

# A Bibliometric and Meta-Analysis of Studies on Build Operated Transfer

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## Abstract:

Several countries most often face the problem of completing national infrastructure development. The BoT Build Operated Transfer scheme is often used between the government and the private sector. From these studies, there are still too few bibliometric studies on government and private cooperation through the BoT scheme. This research aims to map trends in studies regarding the BoT scheme in government infrastructure development. The analysis method uses searching and collecting metadata from Scopus documents. The data is then processed using Vosviewer software. This research found that research on BoT topics discussed planning, efficiency, assessment, and risk management. Research on BoT will be interesting to discuss in future research on issues surrounding aspects of cooperation with the BoT scheme with political and economic approaches that can influence the success of BoT cooperation. Even though this research can map several topics surrounding BoT, there is still limited space for data collection methods from one source. Future research needs to expand the mapping of BoT studies by exploring broader data.

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**Keywords:** Bulid Operated Transfer, Law, Contract, Development

## Introduction

Infrastructure development is the first step in national development, which has an impact on eradicating social inequality, especially the issue of poverty (Brueckner, 2021; Sun & Cui, 2018; Yunhong et al., 2021). The obstacles that various governments often face in infrastructure development are related to minimal capital and technology. To fill the weaknesses of various countries in infrastructure development, there is something called the Build Operated Transfer Scheme, which is supported by third-party funds, namely the private sector. Investors provide capital support in the development and management of projects with the aim of obtaining rewards in the form of operational income during the concession period. Development using the BoT scheme has started since the 1970s (Jinbo et al., 2018; Šovran & Hadžić, 2016). Projects with third-party husks typically progress through five stages: feasibility, procurement, construction, operation, and transfer (Asheem et al., 2017). The operation stage is a very long stage that requires costs from the net income generated. Considering the long operating period, the investor's position will be faced with dynamic local political, economic, and environmental conditions, which will have the potential for inconsistencies and risks in its operations. This can lead to low operational efficiency and lead to project failure (Doloi, 2012; Allport & Ward, 2010).

The main aim of privatization in the infrastructure development process is to improve company performance and efficiency (Tatahi, 2013). Investor involvement in infrastructure development and management is needed in several conditions, especially in conditions where a developing country has minimal capital and managerial resources (Pheko, 2013). So, policymakers in a country need to take advantage of the experience of countries that have used the BoT scheme. The most widely used schemes are the joint venture structure (JSV) and Build Operate Transfer (BoT) (Brower et al., 2010). BoT relies on higher private participation compared to JVS; BoT provides great benefits for developers and the government as a host. So the BoT scheme can attract the sympathy of various groups, including academics (Wang et al., 2000; Qiao et al., 2001).

The BoT project has an extraordinary social and economic impact, geographically has a wide scope, and has a large relationship to the development of mega projects, so the level of interest of policy stakeholders has different orientations (Mok et al., 2015). The government and private sector, as investors, are the actors who play the most roles in terms of responsibilities and interests. These two actors need to create a system to maintain a long partnership. The stability of government-private cooperation really needs to be maintained; the two policymakers must develop the BoT system. This BoT study has been popular in various developing countries such as Turkey, with 98 out of 198 projects in Turkey with a percentage of 50% of projects in Turkey using the BoT scheme. Thus, this research aims to measure the development of research on national infrastructure development using the Bild Operated Transfer (BoT) scheme. Several sub-discussions in this research, firstly looking at trends in BoT research topics, secondly analyzing BoT research trends by country. Third, analysis of research on BoT from the aspect of publication type. Fourth, analyze the BoT study

sub-sector clusters. This research uses a bibliometric analysis approach to reveal the mapping of studies and research trends regarding BoT.

## Literature Review

### Build Operated Transfer (BOT) Scheme

The BoT scheme is a concept that has been around for a long time, but this scheme is believed to be able to bridge the interests of the government and the private sector in large-scale infrastructure development (Khan et al., 2008). The BoT scheme is used as an alternative to continuing large government-owned projects; the private sector is responsible for the design, financing, construction, operation, and maintenance of facilities on the basis of a concession agreement (Llanto, 2010). Since the 1980s, the BoT idea has been used in the development of power generation projects, the information technology sector, wastewater treatment, and highway construction. One of the countries that have used the BoT scheme is the United States, Europe, and countries in the Asian region (Wang et al., 2000; Khan et al., 2008). One of the large projects such as the construction of the Eurotunnel, the largest BoT project in 1988 until it became operational in 1994, from the project process presented problems of complexity and risk to stakeholders who were financially impacted by time and cost overruns (Li & Wearing, 2000). There is also a project with a BoT scheme that failed due to corruption in Thailand, namely a new airport project with an X-ray baggage scanner (Ahmad et al., 2018).

