Examining the impact of public-private partnership on transportation network development, focusing on bot contracts (case study: Iran rail and road transportation)

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ABSTRACT

Today transportation is considered as one of the important components of national economy and due to its infrastructure role, it has a great influence on economic growth process of the country. This section includes activities that are widely ongoing in all fields of production, distribution and consumption of goods and services, and plays an Undeniable role in economic activities. The purpose of this research is to study the impact of public-private partnership on Iran rail network (rail and road) development, focusing on BOT contracts. In this regard, descriptive and inferential methods were used for data analysis of the research. In the descriptive statistics section, data analysis is performed using central indices such as mean, median and standard deviation indices, standard error, and minimum and maximum scores. To test the hypotheses, correlation and regression test is used. SPSS software were used to conduct research tests. The results of the research showed that There is a meaningful relationship between public-private partnership policies (in terms of clear sharing of projects risks, projects financing, projects concession period, economic justification of projects, official bureaucracy and government support and motivation), and of rail and road transportation network development in Iran.

Keywords: Public-Private partnership, Rail and road transportation network, BOT Contracts

Introduction

Improving people's lives, in the framework of developing infrastructure projects process and providing more efficient services with higher quality, are among the most important factors in the economic growth and development of countries. One of the most important infrastructures of economic development is transportation network, and in particular, road and rail transportation infrastructure. Rail and road transportation network development is one of the governments duties, the high importance of these infrastructures in development process and its role in the growth of other sectors of the economy, in one hand, and an increase in the level of public service and upgrading social indices on the other hand, makes governments think appropriately to strengthen and develop these infrastructures. One possible way is direct entry of the government into investment in this field, but limited financial resources, long decision-making processes, and low efficiency of governmental projects put serious obstacles in the way of developing these infrastructures (Reynars et al., 2014)

Experiences from different countries indicate that factors like limited financial and budget resources of governments to finance large projects as well as the high demand for investment in these projects have made countries try to use active partnership of private sector and create an appropriate competitive environment for their activities. Many economists emphasize the importance of relationship between public sector and private sector in economies and state that delay in completing infrastructure projects is because of the lack of investment, and the poor quality of public services in developing countries due to

inappropriate policy or direct government intervention in the design, Construction, financing and support. In this regard, one of the mechanisms which could utilize capabilities of each of the public and private sectors according to their capacities is public-private partnership. The concept of private and public partnership, termed PPP, is referred to as investment projects, in which one of these subsets of central government (or local government) will finance and construct and operate of the project with the partnership of one or more private companies, and the income gained by launching project will be divided based on the partnership share of each partner (Heibati and Ahmadi, 1388).

In fact, to speed up and facilitate implementation road transportation network development projects and to benefit its role in development process, it is inevitable to design a model based on which private sector investment has a good economic return. It has particular importance in developing countries, and in particular in our country, due to its role in accelerating transportation infrastructure in development process. In Iran, significant shortage of transportation lines and networks, importance of establishing an international transportation network for benefiting the country's geographic advantages and importance of speeding up completing unfinished programs and shortening the life of projects, are among the reasons for adopting new methods to attract private sector investment in developing transportation infrastructure. Partnership of private sector and government in this area has been paid much attention in recent years with the aim of integrating considerations and utilizing the capabilities of each one; achieving a consequent of capabilities and considerations of both private and state sectors requires the achieving a good partnership model and addressing concerns of investors and financiers (Karimzadeh et al., 1390)

In Iran, partnership of state and private sectors in development of freeways is carried out within the framework of "Civil projects law for road and transportation sector through partnership of banks and other financial resources." This law was passed by the Islamic Consultative Assembly on Aban 24th , 1366, and was approved by the Guardian Council on Azar 9th , the same year.

Today governments try to be in the position of governance, meaning policy making, directing and supervising, and delegate ownership of various affairs to nongovernmental sector (Torkan and Shahbazi, 1389)

Using public-private partnership model is common in countries such as UK, Czech Republic, Poland, Hungary and Australia, and UK is leading in using this model, and this country is saturated with using this method. In Iran, one type of public-private partnership, BOT, has been used, and of course very little projects have been carried out using this method. According to what has been described, it is necessary to determine a framework of all types of public-private partnership contracts that are matched with Iran's native, cultural and economic conditions in transportation network (Heibati and Ahmadi, 1388)

In this research, we first introduce and overview different dimensions of public-private partnership. Then, obstacles and issues of government and private sector partnership in transportation network development are discussed. In the following, while examining partnership in the framework of BOT and BOO contracts, criteria for choosing the type of contracts are described. Then, based on the results of the hypotheses and using global experiences, government support and motivation methods, solutions and suggestions are presented.

