Measuring Project Governance of Mega Infrastructure in China: A Scale Development Study

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Abstract: This study builds a measurement framework of project governance for mega-infrastructure considering the institutional situation of mega-infrastructure projects in China, including contractual governance, relational governance, and governmental governance. The factors of governmental governance are identified by the method of grounded theory with six cases of megaprojects, and the measures of project governance for mega-infrastructure are refined by expert interviews. The 235 questionnaires are collected, and exploratory factor analysis is used to identify six factors of the governance mechanism for mega-infrastructure projects. The scales are developed, and reliability and validity tests are conducted. Results indicate that (1) the governmental governance mechanism includes government decision, government supervision, and government coordination. (2) The three-dimensional framework of project governance is established as “contractual–relational–governmental” in the field of mega-infrastructure. (3) The measurement scales of project governance are developed and validated for mega-infrastructure, including government regulation, government coordination, risk sharing, revenue distribution, relationship maintenance, and cultural development. This research contributes to (a) the state of the knowledge by gaining a holistic and comprehensive understanding of project governance in mega-infrastructure in China, and (b) the state of the practice by providing a tool for measuring project governance in mega-infrastructure.

Keywords: mega-projects; project governance; measurement scales; China

1. Introduction

The world has entered the “Trillion Era” of mega-infrastructure projects [1,2]. According to a report of global consulting by McKinsey, the total investment in infrastructures would reach up to 57 trillion by 2030 [3]. Flyvbjerg (2014) also estimated that the global annual investment in mega-infrastructure projects would reach up to 6–9 trillion dollars [2], accounting for 8% of the global Gross Domestic Product (GDP). In 2013, Chinese President Xi Jinping announced that he wanted to resurrect the legendary Silk Road; he proposed a titanic project to build hundreds of roads, bridges, and railroads to connect China and Europe. In China, the government also speaks of the “Belt and Road initiative” (One Belt, One Road—abbreviated OBOR) to describe the project that will span more than 50 years [4]. The implementation of “One Belt, One Road” initiated by the Chinese government had set off a new round of investment climax in construction projects [5]. Mega-infrastructure projects have the characteristics of large scale, complex technology, and extensive profound meaning, compared with general projects [5]. It brings a huge challenge for decision making and project management, and the “over investment, over schedule and low investment profit” has become an international “iron law” in mega-infrastructure projects [6,7].

Project governance (PG) has a significant role in the implementation of projects and has been regarded as a decisive factor affecting project performance [6,8]. Compared
with project management, project governance is a higher level of management activities which is called “management of project management” [9,10]. It helps to reduce the risks throughout the life cycle by coordinating project stakeholders. Numerous researches have been conducted on project governance, especially the framework of project governance. For instance, Brunet (2019) advanced a conceptualization for governance-as-practice [11]. Müller et al. developed a framework for the governance of projects based on eight case studies [12]. Too and Weaver offer a framework to build on current theory development and practice by synthesizing the existing literature [13]. It can be concluded that the research methods are based on the qualitative analysis but lack the qualitative–quantitative analysis of the model, and even less the cross-case analysis and empirical research. Besides, existing research reaches a consensus that project governance mechanisms mainly include contractual governance (CG) and relational governance (RG) [14–16].

However, mega-infrastructure projects have a government-led institutional context in China, compared to common projects [6,7]. The government is a leading force to promote the construction of mega-infrastructure projects in China with the help of a unique institution [7]. The leading group or headquarters are adopted for mega-infrastructure projects and make a series of remarkable achievements. Because most mega-infrastructure projects are directly managed by central or local government departments or authorized branches (such as headquarters, management committee, and government-funded project companies, etc.) [17], it has a special situation of “vertical governance” in mega-infrastructure projects in China [7]. The governance mechanism of administrative instructions from the government is defined as “governmental governance (GG)” in this study [18,19].

Therefore, it is of great theoretical and practical significance to explore governance mechanisms of mega-infrastructure projects in China in the context of “One Belt and One Road”. The main objective is to answer the following research questions: (i) How do we measure the governmental governance suited to the institutional situation in China? (ii) How do we measure multidimensional governance mechanisms of megaprojects in China? To address the research questions, sequential qualitative–quantitative research is conducted in this study to develop and validate the scale to measure project governance in mega-infrastructure. This research contributes to (a) the state of the knowledge by gaining a holistic and comprehensive understanding of project governance in mega-infrastructure in China, and (b) the state of the practice by providing a tool for measuring the project governance in mega-infrastructure.

2. Literature Review

Governance is from the Latin word “gubernare”, meaning “guidance”, and mainly refers to the guidance of the country. Project governance is proposed by Turner and Keegan, who introduced the theory of governance into the field of project management by referring to corporate governance [20]. Regarding the project governance mechanism, existing authors classified project governance into different dimensions [21]. For instance, Chen and Manley classified project governance into formal mechanisms and informal mechanisms [14]. The former one is measured by collective cost estimation, risk and reward sharing regime, and design integration; the latter is measured by leadership, team integration, team workshops, and communication systems. Benitez-Avila et al. and Lu et al. measure project governance by contractual and relational governances in construction projects [22,23]. Lu et al. measured governance mechanisms by contract governance and trust [24]. Caniëls et al. classified the project governance mechanisms into contractual incentives, authority, and relational governance in complex procurement projects [25]. Olsen et al. developed a contractual framework arguing that different combinations of incentives, authority, and trust should govern the procurements [26]. Henisz et al. emphasized the institutional concepts including ‘regulative’ institutional supports (e.g., laws, regulations, contracts and their enforcement through mediation [16], arbitration or litigation), institutional supports that are ‘normative’ (e.g., socially shared expectations of appropriate behavior and social exchange processes), and ‘cognitive’ (e.g., creating shared
identities, scripts or conceptual frameworks to bridge differences in values or interests). Zheng et al. put forward three varieties of governance mechanisms: contract, trust, and institutional support [27].

In conclusion, numerous researches have been conducted on project governance and showed that contractual governance and relational governance are the main dimensions [28]. However, few studies of project governance consider the situation of mega-infrastructure projects in China. As a special construction unit, administrative instructions from the government play an important role in regulating inter-organizational relations. If the organizational model is properly constructed, the governance from the government can effectively promote projects and effectively balance conflicts of public interests [19]. The government-led governance mechanism is defined as “governmental governance”. Since the government has special political characteristics, social function, and the absolute decision in the mega-infrastructure projects of government-led investment, it is necessary to regard the governmental governance mechanism as equally important as contractual governance and relational governance. Thus, the three-dimensional governance framework is hypothesized as “contractual–relational–governmental” of mega-infrastructure projects in this study.