During the BoT concession period, investors can charge fees to users of development services and can also be responsible for managing facilities and investing capital as needed. Project development can be carried out by investors within any period in accordance with the stipulated contract. The longest collaboration projects have occurred in the construction of power plants for up to 10-20 years and toll roads for 20-30 years (Ahmad, 2014). Complex financial issues are a major obstacle for BoT schemes when compared with traditionally financed infrastructure projects (Auriol & Picard, 2013). Several elements, such as bankers, suppliers, contractors, and managers, can be involved in the BoT scheme. However, there are also potentially big problems that each of these elements will face, such as difficulties in making operational decisions and the emergence of moral problems due to each feeling that their incentives conflict with the interests of the project.

State-owned companies can strategically monopolize political power. The benefits of privatization include eliminating management from political interests due to political instability in the country (Mansour, 2008). Government officials in a country often have personal interests in the private sector. As a result, prioritizing personal interests can create competition between fellow state officials, giving rise to conflicts of interest. As a result, this can add to the complexity of problems during negotiations. The impact of political influence on a project can affect its overall success and can even prevent it from starting. Political problems are very common when development projects using the BoT scheme are first implemented.'

Risk issues are the most prominent issue in all types of contracts (Bobotek et al., 2010). Risk issues are sometimes not fully borne by private companies. Often, projects with a BoT scheme create large risks that are not borne by the private sector, so large risk problems are borne by the government (Marques & Berg, 2011). So good risk governance is very important in order to ensure systematic examination of risks in contracts (Jackson, 2002). As recommended by (Bagui and Ghosh, 2011), the main risks in BoT contracts are political risks and state regulations, force majeure, and physical, financial, and income losses.

## Method

This research uses qualitative analysis with a bibliometric analysis approach. The data used in this research is Scopus data. Scopus data is generally trusted among bibliometric researchers. Several stages were passed in the data collection process for this research. The first was a search process using keywords regarding Build Operated Transfer. This data produces 427 indexed research documents on BoT. Next, the document is exported to Vosviewer Software to be processed to produce visualization data and Cluster analysis table data. Apart from that, this research also utilizes Scopus data in the form of graphs and diagrams regarding Build-operated transfer research for further in-depth qualitative analysis. With a bibliometric analysis approach, it is hoped that it can provide insight into research maps and literature. Furthermore, the Bibliometrics approach that we use can show the involvement of research collaboration networks and institutions that contribute to BoT research.

## Result and Discussion

### The research theme is Build operated transfer

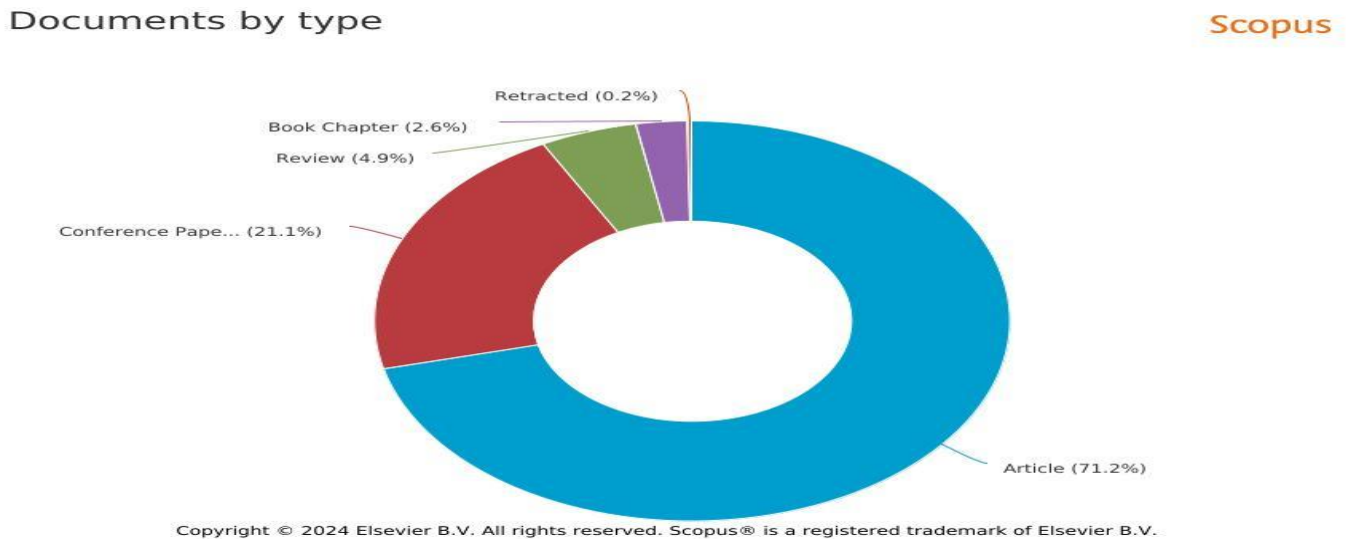
This paragraph discusses mapping research themes on BoT as a step in identifying and analyzing the diversity of topics and research focus related to the Build Operated Transfer scheme in government infrastructure development. By mapping this BoT topic, we can show the diversity of issues and opportunities presented by researchers in facing and overcoming future challenges regarding government collaboration with the private sector in supporting infrastructure development using the BoT scheme.