In this regard, the presented research aims to identify the impact of public-private partnership on Iran rail and road transportation network development (Focusing on BOT contracts), so the main question of the research would be: What is the impact of public-private partnership with BOT approach on Iran rails and roads development?

Methodology

This descriptive research is correlation type and in terms of purpose and method and nature, is quantitative analysis based on causal relationships among variables, in which it examines the relationship between variables. Managers and experts of the Ministry of Roads and Urban Development and other executive agencies that are subset of the Ministry of Roads and Urban Development are included as the statistical community of this research. Considering the size of the population which is 960persons and the Cochran formula, 275 people were selected as the statistical sample.

A structured questionnaire of critical success factors (CSF) was used to collect data about success of public-private partnership in transportation projects. The Cronbach's alpha coefficient for the pre-research questionnaire was equal to 0.764, indicating desirable level of reliability for the questionnaire. Also, elite and expert interviews were conducted to investigate the obstacles and problems of private sector investment. For data analysis of the research, both descriptive and inferential methods were used. In descriptive statistics, data analysis was performed using central indices such as mean, median, and standard deviation indices, standard error, and minimum and maximum scores, and For testing hypotheses, correlation and regression tests were used.

Findings

In this section, Kolmogrov-Smirnov test is firstly used to test the normality of the indices. After this stage, factors affecting electronic customer relationship management of (to identify the status of each index from the respondents' point of view) are examined and ranked through Friedman test. Finally, the impact of relationships and its severity is examined using two correlation and linear regression tests.

Examining distribution of variables using Kolmogrov-Smirnov test:

According to Table 1, it can be stated that since the significance level of all indices is less than the standard, 0.05, these indices do not follow normal distribution.

Table 1: Examination of variables distribution status

Variables	Test Statistic Amount	Number	Significance Level
Transportation network development	2.076	275	0.000
Projects clear risk sharing	1.738	275	0.005
Projects financing	2.205	275	0.000
Projects concession period	1.579	275	0.014
Projects economic justification	2.035	275	0.001
Official bureaucracy	2.001	275	0.000
Government support and motivation	2.034	275	0.000

Due to non-normality of all indices, we examine the status of indices through a nonparametric test.

Examining the Status of Transportation Network Development Variable

Table 2: Examination of transportation network development variable

		Category	Number	Observed ratio	Test ratio	Significance level
Transportation network development	Group 1	<= 3	173	0.6	0.6	0.178
	Group 2	> 3	102	0.4		
	Total		275	1.0		

According to Table 2 and the significance level of the test, which is more than the standard, 0.05, it can be stated that the variable ratio is not significantly different from 0.6. So the status of the variable is evaluated as moderate.

Examining the Status of Projects Risk Sharing

Table 3: Examination of projects clear risk sharing index

		Category	Number	Observed ratio	Test ratio	Significance level
Projects clear risk sharing	Group 1	<= 3	166	0.6	0.6	0.477
	Group 2	> 3	109	0.4		
	Total		275	1.0		

According to Table 3 and significance level of the test, which is more than the standard, 0.05, it can be stated that the variable ratio is not significantly different from 0.6. So the status of the variable is evaluated as moderate.

Examining the Status of Projects Financing Index

Table 4: Examination of projects financing index

		Category	Number	Observed ratio	Test ratio	Significance level
Projects financing	Group 1	<= 3	156	0.6	0.6	0.148
	Group 2	> 3	119	0.4		
	Total		275	1/0		

According to Table 4 and the significance level of the test, which is more than the standard, 0.05, it can be stated that the variable ratio is not significantly different with 0.6. So the status of the variable is evaluated as moderate.

Examining the Status of Projects concession Period Index

Table 5: Examination of projects concession period index

		Category	Number	Observed ratio	Test ratio	Significance level
Projects concession period	Group 1	<= 3	201	0.7	0.6	0.000
	Group 2	> 3	74	0.3		
	Total		275	1.0		

According to Table 5 and the significance level of the test, which is less than the standard, 0.05, it can be stated that the variable ratio is significantly different from 0.6 and according to the ratio observed for the first group, which is more than the test ratio, the status of project points concession period is evaluated as weak.

Examining the status of projects economic justification index

Table 6: Examination of projects economic justification index

		Category	Number	Observed ratio	Test ratio	Significance level
Projects economic justification	Group 1	<= 3	165	0.6	0.6	0.526
	Group 2	> 3	110	0.4		
	Total		275	1.0		

According to Table 6 and the significance level of the test, which is more than the standard, 0.05, it can be stated that the variable ratio is not significantly different from 0.6. So the status of the variable is evaluated as moderate.