The contractual governance mechanism refers to a series of formal institutional arrangements, including contracts and relevant regulations signed by project participants [29]. Based on the literature review, content analysis is carried out to identify the contractual governance factors of general projects, shown in Table 1. It can be seen from Table 1 that the dimensions of contractual governance mechanism mainly include risk sharing, revenue distribution, and accountability mechanism. The risk sharing mechanism aims to improve the project governance level and promote the success of the project, which is reflected in the fact that reasonable risk sharing can reduce the transaction cost of the project [15,30,31]. The revenue distribution mechanism is mainly reflected in the adjustment of contract price according to the occurrence of risk events, and the corresponding rewards and punishments for the performance of the contract [31]. The accountability mechanism means that the owner or project manager should assume basic and necessary responsibilities in the process of public resource management [15].

The relational governance mechanism is an informal and unwritten norm that can influence organizational behavior among the project participants [15,23]. Based on the literature review, content analysis is carried out to identify the relational governance factors of general projects, shown in Table 2. It can be concluded from Table 2 that the dimensions of a relational governance mechanism mainly include information sharing, problem solving, and trust mechanism. Information sharing aims to ensure the timeliness, accuracy, integrity, and adequacy of information exchange. Problem solving can be defined as the common action and willingness that can bring benefits to all participants of the project, such as common goals and cooperation willingness [15,34]. The trust mechanism can improve the contracting efficiency and focus more on solving risk problems by investigating the relationship norms and the perceived importance of personal relationships [25,35].

For the third governance force from the government, namely “governmental governance mechanism” in this study, few scholars have proposed similar concepts such as authoritative governance and hierarchical governance. Authoritative governance refers to the governance based on hierarchical authority, the function is mainly realized through linear hierarchical authority such as formal structure and authorization [26,36]. The core of
authoritative governance is administrative control, which plays a role through a political contract and has great governance power. Hierarchical governance refers to a way of governance of a top-down control system relying on the power or authority to ensure high efficiency to complete normal trade within projects [25,26]. However, existing research lacks literature on the factors of governmental governance taking megaprojects as the research context. Therefore, the grounded theory research method is adopted to explore the dimensions and factors of the governmental governance mechanism in megaprojects.

Table 2. Content analysis of the dimensions of relational governance.

| Dimensions                          | Caniëls et al. [25] | Henisz and Levitt [32] | Chen and Manley [14] | Olsen et al. [26] | Lu et al. [23] | Yan et al. [15] | Zhou et al. [33] | Deng et al. [34] | Liu [35] | Lu et al. [24] |
|-------------------------------------|----------------------|-------------------------|----------------------|-------------------|----------------|----------------|-----------------|-----------------|------------|-------------|
| Information sharing                 | ✓                    | ✓                       | ✓                    | ✓                 | ✓              | ✓              | ✓               | ✓               | ✓          | ✓           |
| Problem solving                     | ✓                    | ✓                       | ✓                    | ✓                 | ✓              | ✓              | ✓               | ✓               | ✓          | ✓           |
| Trust mechanism                     | ✓                    | ✓                       | ✓                    | ✓                 | ✓              | ✓              | ✓               | ✓               | ✓          | ✓           |

3. Research Methodology

The key procedures of the qualitative–quantitative approach in this study are described as follows. Firstly, grounded theory is adopted to identify the factors of governmental governance. Secondly, two rounds of Delphi interviews are carried out to refine the factors of project governance mechanism with the characteristics of mega-infrastructure projects in China considered. Thirdly, 235 valid questionnaires are collected to develop and verify the measurement scales of project governance, including exploratory factor analysis (EFA), reliability analysis, and validity analysis.

3.1. Grounded Theory

Because existing research lacks factors of governmental governance, the grounded theory method is adopted to identify the dimensions and factors of governmental governance mechanism of megaprojects in China. Grounded theory, proposed by sociologist Glaser and Strauss in 1967, is a qualitative research method that uses systematic procedures to develop and guide inductively theories based on a certain phenomenon. The systematic procedures include theoretical sampling, data coding (open coding, axial coding, and selective coding), and theoretical saturation test [37,38]. Zhang stated that the optimal number of selecting multi-case studies is 3–6, and Eisenhardt indicated that 4–10 cases are the best for multicase studies and are the most likely to construct a strong theory [39,40]. Accordingly, 6 megaprojects participated in by the government are selected from the national five-year planning in this study to collect objects, and a total of 229 cases of governmental governance are obtained (Table 3).

Table 3. List of selective projects for identifying governmental governance.

| No. | Project                             | Investment (CNY) | Related City            | Project Type         | Code Range     | Items Count |
|-----|-------------------------------------|-------------------|-------------------------|----------------------|----------------|-------------|
| 1   | Hong Kong-Zhuhai-Macao bridge project | 72 billion        | Hong Kong-Zhuhai-Macao  | Long span bridges   | aaa1–aaa68     | 68          |
| 2   | The high-speed line between Beijing and Shanghai | 220 billion | Beijing-Shanghai        | High-speed railway   | aaa69–aaa76    | 8           |
| 3   | South-to-North water diversion middle route project | 92 billion | Nanyang-Beijing         | Water conservancy project | aaa77–aaa120  | 44          |
Table 3. Cont.

| No. | Project                                      | Investment (CNY) | Related City       | Project Type | Code Range           | Items Count |
|-----|----------------------------------------------|------------------|--------------------|--------------|----------------------|-------------|
| 4   | Qinghai-Tibet railway phase II project       | 33 billion       | Xining-Lhasa       | Railway      | aaa121–aaa145        | 25          |
| 5   | Three Gorges project                         | 248 billion      | Yichan-Chongqing   | Water conservancy project | aaa146–aaa213 | 68          |
| 6   | West-East gas pipeline phase II project      | 46 billion       | Horgos-Guangzhou   | Energy facilities | aaa214–aaa229 | 16          |
|     | Sum                                          |                  |                    |              |                      | 229         |

3.2. Expert Survey

The aim is to collect the opinions of experts on the project governance mechanism considering the actual situation of specific mega-infrastructure. Based on initial factors sorted out by literature review and grounded theory, the expert survey is further used to refine the factors of the project governance mechanism. Two rounds of Delphi interviews are used in this study. The Delphi method is a research method in which the questionnaire is sent to experts for advice. A semi-structured questionnaire is designed, expert opinion is then collected, and statistical feedback result is obtained until the expert opinions reach consensus. The factors of contractual governance and relational governance are determined after two rounds of expert survey [41]. Most Delphi studies have no more than 20 participants [42]. Therefore, eight experts with practical experience are selected for this survey (see Figure 1). It can be seen from the Figure 1 that the most interviewed experts have more than 10 years of management experience in mega-infrastructure projects, including the owner (3), construction unit (1) and consulting unit (4).