Several countries have researched the BoT scheme in developing government infrastructure in collaboration with the private sector. China is the country with the highest percentage of research on the BoT scheme, namely 110%. The United States is the country ranked second in contributing to research on BoT, with a percentage of 60%. Hong Kong ranks third with a percentage of 40%. Singapore is ranked fourth with a percentage of 30.60%. Taiwan is in fifth place with a percentage of 30.40%. The United Kingdom ranked sixth with a percentage of 20.50%. Turkey is ranked seventh with a percentage of 20.45%. India ranks eighth with a percentage of 20.20%. Australia ranks ninth with a percentage of 20.10%. Iran ranked last with a percentage of 10.80%. The Asian continent dominates a number of countries in tenth place. Apart from that, the data above also proves that research on BoT is of great interest to many countries from various continents.

**The Document By Type About Bot**

Research on BoT can also be seen in various types of publications. A number of types of publications are visible in Scopus documents, namely, Articles, Conference Papers, Reviews, Book Chapters, and retracters. The following is a graph of the types of publications contained in the BoT study;

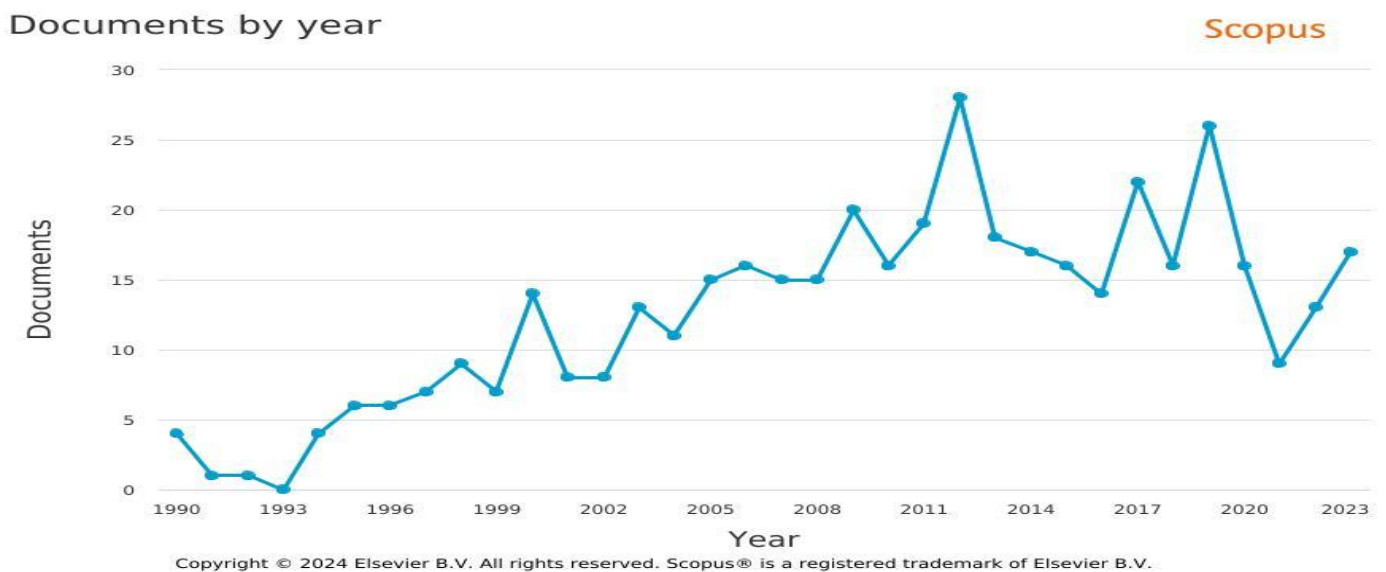


**Source: Database Scopus 2023**

The graph above shows that research on BoT is published in various types; Article Type is ranked first with a percentage of 71.2%. The Conference Paper type ranked second with a percentage of 21.1%. This type of review ranked third with a percentage of 4.9%. Book Chapter type ranked fourth with a percentage of 2.6%. The Rtracted type ranked last with a percentage of 0.2%. This type of article is the most in-demand by researchers, and this proves that the study of BoT is research that focuses on leading research results with high standards.

