Research overview on public-private partnership (PPP) project supervision in the field of hydraulic engineering

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Abstract: As the public-private partnership (PPP) model widely used in the field of hydraulic engineering, the PPP project supervision is particularly important. This paper analyzes the current PPP project supervision and regulation, analyzes the PPP project supervision definition and theory, and summarizes the research progress of PPP project supervision in the field of hydraulic engineering from the perspectives of supervision content, supervision issues and supervision methods. On this basis, together with analyzing the present supervision situation and supervision research present situation of the PPP project in the field of our country hydraulic engineering, this paper explores the limitations of existing research results on the PPP project supervision in the field of hydraulic engineering, and puts forward several further researched areas.

1. Introduction

PPP (Public-Private-Partnership) is a partnership between the government and the private sector for the provision of public goods or services established, due to its advantages in high efficiency of investment, resource allocation optimization, flexible market mechanisms, etc., which has been widely used in the field of hydraulic engineering. Undoubtedly, the participation of private capital in the construction of water conservancy projects provides a mechanism and innovative role that the government's public sector cannot replace, but there is still chaos in the marketization stage, which indicates that there is a problem that government supervision is not in place. Therefore, the regulatory issues throughout the life cycle of a PPP project cannot be ignored.

2. PPP project supervision definition and theory

2.1. PPP project supervision definition

Foreign scholars from different perspectives states the supervision. American economist Daniel F. Spulber defined supervision as the administrative agencies designated to perform the general rules or special behavior, mainly in order to directly or indirectly interfere with the market mechanism to change the businesses and consumers supply and demand decisions\textsuperscript{[1]}. Salamon, L.M. regards regulation as a restriction for the government to restrict the free decision-making behavior of relevant organizations or individuals through legal sanctions,\textsuperscript{[2]}. 

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Domestic scholars also define supervision to a certain extent. Guoan Zeng thinks supervision is generally the regulator for the public interest, or for other purposes, the basis of the existing rules, limiting the supervised activities[3]. Yingjuan Ma defines supervision as: The government administrative agencies intervene in the face of the relevant laws at the micro level to face the economic activities of the market players and the resulting social problems to correct market failures[4]. Similar with Yingjuan Ma, Hongfeng Zhang puts more emphasis on supervision of the norm objective by overcoming market failures in order to realize the maximization of social welfare and achieve the interests of the group[5].

The definitions of supervision are different from domestic and foreign scholars, but they are the same in essence[6]. Although their statements are different, their goals are all to solve market failures and social justice issues[7]. Therefore, it is very necessary to supervise PPP project.

2.2. The theory of PPP project supervision

The supervision of PPP projects in the field of hydraulic engineering projects has formed four main supervisory theories of public interest theory, the capture theory of supervision, supervision of economic theory and the theory of incentive supervision, focusing on the core issues of regulatory representatives’ interests, regulatory purposes and supervision methods[11].

The public interest theory holds that supervision represents the public interest of the whole society, and its direct basis is the market failure. The shortcomings of the market mechanism itself lead to a series of market failures such as monopoly, externality and incomplete and asymmetrical information, leading to ineffective or inefficient resource allocation, which harms the interests of the general public [12-14]. These provide a basis for the rationality of regulation.

The capture theory says that government supervision is to meet the needs of industry[15]. From design to implementation, regardless of how government regulatory program design, government regulation needs to first consider the object of supervision to defend the public interest, that is, government regulation only increases industrial profits rather than social welfare [16-17].

Economic theory of supervision explains the practice of supervision activity by the principles of economics. Stigner thinks supervision is not entirely related to market failure, thus neither supervisory practices must be public interest, nor industrial control force problem exist[18]. Peltzman’s further study draw that interest groups will provide political support for the regulators to obtain regulatory legislation that is beneficial to itself, so government supervision needs to consider the interest groups and regulators preferences[19]. However, Becker regards supervision as the competition between interest groups to enhance the interests of welfare[20].

Incentive supervision theory takes information asymmetry and different objectives between the regulator and the regulated as the premise, using game theory and principal-agent theory, designing reasonable incentive mechanism, inducing regulators to choose the behavior which regulators desired, reducing adverse selection and moral hazard, maximizing the public interest[11].

3. Review of PPP project supervision status of foreign research in different countries

3.1. US-based study of the supervision status of PPP projects

As early as 1898, the US Congress "Hart Act" requires all public works must obtain prior projects guarantee. Currently, the US has established a sound project guarantee insurance system. By using credit, government project guarantee insurance strengthens the relationship of responsibility between the parties to the project, so that the project risk has been effectively transferred to guarantee the successful completion of project construction[21].