![Figure 1](image-url)

**Figure 1.** Background of the expert survey: (a) management experience in mega-infrastructure projects; (b) participators in mega-infrastructure projects.

3.3. Data Collection

A questionnaire is designed based on the identified measures of project governance with a five-point Likert scale method (1 = very inconsistent, 5 = very consistent). According to the actual situation of the selected projects, interviewees are requested to evaluate the degree of conformity between the project description and reality. To ensure the representativeness and objectivity of the opinions collected from the experts, the choices of respondents are also controlled. The experts have at least two years of work experience and are requested to report about the most recently completed mega-infrastructure project. The questionnaire survey (see Appendix A) in this study is conducted and mainly distributed in the form of a network questionnaire star which is a professional online questionnaire survey, evaluation, voting platform in China. A total of 235 valid questionnaires are col-
lected in China, and the recovery rate is 85.00%. The statistical analysis of the collected questionnaires is shown in Table 4. It can be seen that the respondents are males (84.68%) who possess a bachelor’s degree (43.40%) and have more than ten years of work experience in mega-infrastructure projects (31.91%). The data are mainly collected from public projects (65.53%) associated with size of less than 10 hundred million CNY (40.85%) and duration of fewer than three years (54.04%).

Table 4. Statistical analysis of the returned 235 valid questionnaires.

| Characteristic          | Category                  | Frequency | Percentage (%) |
|-------------------------|---------------------------|-----------|----------------|
| Gender                  | Male                      | 199       | 84.68%         |
|                         | Female                    | 36        | 15.32%         |
| Education               | Ph.D.                     | 60        | 25.53%         |
|                         | Master                    | 43        | 18.30%         |
|                         | Bachelor                  | 102       | 43.40%         |
|                         | others                    | 30        | 12.77%         |
| Working experience      | ≤3 years                  | 66        | 28.09%         |
|                         | 3–5 years                 | 51        | 21.70%         |
|                         | 6–10 years                | 43        | 18.30%         |
|                         | >10 years                 | 75        | 31.91%         |
| Project type            | Public projects           | 154       | 65.53%         |
|                         | Public–private partnership projects | 35 | 14.89%         |
|                         | Private projects          | 46        | 19.57%         |
| Project investment      | <10 hundred million CNY   | 96        | 40.85%         |
|                         | 10–40 hundred million CNY | 84        | 35.74%         |
|                         | >40 hundred million CNY   | 55        | 23.40%         |
| Project duration        | ≤3 years                  | 127       | 54.04%         |
|                         | 4–5 years                 | 75        | 31.91%         |
|                         | >5 years                  | 33        | 14.04%         |

Software SPSS version 17.0 and AMOS version 16.0 are adopted for the quantitative analysis in this study. Firstly, EFA is adopted to classify the governance factors into different dimensions in mega-infrastructure projects. A principal component method is conducted to extract the common factor, and the maximum variance method is used for factor rotation. A factor is extracted when the eigenvalue is greater than 1 and vice versa [43]. This step is supported by a high Kaiser–Meyer–Olkin (KMO) and Bartlett test. Secondly, reliability analysis is employed to check the consistency of the internal structure. Corrected-Item Total Correlation (CITC) and Cronbach’s reliability coefficient are used for reliability analysis. CITC is used as the standard of purifying items, and the reliability coefficient is used to test the internal consistency of items. Thirdly, confirmatory factor analysis (CFA) is used for the validity analysis for the measurement scales [44]. CFA is conducted using a measurement model in SEM software, which analyzes the representation of latent variables by using observable variables [45,46].

4. Results

4.1. Factors Identification of Governmental Governance

For the third governance force from the government, existing research lacks literature on the factors of governmental governance taking megaprojects as the research context. Therefore, the grounded theory research method is adopted to explore the dimensions and factors of the governmental governance mechanism in megaprojects. It aims at exploring and summarizing the core elements of the governmental governance mechanism in megaprojects from relevant materials of cases and interviews. The specific research process and results are as follows.

Step 1: Open coding

The process of open coding refers to the gradual conceptualization and categorization of the data collected in the case. The collected data are categorized, and concepts are extracted and then reorganized without personal subjective intention [47].
coding method is adopted in this study, and it mainly includes two steps. The first step is labeling. Labeling refers to screening out the information related to the research topic (governmental governance mechanism) and labeling the information with independent sentences. A total of 229 tags are labeled from the text data of typical cases of megaprojects. Similarly, 26 instances are extracted from the expert interview data for the theoretical saturation test. The second step is conceptualization and categorization. The process refers to assigning specific concepts to the phenomena represented by the 229 tags, further classifying related concepts into a category. Sixty-five categories are extracted after the categorization of key elements of governmental governance mechanism.

Step 2: Axial coding

The purpose of axial coding is to explore the relationships among conceptual categories and further refine the categories extracted from open coding. Combining the inter-relationships and logical order of different categories at the conceptual level, the categories most related to the research objectives are further classified and selected as the main category [38]. After comparing 229 concepts and 65 extraction categories of open coding, 3 main categories and 11 secondary categories of governmental governance are obtained considering the actual situation of megaprojects. The results are tabulated in Table 5.

Step 3: Selective coding

Selective coding refers to the identification of core categories that can connect other categories by analyzing the “main clues” of data. The definition of the core category can be selected from existing categories, and it can be refined at a more abstract level according to the needs of explaining core phenomena [38]. “Governmental governance mechanism of megaprojects” is selected as the core code, and the idea of the storyline is adopted to guide the code in this study. The first step is to define the storyline in this study as “to promote the successful implementation of megaprojects, the government often governs the projects through decision, supervision and coordination mechanism”. The second step is to compare the main and secondary categories and take the government decision, government supervision, and government coordination as the specific mechanism of governmental governance in the implementation of megaprojects. The third step is to analyze the core category and its relationships with other categories. For instance, “government decisions” (A1) is regarded as one mechanism of governmental governance in megaprojects. The main way is the development of planning or management methods (a1), which includes the establishment of development planning (aa2), creation of institutional environment (aa3), and formulation of administrative measures for immigration work (aa4). Through systematic analysis, the constitutional system of governmental governance mechanism is established, including the core category, main category, secondary category, and concept.

