Evaluating the Efficiency of Finance Methods in Residential Complex Projects in Iraq

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Abstract-Financial funding of a construction firm plays an important role in all aspects of the process development. It has been noted that financial crises have a direct impact on the construction industry. The Iraqi government, whether locally or globally, has faced a severe shortage of financing which has resulted in incomplete projects. Due to the financial crisis that Iraq went through which led to the suspension of many residential complex projects and the difficulty of the use of public financing methods, we researched the private financing (public-private partnership) methods instead of public financing methods in residential complex projects implementation. This study verified the financial problems and the factors that relate to the possibility of their occurrence with the use of a questionnaire that was designed and distributed to professionals in the field. Arbitration of the questionnaire, pilot study, questionnaire distribution, and statistical tests were conducted. The T-test (paired samples T-test) was used to find out if there are differences between the public and private financing methods. The results showed that the private financing (public-private partnership) methods, under the current conditions in Iraq, are better than the public financing methods.

Keywords-finance methods; residential complex projects; paired samples t-test; Iraq

I. INTRODUCTION

Many previous studies have criticized the public financing methods. Their issues include the completion of the project on time, the completion within budget, delay in payment of contractor entitlements, clear roles and responsibilities for project participants, errors and inconsistencies in the contract document, etc. The concept of Public-Private Partnership (PPP) is relatively new to residential complex projects for the Iraqi government since the construction of residential complexes is the responsibility of the Iraqi government which uses public financing methods. Due to the high cost of residential complex projects in recent years, PPP schemes have become popular in the global construction market. By implementing them, governments are able to put projects on the right track without worrying themselves too much about raising funds [1]. PPP can be defined as the contractual agreements between a private party and a part (or all) of the government. Under this contract, the private party agrees to perform certain functions or activities which are considered a public responsibility.[2].

A PPP project includes many important contractual arrangements between the participants. It is a complex network of relationships that includes multiple parties and their formal relationships are defined by contracts. The basic rationale for establishing partnerships is that both public and private sectors have unique characteristics that provide them with advantages in specific aspects of the service or project delivery. The most successful partnership arrangements are built on the strengths of both sectors to establish complementary relationships [3]. The concept of PPP has been around for centuries in Europe and the United States while it has been a recent development in other parts of the world. PPP as a concept originated in the UK and its early development was primarily driven by the need for new investments and financing possibilities to provide and deliver public sector assets and services [4]. Common reasons for the discontinuation of projects are insufficient project preparation, inadequate funding, lack of administrative/legal procedures, inflation, variance in project scope, political factors, client's death, conflicts, and incompetence of the project manager. In addition, the lack of strong government control and monitoring management is a key factor contributing to the causes of discontinuation projects [5]. Table I represents a set of success and failure factors in the use of financing methods collected from previous studies.

II. QUESTIONNAIRE DESIGN

All necessary information was collected, reviewed, and formalized based on literature review, personal observations, and interviews with experts in the topic.

A. Part I (General Information)

This part contains general information about the participant (name, age, gender, ministry name, and sector of work), as well as classifications of educational qualifications, specializations, employment positions, and work experience.

B. Part II (Evaluating the Efficiency of Public Financing)

This section contains a list of 32 factors that can occur when using public funding related to project completion in time, cost, quality, quality of communication between project parties, experience and skill needs, government guarantee, and quality of service. Regulatory and legal framework, capital strength, project financing, ability of the contractor to deal with

a large number of projects at the same time, etc. It was constructed using the 5-point Likert scale (very high, high, medium, week, very week) design [18]. The respondents answered based on their experience.

TABLE I.   PROJECT SUCCESS AND FAILURE FACTORS

Most Important factors	Ref.
Competition and innovation Improved operation and maintenance quality The government is able to focus on core public sector responsibilities	[7]
Financial and capital strength Technical ability Personnel reserve Project management capacity Ability of communication	[10]
Favorable legal and political support Financial allocations are available Favorable social support Economic viability Reliable contractual arrangement Government guarantee and experience	[8]
Avoid claims and consequent disputes Avoid cost and time overruns Consider concurrent delays Project progress can be efficiently tracked throughout the project lifecycle	[6]
Appropriate concessionaire contracts and agreements Clear definition of project scope and documentation The roles and responsibilities are clear Accelerated permitting and approvals Appropriate risk distribution	[12]
Appropriate risk distribution and risk sharing Competition and innovation Commitment of public and private sector Thorough and realistic cost and benefit assessment Feasibility of technical project Good governance Favorable legal framework	[13]
On time financing Public organizations' cooperation Commitment Quality of team intercommunication	[15]
Public awareness and support Public safety A multidisciplinary and multinational team Quality control and supervision Financial market availability Appropriate project identification	[17]
Adequate funding throughout the project Multidisciplinary/competent project team Contractor's good combination of expertise of design and techniques of building Strong design of contractor and construction management capability Comprehensive contract documentation Contract form and contract period	[14]
Quality improvement Shorter project durations Reduction of long term projects	[16]
Shortest construction and concession period Most cost-effective and innovative solution Safest for construction Strongest financial commitment	[11]
Legal and economic framework can be developed. Political stability-opposed/support Right project can be selected Feasibility study Financial capability Compatibility/complimentary skills	[3]

