

# A Study in Government Procurement System: Public-Private Partnership for Infrastructure in Energy Sector

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**Abstract.** Public-private partnerships scheme are increasingly being employed as an alternative government procurement for delivering public services for the past two decades. The collaboration between public and private in the energy infrastructure development has become an interesting topic to be researched especially in the implementation of PPP in energy sector. This study aims to analyze what are the main theme of research in PPP in energy infrastructure development. Using Systematic Literature Review, this qualitative research wants to discuss further about what are the trend of research theme from 2010 to 2020, in different continents and the impact of Accounting to PPP and the connection of PPP research to Accounting and Finance theory. The data were taken from journals that already published from highly selected international journal. The study found that research quality was 48% published in Q1 Scopus Indexed journals. The most popular topics in the body of research are PPP challenges; the importance of the PPP project; Project Management and Regulatory Implications; Risk Management and PPP Financing. In PPP studies there are several topics relate to accounting and theory and Finance which are Cost and Management Accounting and Risk Management on allocating risk and PPP Financing for setting the project implementation more efficient and to create Value for Money.

## 1 Objectives

Public-Private Partnership (PPPs) have become an alternative procurement scheme that is widely used in various countries [1, 2]. Since there is a gap between the need for infrastructure development [3] and the ability of government to build it in an effective and efficient way [4].

There has been a significant increase in research on energy sector [5], especially in energy infrastructure with Public-Private Partnerships in the past two decades [6] and become an interesting topic to be researched. With the increasing growth of research in the last 10 years, it is considered necessary to conduct a literature review to observe the development of research on PPP Energy Infrastructure projects from 2010 to 2020.

The main study is in PPP research literatures in the field of Energy Infrastructure and formulating the research objective as follows: (i) What is the trend in PPP research in Energy Infrastructure within countries across Asia, America, Europe, and Australia between 2010-2020? and (ii) What is the connection of Public-Private partnerships studies with Accounting theory and Finance?

## 2 Methods

This study uses a qualitative method by applying Systematic Literature Review using secondary data

based on the step-by-step SLR method [7] and can be explained in Figure 1 as follow:

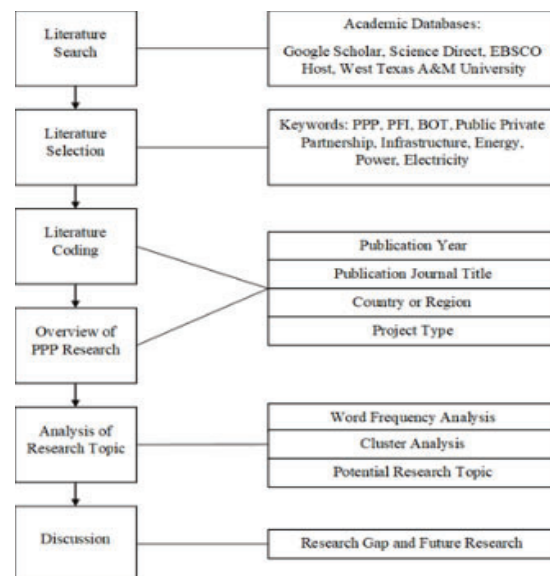


Fig. 1. The overall flow of the research framework.

## 3 Results and discussion

This research was based on a plot adaptation created by [8] by collecting literature consisting of journals and conference papers from the academic databases of Google Scholar, Science Direct, EBSCOHost, West

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Texas A&M University, which are described in Table 1. Then, based on the SLR Method [9], the second process is to select and collect journals based on keywords mentioned in journals such as PPP, PFI, BOT, Public Private Partnership, Infrastructure, Energy, Power, and Electricity. Third and fourth, the researchers conducted coding and looked at the overall journals that the researchers collected to be categorized by year of publication, title, country, and type of topic discussed. After the journal was collected researchers conducted an analysis with the help of Excel software and NVivo 12. By showing the results of Word Frequency, Cluster Analysis or research categorization, as well as research topics that still have the potential to be explored more deeply. The latter part is a researcher's analysis that concludes what are the gaps in and provides input to researchers in the future.