Table 5. Axial coding of governmental governance mechanism in megaprojects.

| Main Category | Secondary Category | Extraction Category of Open Coding |
|---------------|--------------------|-----------------------------------|
| a1 Development of planning or management methods | | aa1 Formulation of policies and management methods |
| | | aa2 Establishment of development planning |
| | | aa3 Development of the institutional environment |
| | | aa4 Formulation of administrative measures for immigration work |
| | | aa5 Formulation of policy suggestions on hub project, power transmission and transformation project |
| | | aa6 Establishment of the related regulation proposal |
| | | aa7 Development of plans and policies for development areas |
| | | aa8 Establishment of immigration resettlement plans |
| A1 Government decision | a2 Development of decision-making guidelines and policies | aa9 Decision making of policies and guidelines in project construction |
| | | aa10 Decision making of major steps in project construction |
| | | aa11 Development of water price policies |
| | | aa12 Development of national laws, regulations, and policies |
| | a3 Development of resource allocation plans | aa13 Development of resource allocation plans |
| | | aa14 Optimization of resource allocation |
| | | aa15 Development of water resource allocation plans |
| Main Category | Secondary Category | Extraction Category of Open Coding |
|--------------|--------------------|-----------------------------------|
| A2 Government supervision | a4 Establishment of project entity and supervision of scientific decisions | aa16 Establishment of project entity aa17 Supervision of scientific decision making aa18 Supervision of project operation aa19 Supervision of implementation of matters decided by the meeting aa20 Supervision of implementation of immigration relocation planning aa21 Supervision and inspection of project construction parties responsibility |
| | a5 Supervision of construction procedure and scheme change | aa22 Supervision of project construction procedures aa23 Supervision of construction process plan and change aa24 Supervision of environmental protection aa25 Supervision of audit aa26 Supervision of construction pollution control aa27 Reviewing major changes to the initial design aa28 Supervision of spot check quality assessment aa29 Supervision and inspect of engineering entity quality aa30 Supervision of the whole process of project construction aa31 Organization of engineering acceptance work |
| | a6 Supervision of bidding and contract management | aa32 Supervision of project work plans aa33 Supervision of personnel management matters aa34 Supervision of bidding aa35 Supervision of contract management aa36 Supervision of the overall balance of plans, funding, and project progress |
| | a7 Supervision of construction fundraising and management | aa37 Supervision of total project investment aa38 Supervision of project construction fundraising and management use aa39 Supervision of the implementation of investment planning aa40 Monitoring and reviewing annual investment price indices and spreads aa41 Monitoring and reviewing reserve fund and investment surplus use plans aa42 Monitoring and reviewing increased project investment due to policy changes |
| A3 Government coordination | a8 Coordination of land acquisition, demolition, and resettlement | aa43 Coordination of land acquisition and demolition aa44 Coordination of relocation of immigrants aa45 Making an annual plan for immigration and relocation aa46 Guiding immigration training aa47 Coordination with supervision department for immigration funding aa48 Coordination and promotion of migration and counterpart support |
| | a9 Coordination of social interest relations | aa49 Coordination of social interest relationship involved in the project aa50 Coordination of interest relationship between water transfer area and demand area aa51 Coordination of relationship between water transfer, flood control and drought resistance aa52 Coordination of programmatic issues, technical issues, and major policy issues |
| | a10 Coordination of relations among central departments or central and local authorities | aa53 Coordination of relationship between central departments and between central and local governments aa54 Coordination of relationship between provinces aa55 Coordination and exchange between the project and foreign governments aa56 Coordination of administrative originations and foreign affairs |
| | a11 Coordination of public affairs related to the project | aa57 Coordination of local supporting project construction aa58 Coordination of external publicity aa59 Coordination of project operation management system aa60 Coordination of engineering comprehensive scheduling program work aa61 Coordination of protection of cultural relics aa62 Coordination of water saving, pollution control, and ecological environmental protection aa63 Coordination of geological disaster control work aa64 Coordination of technological breakthrough and localization of major engineering equipment aa65 Coordination of ecological construction and environmental protection science and technology |
Step 4: Theoretical saturation test

The theory tends to be saturated when there is no new category obtained. In this case, the theoretical saturation test is required to ensure the reliability of the model. It can be concluded that the integration process of the model is reliable and the theoretical saturation is achieved. Hence, the governmental governance mechanism includes government decision, government supervision, and government coordination. Government decision refers to the decisions made by the government on policies and resource allocation of megaprojects by administrative instructions. Government supervision refers to the supervision function exercised by the government on the construction plan and fundraising management. Government coordination means that governments adopt the administrative rights to have coordination among central departments.

4.2. Framework Establishment of Project Governance

Two rounds of Delphi interviews are used to refine the factors of the project governance mechanism considering the actual situation of specific mega-infrastructure. In the first round of Delphi expert interviews, the factors of project governance are supplemented and improved as follows. Firstly, the accountability mechanism is deleted from contractual governance. Through interviews, the consensus is achieved that the significance of accountability mechanism is not clear in mega-infrastructure projects, and it is suggested to be deleted. Secondly, the trust dimension is deleted and is merged into relational governance because trust is the result of relational governance. Thirdly, cultural development is supplemented to relational governance. The sense of belonging can be strengthened through continuous cultural construction activities in mega-infrastructure projects under the Chinese context. For instance, project culture like “project interests above all” and “the one-hundred-day pledging” in Expo 2010 helps improve project performance [19]. Fourthly, measures of the governmental governance mechanism are supplemented.

In the second round of the Delphi interview, the modified project governance factors are sent back to the experts for evaluating the results of the first round. The results show that consensus has been reached on the revised project governance mechanism. Hence, through two rounds of interviews, the contractual governance mechanism is summarized as risk sharing and revenue distribution, the relational governance mechanism includes information sharing, problem solving, and cultural development, and the governmental governance mechanism is summarized as government decision, government supervision, and government coordination. The measures of the governance mechanism in mega-infrastructure projects are tabulated in Table 6.

| Dimensions         | Potential Factors                                                                 |
|--------------------|-----------------------------------------------------------------------------------|
| Risk sharing (RS)  | Clarity of responsibilities and rights (RS1), Procedures for handling the risk of disputes (RS2), Measures to deal with unforeseen events (RS3), Rationality of interest claims (RS4), Responsibilities and rights for handling disputes (RS5) |
| Revenue distribution (RD) | Setting of reward clauses (RD1), Setting of punishment clauses (RD2), Rationality of revenue acquisition (RD3), Contract price adjustment according to laws and regulations (RD4), Contract price adjustment according to price fluctuation (RD5) |
| Information sharing (IS) | Timeliness of information notification (IS1), Accuracy of information exchange (IS2), Adequacy of information sharing (IS3), Informal channel communication (IS4) |
| Problem solving (SP) | Solving conflicts and disputes through cooperation (SP1), Helping relevant parties to solve problems (SP2), Sharing responsibilities of project participators (SP3), Committing to solve project problems (SP4) |
| Cultural development (CD) | Organizing investigation and learning activities (CD1), Establishing project partnership (CD2), Advocating pleasant project culture (CD3), Implementing labor competition and other cultural activities (CD4) |
Table 6. Cont.