C. Part III (Evaluating the Efficiency of Private Financing - PPP)

This part contains a list of 32 factors that can occur when using PPP related to completion of projects in cost, time, quality. Appropriate risk distribution and risk sharing, quality of communication between parties of project, skill needs and experience. A comprehensive cost-benefit assessment with good project cost, experienced management, skilled and multidisciplinary staff, speed in permits and approvals, project financing, ability of the contractor to deal with a large number of projects at the same time, etc. It also was created with the use of the pentatonic scale design [18].

III. QUESTIONNAIRE ARBITRATION

Questionnaire arbitration is a good approach for professionals to see if the questionnaire is measuring what they want to measure [19]. According to the arbitration, the questionnaire was submitted to a group of contracting experts in funding of residential complexes projects. The previously developed questionnaire was presented to them, their comments and recommendations were taken into account, and the amendments they mentioned were approved.

IV. PILOT STUDY

Before collecting the final data from the entire sampled population, a pilot study was conducted. The pilot study is a trail run for the questionnaire, which includes checking the wordings of questions, clarifying ambiguous questions, and evaluating the techniques that were utilized to collect the data [20]. The study's main purpose is to identify obstacles and concerns that are more ambiguous than others, allowing remedial actions to be taken and the testing process to be improved. The sample size of the pilot study should range from 30 to 50 respondents .The sample size of the current study was 40.

V. STATISTICAL VALIDITY OF THE PILOT STUDY

According to [21], validity refers to how well an instrument measures what it is designed to measure. Validity has many different aspects and methods of evaluation. There are two statistical tests that should be performed, namely internal validity and external validity (Figure 1). They are used to ensure the questionnaire's validity. The tests of statistical validity were conducted with the data obtained from the pilot study. The tests included in the statistical validity of the pilot study were conducted with IBM SPSS V.26.
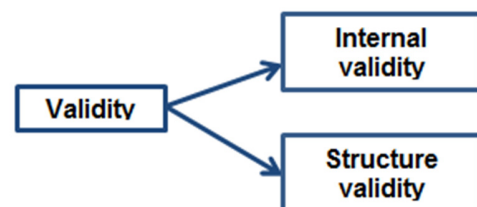

Fig. 1.   Statistical validity tests of the pilot study.

A. Internal Validity

The questionnaire's internal validity is the first statistical test used to determine its validity. It is done by computing the correlation coefficients between each item in one field and the entire field [22]. Table II shows the results.

TABLE II.   SPEARMAN'S RHO CORRELATION FOR EVALUATING THE EFFICIENCY OF PUBLIC FINANCE IN PILOT DATA

	Item	Correlation coefficient	Sig. (2-tailed)	Item	Correlation coefficient	Sig. (2-tailed)
Spearman's Rho	Pf 1	0.619**	0.000	Pf17	0.685**	0.000
	Pf 2	0.605**	0.000	Pf 18	0.705**	0.000
	Pf 3	0.624**	0.000	Pf 19	0.403**	0.000
	Pf 4	-0.159*	0.044	Pf 20	0.161*	0.042
	Pf 5	-0.175*	0.027	Pf 21	0.650**	0.000
	Pf 6	0.183*	0.021	Pf 22	0.649**	0.000
	Pf 7	0.301**	0.000	Pf 23	0.554**	0.000
	Pf 8	0.380**	0.000	Pf 24	0.665**	0.000
	Pf 9	0.411**	0.000	Pf 25	-0.469**	0.000
	Pf 10	0.567**	0.000	Pf 26	0.676**	0.000
	Pf 11	0.563**	0.000	Pf 27	-0.240**	0.002
	Pf 12	0.568**	0.000	Pf 28	0.613**	0.000
	Pf 13	0.643**	0.000	Pf 29	0.648**	0.000
	Pf 14	0.703**	0.000	Pf 30	0.544**	0.000
	Pf 15	0.508**	0.000	Pf 31	0.561**	0.000
	Pf 16	0.609**	0.000	Pf 32	0.634**	0.000

*Correlation is significant at the 0.05 level (2-tailed)
**Correlation is significant at the 0.01 level (2-tailed)

The correlation coefficients ranged from 0.159 to 0.705, and the P-values were all less than 0.05, indicating that all items are consistent and have the validity to measure what they were put up to measure. Table III shows the values of the Spearman correlation coefficient for the evaluation of the efficiency of private financing (PPP).