**BoT Sutdi Trends from year to year**

The development of research on BoT is also an important part to know. *The year* is an indicator that can be used to indicate increasing research interest in researching BoT. The following is annual trend data regarding research that focuses on BoT;



**Source: Database Scopus 2023**

Research on BoT began in 1990, proving that this study has long been of interest to social scientists. 1993 was a bad year for BoT research, with very low graphs. In 1996, the graph shows a significant increase in BoT research. 2011 was the high peak of research on BoT. However, until 2023, research on Bots will experience a decline in interest, but it is not too significant. It is still high compared to 1993. The trend based on that year can provide information on why research on BoTs is still very popular. Although it has decreased, it is not significant, and it can be predicted in the future. Increased.

**Cluster study area Build operated Transfer**

Clustering can be used as a measurement of study objects in BoT research. Below is a table presentation of the BoT research cluster;

No	Cluster	Item
1	Cluster 1	Bot Freeway Project
		Infrastructure Project
2	Cluster2	Bot Contract
		Bot Scheme
		Build Operate Transfer Contract
		Capital Structure
		Negotiation
	Cluster 3	Capacity
		Government Guarantee
		Subsidy
		Toll
		Transfer Road
	Claster 4	BOT Power Plant Project
		Competitive Tendering
		Infrastructure Development
		Private Participation
	Claster 5	Current Practice
		Legal Analysis
		Privatitation
	Claster 6	BoT Tender
		Concessionaire Selection
		Traffic Bot Project
	Cluster 7	Bot Power Project
		Public Private Partnership
	Claster 8	BoT Infrastruktur Project
		BoT Type Contract
		Precedent Relationship Problem
	Cluster 9	Public Private Patnership
		Critical Succes Factor
		Minimum Revenue Guarantee
	Cluster 10	Cost Benefit Analysis
	Clucter 11	Pareto Efficient Bot Contract
		Road Franchising

There are 11 clusters in the field of study with the theme Build Operated Transfer. The first cluster contains two areas of study, namely the Bot Freeway Project. The second cluster contains five areas of study, namely BoT Contract, BoT Scheme, Capital Structure, and Negotiations. The third cluster contains five areas of study, namely Capacity, Government Guarantee, Subsidy, Toll, and Transfer Road. The fourth cluster contains four areas of study, namely, BoT Power Plant Project, Competitive Tendering, Infrastructure development, and Private Participation. The fifth cluster contains three areas of study, namely Current Practice Legal Analysis Privatization. The sixth cluster has three study options, namely BoT Tender, Concessionaire Selection, and Traffic BoT Project. The seventh cluster contains two areas of study, namely, the BoT Power Project and Public Private Partnership. The eighth cluster contains three areas of study, namely, BoT Infrastruktur Project, BoT Type Contract, and Precedent Relationship Problem. The ninth cluster contains three areas of study, namely public-private partnership, Critical Success Factor, and Minimum Revenue

Guarantee. The tenth cluster contains one area of study, namely Cost Benefit Analysis. The eleventh cluster contains two areas of study, namely Pareto Efficient BoT Contract and Road Franchising.

## Conclusion

Research trends on BoT show that there are developing research trends that highlight multiple issues. From the results of research mapping with the BoT theme, several focuses were produced, namely, planning in the BoT scheme, BoT assessment, efficiency with the BoT scheme, and BoT contracts. Some of these findings prove that strategic planning will influence success in BoT cooperation, selective assessment will minimize the risk of contract failure, efficiency is the initial idea for entering into a contract with the BoT scheme, and contracts with the principle of commitment and consistency are needed in the BoT scheme. The Asian continent and China are the most dominant countries discussing the topic of the BoT Scheme, and in 2012, it was the highest peak for experts researching the BoT topic.