| Dimensions                        | Potential Factors                                                                                                                                 |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Government decision (GD)          | Development of planning or management methods (GD1), Development of decision-making guidelines and policies (GD2), Development of resource allocation plans (GD3) |
| Government supervision (GS)       | Establishment of project entity and supervision of scientific decisions (GS1), Supervision of construction procedure and scheme change (GS2), Supervision of bidding and contract management (GS3), Supervision of construction fundraising and management (GS4) |
| Government coordination (GC)      | Coordination of land acquisition, demolition, and resettlement (GC1), Coordination of social interest relations (GC2), Coordination of relations among central departments, central and local authorities (GC3), Coordination of public affairs related to the project (GC4) |

4.3. Development and Validation of Measurement Scales

Based on identified factors of project governance, a questionnaire survey is designed and 235 data are collected to refine and validate the project governance scales. Firstly, EFA is conducted to refine the PG framework quantitatively in consideration of the possible strong correlation between factors of project governance. Before factor analysis, Kaiser–Meyer–Olkin (KMO) and Bartlett tests are carried out on the factors of project governance. Results show that the KMO value is 0.921, greater than 0.8. Bartlett of spherical test $\chi^2$ value significance level is less than 0.05 with statistical significance. Thus, the data is suited for EFA. The factor extraction is based on the standard that the eigenvalue is greater than 1, and the factor extraction is stopped when the eigenvalue is less than 1. The results of factor analysis show that seven factors are extracted from the 34 items of project governance, and the total variance of the accumulative interpretation of the factors is 68.281%, greater than 60%. The factor loads of the items are above 0.400, indicating that the seven common factors extracted can effectively reflect the 34 variables. However, the extracted factors deviate greatly from the dimensions in project governance. Therefore, some items are considered to be deleted. Factor analysis of 30 variables is carried out after deleting IS4, CD1, GS2, and RD2, and the results are tabulated in Table 7. It can be seen that the total variance of the six factors extracted is 68.430%, greater than 60%. The factor loading of all items is above 0.400, indicating that the six common factors extracted can effectively reflect 30 variables.

Table 7. Results of EFA of project governance in mega-infrastructure projects.

| Factors                  | Factor Loading | %    | $\alpha$ |
|--------------------------|----------------|------|----------|
| Relationship maintenance |                |      |          |
| IS2                      | 0.798          |      |          |
| IS3                      | 0.760          |      |          |
| SP4                      | 0.735          |      |          |
| IS1                      | 0.623          |      |          |
| SP5                      | 0.622          |      |          |
| SP3                      | 0.621          |      |          |
| SP1                      | 0.565          |      |          |
| SP2                      | 0.491          |      |          |
| Government regulation    | 14.404         |      | 0.899    |
| GD1                      | 0.853          |      |          |
| GD3                      | 0.828          |      |          |
| GD2                      | 0.779          |      |          |
| GS1                      | 0.732          |      |          |
| GS3                      | 0.556          |      |          |
| GS4                      | 0.506          |      |          |
| Government coordination  | 11.703         |      | 0.896    |
| GC3                      | 0.793          |      |          |
| GC1                      | 0.791          |      |          |
| GC2                      | 0.778          |      |          |
| GC4                      | 0.748          |      |          |
Table 7. Cont.

| Factors                  | Factor Loading | %     | α     |
|--------------------------|----------------|-------|-------|
| Risk sharing             |                | 11.505| 0.873 |
| RS2                      | 0.815          |       |       |
| RS1                      | 0.726          |       |       |
| RS3                      | 0.684          |       |       |
| RS4                      | 0.676          |       |       |
| RS5                      | 0.644          |       |       |
| Revenue distribution     |                | 9.119 | 0.809 |
| RD4                      | 0.788          |       |       |
| RD5                      | 0.766          |       |       |
| RD1                      | 0.718          |       |       |
| RD3                      | 0.450          |       |       |
| Cultural development     |                | 6.560 | 0.800 |
| CD2                      | 0.690          |       |       |
| CD3                      | 0.590          |       |       |
| CD4                      | 0.543          |       |       |

Note: %—the percentage of variance explained, α—Cronbach α, total variance explained = 68.430%.

The results in Table 7 show that six factors are identified for project governance in mega-infrastructure. Factor 1 includes items IS2, IS3, SP4, IS1, SP5, SP3, SP1, and SP2, namely three items of information sharing (IS) and five items of problem solving (SP). These items can reflect the measures of maintaining the relationship, so factor 1 is named as relationship maintenance. Factor 2 includes items GD1, GD3, GD2, GS1, GS3, and GS4, namely three items of government decision (GD) and three items of government supervision (GS). These items can reflect the governing measures by the government, thus factor 2 is merged as government regulation. Factor 3 includes items GC3, GC1, GC2, and GC4, which are consistent with the governmental coordination of governmental governance; thereby, it is retained as governmental coordination. Factor 4 includes items RS2, RS1, RS3, RS4, and RS5, which are consistent with the risk sharing (RS) of contractual governance—hence, retained as risk sharing. Factor 5 includes items RD4, RD5, RD1, and RD3, which are consistent with the revenue distribution (RD) of contractual governance (except item RD2). Therefore, the name is retained as revenue distribution. Factor 6, including items CD2, CD3, and CD4, is consistent with the cultural development (CD) of relational governance (except item CQ1); therewith the name is retained as cultural development.