**Table 1.** Keywords validation.

No.	Source	Keywords	Date	Time	Result	Relevant Papers
1	Google Scholar	"PPP" and "ENERGY" and "INFRASTRUCTURE" and "AUSTRALIA"	14-May-20	14:20	17800	1
		"PUBLIC" and "PRIVATE" and "PARTNERSHIP" and "INFRASTRUCTURE" and "ENERGY" and "AUSTRALIA"	11-May-20	18:00	17300	2
		(public private partnership OR ppp OR pfi) AND energy AND china	19-May-20	14:48	59600	2
		"PUBLIC" and "PRIVATE" and "PARTNERSHIP" and "ENERGY" and "INFRASTRUCTURE" and "CHINA"	17-May-20	20:54	25200	4
		public private partnership OR pfi AND energy OR power OR electricity AND africa	02-Jun-20	12:23	17600	7
		("public private partnership" OR pfi) AND (energy OR power OR electricity) AND europe	03-Jun-20	18:24	17300	5
		("public private partnership" OR pfi) AND (energy OR power OR electricity) AND Asia	05-Jun-20	16:16	17400	9
		("public private partnership" OR pfi OR bot) AND (energy OR power OR electricity)	10-Jun-20	16:38	30600	11
		("public private partnership" OR pfi OR bot) AND (energy OR power OR electricity) AND germany	10-Jun-20	22:32	60100	2
		("public private partnership" OR pfi OR bot) AND (energy OR power OR electricity) AND Japan	10-Jun-20	22:46	32400	1
		("public private partnership" OR pfi OR bot) AND (energy OR power OR electricity) AND Indonesia	11-Jun-20	10:00	17700	8
		"PPP" and "ENERGY" and "INFRASTRUCTURE"	11-Jun-20	12:35	24300	4
2	Science Direct	("public private partnership" OR pfi) AND (energy OR power OR electricity)	07-Jun-20	21:56	6606	4
3	EBSCO	"public private partnership" AND Energy AND China	24-May-20	21:49	21	2
		("public private partnership" OR ppp OR pfi OR bot OR "private finance") AND (energy OR electric* OR power) AND (china OR chinese OR "People's Republic of China")	27-May-20	21:03	231	2
		("public private partnership" OR pfi) AND (energy OR power OR electricity) AND (america OR us OR usa)	06-Jun-20	21:09	46	1
4	West Texas A&M University Cornette Library	("public private partnership" OR ppp OR pfi OR bot OR "private finance") AND (energy OR electri* OR power) AND (china OR chinese OR "People's Republic of China")	28-May-20	20:51	14860	2
Total						67

In the search engine keyword table used in collecting research journals. It can be seen that, keywords use the "Boolean Operators" method to get more specific and targeted journals. The main source used is the Search engine Google Scholar. Journals are selected based on the title, abstract, and keywords of the journal to perform an initial screening of the journal to be taken. A total of 67 journals were the focus of the study.

### 3.1 Journal quality distribution

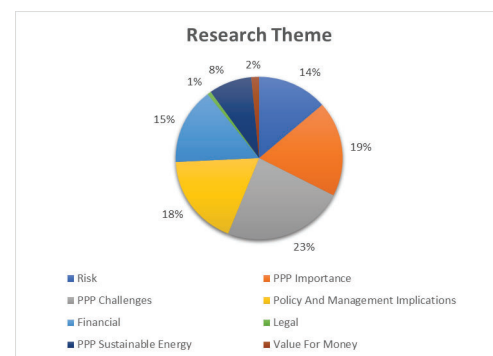
Researchers conducted a quality test of research journals, From the search engine journals used (Google Scholar, EBSCOHost, Science Direct, and West Texas A&M University Cornette Library). They obtained 67 journals to be used as research materials. There are 3 categories that are assessed by SCImago Journal Rank (SJR). These categories are Q1, Q2, Q3, and Q4. Journals with Q1 quality represents 48% or 32 journals.

### 3.2 Distribution of research themes

The distribution of research themes from the paper collection is explained in Table 2: (i) Risk (ii) PPP Challenges (iii) Financial (iv) PPP Sustainable Energy (v) PPP Importance (vi) Policy and Management Implications (vii) Legal (ix) Value for Money and the percentage of each research theme can be found in Figure 2.

**Table 2.** Topics distribution.

No	Theme	Total
1	PPP Challenges	31
2	PPP Importance	25
3	Policy and Management Implications	24
4	Financial	20



**Fig. 2.** Research theme diagram.

### 3.3 Distribution of research methods

The majority of countries obtained in this study were represented by Asian Countries as many as 37 journals. Although PPP was started and used first by the United Kingdom and Australia, with the rapid economic development and the need for energy in high demand that developing countries in Asia may rely on PPP methods to meet energy needs.

### 3.4 Research trends

To see the research trends of all the journals that have been obtained, this study used the help of Nvivo software version 12 to autocoding for the 100 most common words that have appeared in the journals that have been collected. Word Frequency Analysis from NVivo can be found in Figure 3 which is a data exploration technique that can classify research topics

by analyzing scientific content with indications of high-frequency words [10]. The results provided by the software are as follows:



Fig. 3. Word cloud NVivo.