## References:

- Ahmad, E. (2014). Involving the private sector and PPPs in financing public investments.
- Ahmad, E., Bhattacharya, A., Vinella, A., & Xiao, K. (2018). Involving the private sector and PPPs in financing public investments: Some opportunities and challenges. *Fiscal Underpinnings for Sustainable Development in China: Rebalancing in Guangdong*, 123–159.
- Allport, R. J., & Ward, S. (2010). Operational risk: the focus for major infrastructure? *Proceedings of the Institution of Civil Engineers - Management, Procurement and Law*, 163(3), 121–127. <https://doi.org/10.1680/mpal.2010.163.3.121>
- Asheem, S., Toong-Khuan, C., A., A. A., Chuan, C., & Igor, M. (2017). Risks in PPP Water Projects in China: Perspective of Local Governments. *Journal of Construction Engineering and Management*, 143(7), 5017006. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0001313](https://doi.org/10.1061/(ASCE)CO.1943-7862.0001313)
- Auriol, E., & Picard, P. M. (2013). A theory of BOT concession contracts. *Journal of Economic Behavior & Organization*, 89, 187–209.
- Bagui, S. K., & Ghosh, A. (2011). Risk analysis for a BOT project. *Jordan Journal of Civil Engineering*, 5(3), 330–342.
- Bobotek, J. P., Pillsbury, W., & Shaw, P. (2010). *Construction risk management: Ten issues in construction contracts*. LexisNexis Legal Newsroom. LexisNexis Risk Solutions, Irvine, CA.
- Brower, G. J., Ehrhardt, D., Fan, M., Gu, L., Kim, Y., Xie, S., Asia, E., & Pacific, D. D. (2010). Stepping up: improving the performance of China's urban water utilities. *Disclosure*.
- Brueckner, M. (2021). Infrastructure and Economic Growth. In *Journal of Risk and Financial Management* (Vol. 14, Issue 11). <https://doi.org/10.3390/jrfm14110543>
- Doloi, H. (2012). Understanding impacts of time and cost related construction risks on operational performance of PPP projects. *International Journal of Strategic Property Management*, 16(3), 316–337.
- Jackson, S. (2002). Project cost overruns and risk management. *Proceedings of Association of Researchers in Construction Management 18th Annual ARCOM Conference, Newcastle, Northumber University, UK*, 1, 1–10.
- Jinbo, S., Yibo, H., & Zhuo, F. (2018). Factors Influencing Early Termination of PPP Projects in China. *Journal of Management in Engineering*, 34(1), 5017008. [https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000572](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000572)
- Khan, A. H., Jamil, M., & Sattar, M. (2008). The trend of build operate and transfer (BOT) projects in Pakistan. *Construction in Developing Countries*, 88.
- Li, C., & Wearing, B. (2000). The financing and financial results of Eurotunnel: Retrospect and prospect. Citeseer.
- Llanto, G. M. (2010). A review of build-operate-transfer for infrastructure development. (No Title).
- Mansour, A. M. E. (2008). The impact of privatization on United Arab Emirates federal public sector. *International Public Management Review*, 9(2), 66–89.
- Marques, R. C., & Berg, S. (2011). Risks, contracts, and private-sector participation in infrastructure. *Journal of Construction Engineering and Management*, 137(11), 925–932.
- Mok, K. Y., Shen, G. Q., & Yang, J. (2015). Stakeholder management studies in mega construction projects: A review and future directions. *International Journal of Project Management*, 33(2), 446–457.
- Pheko, M. M. (2013). Privatization of public enterprises in emerging economies: Organizational development (OD) perspectives. *International Journal of Business and Management*, 8(20), 25.
- Qiao, L., Wang, S. Q., Tiong, R. L. K., & Chan, T.-S. (2001). Framework for critical success factors of BOT projects in China. *The Journal of Structured Finance*, 7(1), 53–61.
- Šovran, S., & Hadžić, M. (2016). Forms of international movement of capital with special emphasis on the PPP and concessions. *Spatium*, 55–60.
- Sun, Y., & Cui, Y. (2018). Analyzing urban infrastructure economic benefit using an integrated approach. *Cities*, 79, 124–133. <https://doi.org/https://doi.org/10.1016/j.cities.2018.03.001>
- Tatahi, M. (2013). Enterprise performance, privatisation and the role of ownership in Bulgaria. *Economic and Environmental Studies*, 13(4 (28)), 387–413.

24. Wang, S. Q., Tiong, R. L. K., Ting, S. K., & Ashley, D. (2000). Evaluation and management of foreign exchange and revenue risks in China's BOT projects. *Construction Management and Economics*, 18(2), 197–207.
25. Yunhong, W., Woo, L. H., Wenzhe, T., Jan, W., & Maoshan, Q. (2021). Structural Equation Modeling for the Determinants of International Infrastructure Investment: Evidence from Chinese Contractors. *Journal of Management in Engineering*, 37(4), 4021033. [https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000933](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000933)
26. Zou, W., Kumaraswamy, M., Chung, J., & Wong, J. (2014). Identifying the critical success factors for relationship management in PPP projects. *International Journal of Project Management*, 32(2), 265–274.