Secondly, reliability analysis is conducted to evaluate the consistency of the internal structure of project governance [43]. In this study, Corrected-Item Total Correlation (CITC) and Cronbach’s reliability coefficient are used for reliability analysis. CITC is used as the standard for purification clauses, and 0.3 is the critical value for judging whether clauses should be deleted. If the CITC value is less than 0.3 and can be increased after being deleted, the clauses should be deleted [43]. The reliability coefficient α is used to test the internal consistency of terms. The lowest α coefficient at different subscales should be above 0.50 and preferably higher than 0.60, while the lowest coefficient for the whole scale should be above 0.70 and preferably higher than 0.80 [43]. The reliability analysis results of each item in the project governance scale are tabulated in Table 8. It can be seen from Table 8 that the overall Cronbach’s coefficient value of subscales of project governance is greater than 0.60, with good internal consistency and reliability. The CITC values are greater than 0.300, indicating a high consistency between the sum of each item and the rest. The values of Cronbach’s Alpha after item deleted are less than Cronbach’s Alpha, indicating good internal consistency reliability.
Table 8. Reliability analysis of project governance.

| Dimensions                  | Measure Items | CICT | Cronbach's Alpha after Item Deleted | Cronbach's Alpha |
|-----------------------------|---------------|------|------------------------------------|------------------|
| Risk sharing                | RS1           | 0.669| 0.854                              | 0.873            |
|                             | RS2           | 0.744| 0.836                              |                  |
|                             | RS3           | 0.644| 0.860                              |                  |
|                             | RS4           | 0.739| 0.837                              |                  |
|                             | RS5           | 0.712| 0.844                              |                  |
|                             | RD1           | 0.542| 0.803                              |                  |
| Revenue distribution        | RD3           | 0.569| 0.786                              | 0.809            |
|                             | RD4           | 0.724| 0.714                              |                  |
|                             | RD5           | 0.682| 0.733                              |                  |
| Relationship maintenance    | IS1           | 0.678| 0.902                              | 0.910            |
|                             | IS2           | 0.781| 0.893                              |                  |
|                             | IS3           | 0.739| 0.896                              |                  |
|                             | SP1           | 0.696| 0.900                              |                  |
|                             | SP2           | 0.573| 0.909                              |                  |
|                             | SP3           | 0.699| 0.901                              |                  |
|                             | SP4           | 0.787| 0.892                              |                  |
|                             | SP5           | 0.735| 0.897                              |                  |
| Cultural development        | CD2           | 0.640| 0.737                              | 0.800            |
|                             | CD3           | 0.709| 0.657                              |                  |
|                             | CD4           | 0.596| 0.784                              |                  |
|                             | GD1           | 0.765| 0.876                              | 0.899            |
|                             | GD2           | 0.754| 0.877                              |                  |
|                             | GD3           | 0.786| 0.872                              |                  |
|                             | GS1           | 0.743| 0.879                              |                  |
|                             | GS2           | 0.683| 0.888                              |                  |
|                             | GS4           | 0.628| 0.896                              |                  |
|                             | GC1           | 0.742| 0.876                              |                  |
|                             | GC2           | 0.783| 0.861                              | 0.896            |
|                             | GC3           | 0.790| 0.858                              |                  |
|                             | GC4           | 0.765| 0.868                              |                  |

Thirdly, CFA is adopted for the validity test of project governance scales using AMOS software. The overall model of the project governance mechanism is depicted in Figure 2, and the results are tabulated in Table 9. From the perspective of the absolute fitting index, $\chi^2/df = 1.088$ and $p = 0.130 > 0.01$, which does not reach a significant level. Thus, the assumption is supported that the covariance matrix of the measurement model of the project governance mechanism is equal to the covariance matrix of empirical data. Hence, the hypothesis model is consistent with the observed data. Other indicators need to be further observed, GFI = 0.914 (>0.80), AGFI = 0.879 (>0.80), RMSEA = 0.019 (<0.08), indicating that the model is acceptable. By observing the relative fitting indicators, IFI = 0.994 (>0.90), CFI = 0.994 (>0.90), and NFI = 0.930 (>0.80), it can be concluded that the model has good construct validity. In terms of convergent validity, the factor load of most variables is greater than the critical value of 0.5. It shows that the model has good convergent validity. In terms of combined reliability, the standardized load of all measurement items reaches the critical value of 0.5, and all standardized coefficients reach a significant level. It concludes that these 30 indicators can reflect the six dimensions of project governance. Besides, the combined reliability value shows that all variables have reached a critical value of 0.6, except for revenue distribution. Hence, the internal consistency of each variable of the project governance mechanism is good and has good reliability.
Figure 2. CFA analysis of the overall model of project governance mechanism.

Table 9. Parameter estimation of the overall measurement model of project governance mechanism.

| Dimensions                | Items | Standardized Coefficient (R) | t Value   | R2    | ρc  | AVE |
|---------------------------|-------|------------------------------|-----------|-------|-----|-----|
| Government supervision    | GD1   | 0.790                        | —         | 0.624 |     |     |
|                           | GD2   | 0.831                        | 14.215 ***| 0.690 |     |     |
|                           | GD3   | 0.827                        | 17.231 ***| 0.684 |     |     |
|                           | GS1   | 0.779                        | 13.227 ***| 0.607 |     |     |
|                           | GS3   | 0.735                        | 11.980 ***| 0.540 |     |     |
|                           | GS4   | 0.635                        | 10.273 ***| 0.403 |     |     |
| Government coordination   | GC1   | 0.785                        | —         | 0.616 |     |     |
|                           | GC2   | 0.841                        | 14.171 ***| 0.708 |     |     |
|                           | GC3   | 0.839                        | 15.633 ***| 0.705 |     |     |
|                           | GC4   | 0.820                        | 15.124 ***| 0.672 |     |     |
| Risk sharing              | RS1   | 0.673                        | 10.060 ***| 0.454 |     |     |
|                           | RS2   | 0.734                        | 11.074 ***| 0.539 |     |     |
|                           | RS3   | 0.718                        | 10.947 ***| 0.515 |     |     |
|                           | RS4   | 0.786                        | —         | 0.617 |     |     |
|                           | RS5   | 0.740                        | 16.213 ***| 0.548 |     |     |
Table 9. Cont.

| Dimensions          | Items | Standardized Coefficient (R) | t Value  | R²       | ρc   | AVE |
|---------------------|-------|------------------------------|----------|----------|------|-----|
| Revenue distribution| RD1   | 0.605                        | —        | 0.366    | 0.477| 0.784|
|                     | RD3   | 0.763                        | 8.728 ***| 0.583    |      |     |
|                     | RD4   | 0.717                        | 8.463 ***| 0.515    |      |     |
|                     | RD5   | 0.668                        | 8.044 ***| 0.446    |      |     |
| Cultural development| CD2   | 0.734                        | 10.717 ***| 0.538   | 0.805| 0.580|
|                     | CD3   | 0.823                        | 11.602 ***| 0.677   |      |     |
|                     | CD4   | 0.723                        | —        | 0.522    |      |     |
| Relationship        | IS1   | 0.757                        | 11.683 ***| 0.572   | 0.905| 0.546|
| maintenance         | IS2   | 0.762                        | 12.012 ***| 0.581   |      |     |
|                     | IS3   | 0.736                        | 11.611 ***| 0.542   |      |     |
|                     | SP1   | 0.748                        | —        | 0.599    |      |     |
|                     | SP2   | 0.559                        | 8.683 ***| 0.313    |      |     |
|                     | SP3   | 0.767                        | 12.026 ***| 0.588   |      |     |
|                     | SP4   | 0.797                        | 12.649 ***| 0.636   |      |     |
|                     | SP5   | 0.757                        | 11.826 ***| 0.573   |      |     |

Goodness of fit index (p = 0.130):

|          | GFI    | AGFI   | NFI     | IFI     | CFI    | RMSEA |
|----------|--------|--------|---------|---------|--------|-------|
| χ²/df    | 1.088  | 0.914  | 0.879   | 0.930   | 0.994  | 0.019 |

Note: If t value is not listed, it is a fixed parameter item. *** represents p < 0.001.