In the analysis of NVivo based on the basic word. From the results of autocoding analysis produced by Nvivo software, the journals that have been obtained in this study are sufficient in accordance with the formulation of problems and topics that have been determined.

## 4 Results and discussion

The study wanted to find out what was discussed in a PPP project by researchers around the world, specifically on energy.

### 4.1 The research trend in public private partnership scheme in energy sector

Based on the Systematic Literature Review that has provided an effective method for mapping out thematically the papers based on the field of PPP studied in some countries such as Asia, the United States, Europe, and Australia on developing the Energy Sector infrastructure from 2010 to 2020, the results are conclude as follows: the theme of PPP challenges is the highest rank with 23% from all journal sample. Most of PPP Challenges themes contribute Positive tone and increase project towards the development of PPP Energy research, especially in developing countries [11] which are doing a lot of energy infrastructure development. Some point of the challenges are Policies, Contracts Management, Regulatory framework and Financing are the main topic of discussion that become challenges faced in a PPP project. Private initiative should be encouraged by the government's participation in PPP through the Public Policy and Regulatory Framework [12], which effects the utilization of public money and private investment areas [13]. Policy Strategy is critical in shaping the regulatory framework and acting as a catalyst to propel infrastructure development to the next level [14]. Both the policy strategy for utilizing the taxpayer-funded state budget [15], and the policy for universal access have a substantial influence on infrastructure development. To expedite growth, the government, as the representation of the public sector, should prioritize public policy approach in broadband infrastructure.

Table 1. Multicollinearity result.

Model	Tolerance	VIF
Total X1	24	2.122
Total X2	56	2.164
Total X3	39	1.056

### 4.2 The relation of public-private partnerships studies with accounting theory & finance

There are several connections of Accounting & Finance with PPP scheme in the implementation and practice which are as follow:

- Cost Accounting/Management Accounting. The PPP scheme and life cycle costs, which include startup operating costs, operation & maintenance costs [16], and revenues, were utilized to assess project feasibility [17]. The operations and maintenance expenses were calculated using benchmarking data from nations with similar technology parks [18]. The capacity analysis and price per unit were established based on a process flow for the examination of the revenue outcomes [19]. The operations and maintenance expenses, as well as income outcomes, provided the foundation for creating financial feasibility [20], such as IRR value, financing schemes, and institutional schemes between the government and the private sector [21]. Because good accounting in PPP will also produce good results for the continuity of the PPP method [22].
- Financing. The result has shown that one of essential factors in PPP is financing. The decision and project feasibility is based on Financial Model calculation which include IRR value, financing schemes and Net Present value calculation [23]. Project finance is needed to provide project completion timely. Finance is significantly related with Public Private Partnership scheme.
- Risk Management. A PPP is fundamentally a risk-sharing relationship, in this case to achieve certain public policy results. Any project must be organized in order to obtain the best risk allocation [24]. The core of a PPP is that the public sector is acquiring a service under specific terms and conditions rather than an asset ([25-26]). PPPs are agreements in which private parties collaborate or assist the delivery of public infrastructure, and a PPP project finishes with a contract for a private enterprise to provide public infrastructure-based services [27]. Value for money is an important aspect of the strategy [28], and if major risk cannot be transferred to private parties [19], a PPP is an option. A PPP is expected to provide good Value for Money. Furthermore, shifting inappropriate forms of risk adds unnecessary cost to a PPP agreement [29]. Only 'effective' risk levels should be communicated. Risk management, which entails identifying, evaluating, allocating, and mitigating risks, is critical to project success and obtaining value for money [30].

## 5 Conclusions

The purpose of this study is to observe the development of research themes in PPP Research in infrastructure development of Energy Sector from 2010 - 2020 in some countries such as Asia, USA, Europe and Australia on developing the Energy Sector infrastructure and for allowing this field to be viewed holistically. The study identified literature and countries that are the subject of research and identify the topic of research that has connection with Finance and Accounting field.

This SLR has provided an effective method for mapping out thematically the papers and for allowing this field to be viewed holistically [31]. The majority of publications are coming from Asian countries. There are trend in the themes of research which are PPP challenges as the highest rank with 23% from all journal sample and followed by PPP Importance (19%) and the third theme is Policy and Management Implication (18%) and PPP Financing (15%). Governments could promote the development of energy sector with PPP scheme in their respective nations with a variety of ways. The studies found that 48% PPP Research has been published in Q1 Scopus Index Journal and there are some points relate to the field of accounting and finance which are Cost and Management Accounting, Financing and Risk Management which these theme can be explored as future research direction.

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