Examining relationships between research variables

Hypothesis 1. There is a meaningful relationship between public-private partnership policies in terms of projects clear risk sharing and rail and road transportation network development in Iran.

Table 7: Rail and road transportation network development in Iran

Variable 1	Variable 2	Correlation coefficient	Significance level
Projects clear risk sharing	transportation network development	0.555	0.000

According to the above table, the correlation between the two variables is 0.555 and since the significance level of the zero test is less than 0.05, then the zero assumption is rejected and there is a meaningful relationship between two examined variables. So we examine the relationship status using the regression test.

- **Regression of projects clear risk sharing index and transportation network development:**

Table 8: Regression of projects clear risk sharing index and transportation network development

T	Beta	Coefficient of determination	Significance level
11.029	0.555	0.308	0.000

The significance level of these two indices is less than 0.05; so there is a relationship between these two indices and the coefficient of determination is 0.308. As a result, projects clear risk sharing index, justifies 30.8% of variations of dependent variable which is transportation network development.

Hypothesis 2. There is a meaningful relationship between public-private partnership policies in terms of financing projects and rail and road transportation networks development in Iran.

Table 9: Regression of projects clear risk sharing index and transportation network development

Variable 1	Variable 2	Correlation coefficient	Significance level
Projects financing	transportation network development	0.430	0.000

According to the above table, the correlation between the two variables is 0.430 and since the significance level of the zero test is less than 0.05, then the zero assumption is rejected and there is a meaningful relationship between two examined variables. Positive correlation coefficient also means that there is a direct relationship between two variables.

- **Regression of project financing index and transportation network development**

Table 10: Regression of project financing index and transportation network development

T	Beta	Coefficient of determination	Significance level
7.868	0.430	0.185	0.000

The significance level of these two indices is less than 0.05; so there is a relationship between these two indices and the coefficient of determination is 0.185. As a result, project financing index justifies %18.5 of variations of the dependent variable which is transportation network development.

Hypothesis 3. There is a meaningful relationship between public-private partnership policies in terms of project concession period and rail and road transportation network development.

Table 11: Public-Private partnership policies in terms of projects concession period

Variable 1	Variable 2	Correlation coefficient	Significance level
projects concession period	transportation network development	0.430	0.000

According to the above table, the correlation between the two variables is 0.490, and since the significance level of the zero test is less than 0.05, then the zero assumption is rejected and there is a meaningful relationship between two examined variables. Regarding positive correlation coefficient, direct relationship between the two variables is concluded.

Table 12: Regression of project concession period and transportation network development

T	Beta	Coefficient of determination	Significance level
8.263	0.447	0.200	0.000

Significance level of these two indices is less than 0.05, so there is a relationship between these two indices and the coefficient of determination is 0.200. As a result, project concession period justifies %20 of variations of the dependent variable which is transportation network development.

Hypothesis 4. There is a significant relationship between public-private partnership policies in terms of projects economic justification and the rail and road transportation network development in Iran.

Table 13: Public-Private partnership policies in terms of projects economic justification

Variable 1	Variable 2	Correlation coefficient	Significance level
projects economic justification	transportation network development	0.366	0.000

According to the above table, the correlation between the two variables is 0.366, and since the significance level of the zero test is less than 0.05, then the zero assumption is rejected and there is a meaningful relationship between two examined variables. On the other hand, regarding positive correlation coefficient, it can be stated that the relationship between the two variables is direct, and increase in one results increase in another, and vice versa.

Table 14: Regression of project economic justification and transportation network development

T	Beta	Coefficient of determination	Significance level
6.490	0.366	0.134	0.000

The significance level of these two indices is less than 0.05; so there is a relationship between these two indices and the coefficient of determination is 0.134. As a result, projects economic justification index justifies %13.4 of variations of the dependent variable, which is transportation network development.

Hypothesis 5. There is a meaningful relationship between public-private partnership policies in terms of official bureaucracy and rail and road transportation network development in Iran.

Table 15: Public-Private partnership policies relationship in terms of official bureaucracy and transportation network development

Variable 1	Variable 2	Correlation coefficient	Significance level
Official bureaucracy	transportation network development	0.470	0.000

According to the above table, the correlation between the two variables is 0.470 and since the significance level of the zero test is less than 0.05, then the zero assumption is rejected and there is a meaningful relationship between two examined variables. Also, regarding positive coefficient of determination, it can be stated that the relationship between the two variables is direct and increase in one results increase in another and vice versa.

- **Regression of official bureaucracy index and transportation network development**

Table 16: Regression of official bureaucracy index and transportation network development

T	Beta	Coefficient of determination	Significance level
8.808	0.470	0.221	0.000

The significance level of these two indices is less than 0.05; so there is a relationship between these two indices and the coefficient of determination is 0.221. As a result, the official bureaucracy index justifies 22.1% of variations of the dependent variable, which is the transportation network development.