5. Discussions

The multidimensional framework of governance mechanisms for mega-infrastructure projects includes contractual governance, relational governance, and governmental governance. The results prove that the 30 factors classified as six dimensions can measure the project governance of mega-infrastructure projects in China. This research contributes to knowledge and practice in the field of mega-infrastructure projects in two specific ways.

The first and most important contribution of this research is the identification of the factors of governmental governance in mega-infrastructure projects in China. Governmental governance mechanism is the active control behavior and mechanism carried out by the government to promote the construction of mega-infrastructure projects. The research fills the gaps of governmental governance and firstly identifies the factors of governmental governance based on the six cases of mega-infrastructure projects in China with grounded theory. The results show that the governmental governance mechanism includes government decision, government supervision, and government coordination. Governmental governance reflects the particularity of the governance mechanism of mega-infrastructure projects under the background of Chinese culture. Like an expert pointed out, “in fact, our mega-infrastructure projects are government-led in China. The government can gather all the strength of the country to achieve great events, such as Olympics, earthquake, and Expo”.

In the process of project governance, the government in China plays an important role in decision making due to the complexity of mega-infrastructure projects. The government is the public administrator and the indirect owner of the project. The goal is to ensure the implementation of the project and the realization of the social and economic benefits project involved. Moreover, local governments have indeed invested a great deal of enthusiasm in the construction of mega-infrastructure projects. It strengthens the role of governmental governance in mega-infrastructure projects. The pursuit of political achievements is the main incentive factor for local officials because the construction of mega-infrastructure
projects is the most significant indicator of political achievements. These incentives contribute to the high speed and efficiency of the construction of mega-infrastructure projects. China has built highly developed urban infrastructures and a series of mega-infrastructure projects in a few decades, which proves the role of governmental governance.

The second contribution of this research is that it provides a comprehensive and quantifiable measurement framework of project governance for mega-infrastructure. It can be used by the research and industry to measure and quantify the integration of project governance in the context of mega-infrastructure in China. The lack of a project governance framework in mega-infrastructure and the need to address it has been highlighted by previous studies [48,49]. Based on the literature review, existing research focuses on contractual governance and relational governance mechanisms. However, the government, as a special construction unit for mega-infrastructure projects in the Chinese context, has a significant role in regulating the inter-organizational relationship with its administrative directive. Governmental governance can effectively promote the project and balance the conflicts among public interests [19]. At this point, the two-dimensional governance framework of “contractual–relational” is extended to the three-dimensional framework of “contractual–relational–governmental” in the field of mega-infrastructure projects to fit the situation of China.

Furthermore, the scales of project governance are developed and validated by quantitative analysis with 235 valid questionnaires. The results of EFA show that the 30 identified factors of project governance are classified into six dimensions of government regulation, government coordination, risk sharing, revenue distribution, relationship maintenance, and cultural development. Specifically, the scale of government regulation includes items GD1, GD2, GD3, GS1, GS3, and GS4; the scale of government coordination includes items GC1, GC2, GC3, and GC4; the scale of risk sharing includes items RS1, RS2, RS3, RS4, and RS5; the scale of revenue distribution includes items RD1, RD3, RD4, and RD5; the scale of relationship maintenance includes items IS1, IS2, IS3, SP1, SP2, SP3, SP4, and SP5; the scale of cultural development includes items CD2, CD3, and CD4. The validated framework proposed by this research enables owners and managers of mega-infrastructure projects to evaluate and improve governance ability. The framework can also function as a measuring tool in academia to help gain insight into the multidimensions of governance mechanism to explore the impacts on project performance.

6. Conclusions and Future Works

This study builds a measurement framework of project governance for mega-infrastructure considering the institutional situation in China, adopting the panoramic qualitative method of grounded theory and the empirical method of a questionnaire survey. Through clustering analysis of 229 cases of governmental governance based on the six typical megaprojects, the qualitative research method of grounded theory is used to identify the factors of governmental governance. Through semi-structured interviews from the practice of eight experts, the measures of project governance are refined considering the context of mega-infrastructure projects, and the framework of the governance mechanism for megaprojects is built as (CG, RG, GG). On this basis, through the investigation of 235 project managers of mega-infrastructure projects in China, the measurement scales of project governance for mega-infrastructure are developed and validated quantitatively.

In terms of qualitative and quantitative studies, the obtained research findings are presented as follows. (1) The factors of governmental governance are identified based on the six cases of mega-infrastructure projects in China with grounded theory, and the governmental governance mechanism includes government decision, government supervision, and government coordination. (2) The three-dimensional framework of project governance is established as “contractual–relational–governmental” in the field of mega-infrastructure projects. (3) The measurement scales of project governance are developed and validated for mega-infrastructure, including government regulation, government coordination, risk sharing, revenue distribution, relationship maintenance, and cultural
development. This contribution of this research lies in developing the measuring scale of project governance that is capable of depicting the governance mechanisms systematically in mega-infrastructure projects. It can help us understand project governance in mega-infrastructure and can facilitate managers to take appropriate actions to enhance the ability of project governance.

However, the research has some limitations. The research result is obtained based on the data of mega-infrastructure projects collected in China; particularly, the governmental governance mechanism has a special situation of Chinese projects. Therefore, more research should be done in other countries to compare the results and obtain more generic results about the measurement scales. Besides, the research provides a framework of project governance for mega-infrastructure including contractual governance, relational governance, and government governance. Future studies could consider the relationship and interactions among the three dimensions of project governance.

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Institutional Review Board Statement: Ethical review and approval were waived for this study, due to three reasons. Firstly, the questionnaire survey in this study was conducted electronically. In the network survey, the network investigator is allowed to choose their identity name and password. Secondly, this study uses email to inform respondents about the survey and provide links, and these addresses are only accessible to selected respondents. Thirdly, each email contains informed consent and provides sufficient written information to potential respondents to determine whether they can complete the survey.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to the terms which has been stated in the informed consent that the questionnaire data are only for research.