The United States adopts a tiered supervision model with federal and state-level local regulatory agencies at the national level and local level, but there is no affiliation between the two levels of
regulatory agencies. The independent regulatory agencies in the United States generally consist of 5-7 members, to exercise legislative, executive, and judicial powers simultaneously [22].

3.2. Germany-based PPP project Supervision
Government PPP project supervision in Germany is a typical indirect government regulatory mode. The German government entrusted the specific work of project quality review and supervision to the quality inspection and supervision company. The government only supervises and manages the qualifications and behaviors of quality inspection and supervision engineers, and does not supervise and inspect specific projects [22].

3.3. Based on Britain and France PPP project Supervision
The UK PPP projects have strict laws and regulations restrict, and quality control mainly depends on market mechanisms, and the role of social intermediary is obvious [23].

In France, the government does not directly intervene in the construction process of PPP projects. Instead, it uses laws, regulations, and economic means to supervise the project quality. France has complete technical legislation, such as "NF" (French standard) and "DTUF" (French standard), which provide the necessary basis for quality inspection and quality appraisal.

4. Research overview on PPP project supervision from different aspect

4.1. Research overview based on PPP project supervision content
PPP project supervision content research in the field of hydraulic engineering involves quality and safety supervision, cost regulation, price regulation, performance monitoring, and other aspects.

Yunna Wu (2013) thought the cost regulation is helpful for the government to regulate the object's management behavior and activity legitimacy and rationality of control in a timely manner [24]. Honghui Jin (2014) explores under the new situation new path for the construction project quality supervision by the government [25].

4.2. Research overview based on regulatory issues of the PPP project
At present, there are many problems in the supervision of PPP projects in the field of water conservancy projects, such as lack of relevant laws and regulations, defects in regulatory mechanisms, opaque information, and insufficient public participation. Many scholars have also put forward their own opinions and suggestions on different regulatory issues in the PPP project.

Zhang Zhi Yuan (2010) thought that due to the lack of public participation mechanism, the supervision of public utilities concession operation suffers a setback [26]. Hou Xiao Xian (2012) thought the relationship among the related parties should be known well to maximize the usage efficiency of public project construction fund [27]. Dai Chen (2014) suggests that the role of government should be clarified, the laws should be enhanced, the supervision institution should be independent, professional, and comprehensive [28].

4.3. Research overview based on supervision methods of the PPP project
By the research of developed countries effective regulation of the PPP mode, combined with China's national conditions, scholars proposed supervision methods of different levels and angles from government regulation, market supervision and social supervision these three main angles.

Yanhai (2011) agreed that the realization of supervision unify and independence is the basis of public benefits' concession operation supervision [29]. Wang Shou Qing (2014) thought that the government is the final responsible party in the PPP project, thus the government should strengthen the supervision of the PPP project, through the research of government regulation and admittance regulation and performance supervision [30].
5. Conclusion

5.1. Research reference
At present, China's supervision of hydraulic engineering PPP projects is in the run phase, and there are many problems, such as there is no scientific system; independence of the regulator is not strong; legislation is not perfect, etc. By combing the above documents, the following aspects can be used in the supervision of PPP projects in China's hydraulic engineering field:

(1) Improve the PPP project in the whole process supervision system. Establish a supervision agency, clarify its properties, rights and responsibilities, maintain its relative independence from administration and finance to other government departments, strengthen the professionalism of regulators to further enhance the efficiency of direct supervision.

(2) Strengthen the social regulatory role in PPP projects. Transform the role of the government's regulatory body. Entrust a third-party review and supervision agency to carry out the evaluation and supervision of PPP projects, establish a sound auditing qualification review mechanism, and strengthen its behavior supervision to achieve the government's indirect macro control.

(3) Improve the market supervision of PPP projects. Establish sound laws and regulations to clarify the duties, rights, regulatory content and methods of the regulatory agencies; strengthen the construction of engineering guarantees and insurance systems, effective implementation and sound operation; enhance the supervision of market mechanisms.

5.2. Questions for further research
This article only applies to existing hydraulic engineering PPP projects in the areas supervisory literature at home and abroad, and sorts out the different stages of the regulatory status of PPP projects research results. Due to different national conditions and scope of regulation, the PPP project supervision systems are different. The future research will focus on:

(1) Due to the path dependence on the traditional regulatory model, the transition of the regulatory thinking mode to the service-oriented government function requires a transition period. How to accelerate the transformation of government functions to quickly adapt to the new development situation remains to be explored.

(2) Considering China's current complex and volatile market environment, there are obvious deficiencies in social supervision based on industry self-regulation. How to guide industry self-discipline to achieve effective social supervision needs further research.

(3) The market supervision mode based on guarantee and insurance forms is not perfect in China. How to play the regulatory role of the market mechanism and carry out comprehensive and effective implementation still need to be discussed in detail.

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