Hypothesis 6. There is a meaningful relationship between public-private partnership policies in terms of government support and motivation and rail and road transportation networks development in Iran.

Table 17: Public-Private partnership policies relationship in terms of government support and motivation and transportation network development

Variable 1	Variable 2	Correlation coefficient	Significance level
government support and motivation	transportation network development	0.634	0.000

According to the above table, correlation between the two variables is 0.634 and since the significance level of the zero test is less than 0.05, then the zero assumption is rejected and there is a meaningful relationship between two examined variables. Also, regarding positive coefficient of determination, it can be stated that relationship between the two variables is direct, and the increase in one results increase in another, and vice versa.

- **Regression of government support and motivation index and transportation network development**

Table 18: Regression of government support and motivation index and transportation network development

T	Beta	Coefficient of determination	Significance level
8.808	0.634	0.403	0.000

The significance level of these two indices is less than 0.05; so there is a relationship between these two indices and the coefficient of determination is 0.403. As a result, government support and motivation index justifies 40.3% of variations of the dependent variable which is transportation network development.

Discussion and Conclusion

The results show that there is a significant relationship between public-private partnership policies in terms of projects clear risk sharing and rail and road transportation network development in Iran. Regarding the correlation test results, the correlation of the two variables was 0.555 and since the significance level of the zero test was less than 0.05, then the zero assumption is rejected and there is a significant relationship between the two variables. Therefor, by using regression test, the relationship status was examined and results showed that the significance level of these two indices was less than 0.05. So there is a significant relationship between these two indices and the coefficient of determination is 0.308. As a result projects clear risk sharing justifies %30.8 of variations of the dependent variable which is transportation network development.

There is also a significant relationship between public-private partnership policies in terms of financing projects and rail and road transportation network development in Iran. According to the results of the correlation test, the correlation of the two variables was 0.430 and since the significance level of the zero test was less than 0.05, then the zero assumption is rejected and there is a significant relationship between the two variables. Therefore, by using regression test, the relationship status was examined. Results showed that the significance level of these two indices was less than 0.05. So there is a significant relationship between these two indices and the coefficient of determination is 0.185. As a result, the project financing index justifies %18.5 of variations of the dependent variable which is transportation network development.

A significant relationship was also observed between public-private partnership policies in terms of project concession period and rail and road transportation network development. According to the results of the correlation test, the correlation between the two variables was 0.490, and since the significance level of the zero test was less than 0.05, then the zero assumption was rejected and there is a significant relationship between the two variables. Therefore, by using regression test, the relationship status was examined. The results showed that the significance level of these two indices is less than 0.05. So there is a significant relationship between these two indices and the coefficient of determination is 0.200. As a result, project concession period justifies %20 of variations of the dependent variable which is transportation network development.

There was a significant relationship between public-private partnership policies in terms of projects economic justification and rail and road transportation network development in Iran. According to the correlation test results, the correlation between the two variables was 0.366 and as the significance level of zero test was less than 0.05, then the zero assumption is rejected and there is a significant relationship between the two variables. On the other hand, due to the positive correlation coefficient, it can be stated that the relationship between the two variables is direct, and the increase in one results increase in another and vice versa. Therefore, by using regression test, the relationship status was examined. Results showed that the significance level of these two indices is less than 0.05. So there is a significant relationship between these two indices and the coefficient of determination is 0.134. As a result, project economic justification index justifies %13.4 of variations of the dependent variable, which is transportation network development.

The results also showed that there is a significant relationship between public-private partnership policies in terms of official bureaucracy and rail and road transportation network development in Iran. Regarding the correlation test results, the correlation between two variables was 0.470 and since the significance level of the zero test was less than 0.05, then the zero assumption is rejected and there is a significant relationship between the two variables. Therefore, by using regression test, the relationship status was examined. Results showed that the significance level of these two indices was less than 0.05. So there is a significant relationship between these two indices and the coefficient of determination is 0.221. As a result, the official bureaucracy index justifies %22.1 of variations of the dependent variable, which is transportation network development.

A significant relationship was also observed between public-private partnership policies in terms of government support and motivation and rail and road transportation network development in Iran. Regarding the correlation test results, the correlation between the two variables was 0.634 and since the

significance level of the test was less than 0.05, then the zero assumption was rejected and there was a significant relationship between the two variables. Therefore, by using regression test, the relationship status was examined. Results showed that the significance level of these two indices was less than 0.05. So there is a significant relationship between these two indices and the coefficient of determination is 0.403. As a result, government support and motivational index justifies 40.3% of variations of the dependent variable which is transportation network development.

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