Conflicts of Interest: Authors declare no conflict of interest.

Appendix A

Survey of project governance in megaprojects

Instructions: This questionnaire contains items about different factors influencing project governance. Use the following criteria (Table A1) when responding to the description of each factor by circling the number from the scale below (Table A2).

Table A1. Criteria of the definition of project governance levels.

| Score | Degree       | Criteria                                                                 |
|-------|--------------|---------------------------------------------------------------------------|
| 1     | Very inconsistent | The description is very inconsistent with the actual situation of megaprojects |
| 2     | Inconsistent  | The description is inconsistent with the actual situation of megaprojects    |
| 3     | Neutral      | Project participants have a neutral attitude about the description         |
| 4     | Consistent   | The description is consistent with the actual situation of megaprojects    |
| 5     | Very consistent | The description is very consistent with the actual situation of megaprojects |
**Table A2. Question survey of project governance.**

| Item          | Question Survey                                                                 |
|---------------|---------------------------------------------------------------------------------|
| **Risk sharing** |                                                                                 |
|               | The contract is clear about the responsibilities and rights of the parties and   |
|               | the project objectives                                                           |
| Risk sharing  | 1 2 3 4 5                                                                        |
|               | The contract has clear procedures and principles for dealing                      |
|               | with the risk of future disputes                                                  |
| Risk sharing  | 1 2 3 4 5                                                                        |
|               | The contract specifies the specific measures to be taken by each party in the    |
|               | event of unforeseen events                                                        |
| Risk sharing  | 1 2 3 4 5                                                                        |
|               | The contract gives full consideration to the interests of the parties involved in   |
|               | dispute settlement or disagreed matters                                           |
| Risk sharing  | 1 2 3 4 5                                                                        |
|               | The contract gives full consideration to the responsibilities and rights of the   |
|               | parties involved in dispute settlement or matters not agreed upon                 |
| Risk sharing  | 1 2 3 4 5                                                                        |
| **Revenue distribution** |                                                                 |
|               | The contract provides incentives for early completion and investment savings      |
| Revenue        | 1 2 3 4 5                                                                        |
|               | The contract contains penalty clauses for failure to perform the contract         |
| distribution   | effectively                                                                      |
| Revenue        | 1 2 3 4 5                                                                        |
|               | The revenue of participants is in line with the project’s size, complexity,       |
|               | special requirements, etc.                                                        |
| Revenue        | 1 2 3 4 5                                                                        |
|               | Price adjustment are set and paid for changes in laws, regulations, and relevant  |
|               | policies                                                                          |
| Revenue        | 1 2 3 4 5                                                                        |
|               | Price adjustments are set and paid for price fluctuations and engineering        |
| Revenue        | 1 2 3 4 5                                                                        |
|               | changes                                                                           |
| **Information sharing** |                                                                 |
|               | The parties timely notify the relevant information, changes, and events           |
| Information    | 1 2 3 4 5                                                                        |
| sharing        |                                                                                  |
|               | The information exchanged between the participants is accurate                    |
| Information    | 1 2 3 4 5                                                                        |
| sharing        |                                                                                  |
|               | The sharing of information among the various participants is adequate             |
| Information    | 1 2 3 4 5                                                                        |
| sharing        |                                                                                  |
|               | Informal channels are often used to communicate between the participants          |
| Information    | 1 2 3 4 5                                                                        |
| sharing        |                                                                                  |
| **Problem solving** |                                                               |
|               | All participants of the project actively cooperate to solve the conflicts and     |
| Problem        | disputes during the cooperation                                                   |
| solving        | 1 2 3 4 5                                                                        |
|               | The project provides relevant support to help other participants resolve their     |
|               | problems                                                                          |
| Problem        | 1 2 3 4 5                                                                        |
| solving        |                                                                                  |
|               | All parties of the project deal with unexpected changes objectively and share     |
|               | responsibility                                                                     |
| Problem        | 1 2 3 4 5                                                                        |
| solving        |                                                                                  |
|               | All parties of the project mobilize the resources to solve the problems             |
|               | encountered during the implementation of the project                              |
| Problem        | 1 2 3 4 5                                                                        |
| solving        |                                                                                  |
|               | When unforeseen situations arise, project parties work together to find solutions |
| Problem        | 1 2 3 4 5                                                                        |
| solving        |                                                                                  |
| **Cultural development** |                                                              |
|               | The project often have dinner with main partners, send small                       |
| Cultural       | gifts to each other, and organize activities such as investigation and study      |
| development    | 1 2 3 4 5                                                                        |
|               |                                                                                  |
|               | The project encourages all parties to establish project partnerships on a         |
|               | contractual basis                                                                  |
| Cultural       | 1 2 3 4 5                                                                        |
| development    |                                                                                  |
|               | The project actively advocates a pleasant project culture                           |
| Cultural       | 1 2 3 4 5                                                                        |
| development    |                                                                                  |
|               | The project carries out cultural construction activities such as labor competition,|
|               | community construction, civilized construction site, and party member vanguard    |
| Cultural       | 1 2 3 4 5                                                                        |
| development    |                                                                                  |
### Table A2. Cont.

| Item                      | Question Survey                                                                 | Degree of Consistency |
|---------------------------|---------------------------------------------------------------------------------|-----------------------|
| **Government decision**   | Government departments formulate relevant planning or management methods for the project | 1 2 3 4 5             |
|                           | Government departments make decisions on policies and major steps in project construction | 1 2 3 4 5             |
|                           | Government departments formulate reasonable allocation plans for project resources | 1 2 3 4 5             |
| **Government supervision**| Government departments establish project legal persons and supervise the scientific decisions | 1 2 3 4 5             |
|                           | Government departments supervise project construction procedures, construction process plans and changes, quality, and environmental protection, etc | 1 2 3 4 5             |
|                           | Government departments supervise project work plans, personnel management matters, tendering and contract management | 1 2 3 4 5             |
|                           | Government departments supervise and control the total amount of project investment and the raising, management, and use of project construction funds | 1 2 3 4 5             |
| **Government coordination**| Government departments are responsible for organizing or coordinating land expropriation, demolition, and resettlement | 1 2 3 4 5             |
|                           | Government departments are responsible for coordinating the social interests involved in the project | 1 2 3 4 5             |
|                           | Government departments are responsible for coordinating the relations between central departments and between central and local governments | 1 2 3 4 5             |
|                           | The government departments are responsible for coordinating public affairs related to the project | 1 2 3 4 5             |

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