational preparation activities should be considered and governed to create value in the context of MIPs. Third, this study proposes an integrated value creation framework—comprising governance arrangements and hybrid values—which enriches and expands existing project value studies.

This study provides two important practical implications. First, project clients of MIPs should take the perspective of maximizing hybrid values (i.e., project management value, business value, and public value) rather than achieving the iron-triangle objectives in governing MIPs. In practice, project clients should set up the hybrid value objectives at the very beginning of MIPs and pay particular attention to the balance of different values during the whole process. Second, project clients of MIPs should acknowledge that both project activities and operational preparation activities should be governed effectively, and that different governance arrangements should be adopted for governing project activities, operational preparation activities, and their interplay. In practice, project clients should consider and conduct operational preparation activities as early as possible and pay continuous attention to the integration and coupling of project activities and operational preparation during the whole process.

This study also contains some limitations and further studies are needed. On the one hand, the single-case study approach has its inherent limitation, namely, the universality of results needs further validation through a multi-case study or a quantitative study. For example, in this study, the case of BDIA (i.e., airport project) was a vertical (or radiated) project, which is contrary to horizontal (or line) projects, such as the high-speed railway project, the metro project, the highway project. The former usually cannot be physically divided into several sections and involves more complex interface and coordination issues with other transport facilities, which may cause it to have different governance arrangements for project activities. Meanwhile, airport operation has a higher requirement for service quality and safety and involves many operational subsystems, which may cause its governance arrangements for operational preparation activities to be more complicated. Thus, the proposed framework needs to be validated and improved in other infrastructure projects to make it more inclusive. On the other hand, this study focuses on a single client and its project activities and operational preparation activities. Further research can take a project perspective to comprehensively consider all clients and their project activities and operational preparation activities within an MIP. In addition, a comparison of the governance arrangements in newly built projects and expansion projects is welcome in order to improve the conceptual framework. For example, in a newly built project, governance arrangements need to be built from scratch; but in an expansion project, there may be path dependence.

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