TABLE III.   SPEARMAN'S RHO CORRELATION FOR EVALUATING THE EFFICIENCY OF PPP IN PILOT DATA

	Item	Correlation coefficient	Sig. (2-tailed)	Item	Correlation coefficient	Sig. (2-tailed)
Spearman's Rho	PPf 1	0.744**	0.000	PPf 17	0.778**	0.000
	PPf 2	0.695**	0.000	PPf 18	0.729**	0.000
	PPf 3	0.741**	0.000	PPf 19	0.441**	0.000
	PPf 4	-0.289**	0.000	PPf 20	-0.198*	0.012
	PPf 5	-0.248**	0.002	PPf 21	0.698**	0.000
	PPf 6	0.292**	0.000	PPf 22	0.725**	0.000
	PPf 7	-0.165*	0.037	PPf 23	0.673**	0.000
	PPf 8	0.544**	0.000	PPf 24	0.765**	0.000
	PPf 9	0.565**	0.000	PPf 25	-0.441**	0.000
	PPf 10	0.748**	0.000	PPf 26	0.779**	0.000
	PPf 11	0.722**	0.000	PPf 27	-0.405**	0.000
	PPf 12	0.792**	0.000	PPf 28	0.705**	0.000
	PPf 13	0.763**	0.000	PPf 29	0.733**	0.000
	PPf 14	0.752**	0.000	PPf 30	0.570**	0.000
	PPf 15	0.669**	0.000	PPf 31	0.719**	0.000
	PPf 16	0.731**	0.000	PPf 32	0.675**	0.000

*Correlation is significant at the 0.05 level (2-tailed)
**Correlation is significant at the 0.01 level (2-tailed)

The correlation coefficients ranged from 0.165 to 0.792, and the P-values were all less than 0.05, indicating that all items are consistent and have the required validity

B. Structural Validity

The structural validity was calculated by computing the correlation between a particular part of the questionnaire and the questionnaire as a whole [22]. Table IV shows the correlation coefficient between each field and the other fields of the questionnaire.

TABLE IV.   SPEARMAN'S RHO CORRELATION COEFFICIENT BETWEEN THE QUESTIONNAIRE'S PARTS

	Part	Correlation coefficient	Sig. (2-tailed)
Spearman's Rho	Evaluating the efficiency of public finance	0.782**	0.000
	Evaluate the efficiency of PPP	0.881**	0.000

*Correlation is significant at the 0.05 level (2-tailed)
**Correlation is significant at the 0.01 level (2-tailed)

The correlation coefficients ranged from 0.782 to 0.881, and the P-values were all less than 0.05, indicating that all items are consistent and have the required validity.

VI. STATISTICAL RELIABILITY OF THE PILOT STUDY

A. Cronbach'sAlpha Model

One of the most widely used indicators of reliability analysis is Cronbach's alpha. The questionnaire's reliability was calculated using Cronbach's alpha coefficient for each field and for the whole questionnaire. Cronbach's alpha coefficient value lies between 0.0 and +1.0. A greater value indicates a higher degree of internal consistency [23]. Table V shows the classification for the degree of reliability according to the value of the Cronbach's alpha coefficient.

TABLE V.   RELIABILITY CUTOFF VALUES [21, 23]

Cronbach's alpha	Degree of reliability
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

The findings were found to be within acceptable limits. This result verifies the questionnaire's dependability. The Cronbach's alpha values are shown in Table VI.

TABLE VI.   VALUES OF CRONBACH'S ALPHA

Part	Value of α	Reliability
Evaluating the efficiency of public finance	0.885	Good
Evaluate the efficiency of PPP	0.908	Excellent

VII. QUESTIONNAIRE DATA ANALYSIS

The questionnaire data were analyzed using a series of quantitative statistical techniques to obtain a thorough view of the opinions received from the Iraqi experience regarding to the subject of financing residential complexes. These statistical techniques will be explained below. Descriptive statistics is a statistical tool for summarizing, organizing, and simplifying data. The following descriptive statistics were used.

A. Central Tendency Measurement

A measure of central tendency (also known as a central location measure) is a summary measure that aims to describe a whole set of data with a single value that denotes the middle or center of its distribution.

B. T-Test (Paired Samples T-test)

Once the subjects being tested are the same, a paired samples t-test is performed because the two mean scores cannot be independent of each other [24-26]. In testing these samples, we analyzed the data by using the SPSS 26.0's paired samples T-test.

The hypotheses can be expressed in two forms that are mathematically comparable and express the same idea.

(H_0: $\mu_1 = \mu_2$) means that the paired populations are equal.

(H_1: $\mu_1 \neq \mu_2$) means that the paired population are not equal.

Or:

(H_0: $\mu_1 - \mu_2 = 0$) means that the difference between the paired population is equal to zero.

(H_1: $\mu_1 - \mu_2 \neq 0$) means that the difference between the paired populations is not zero.

where μ_1 is the mean of the population of variable 1, and μ_2 is the mean of the population of variable 2.

The data were processed with the SPSS 26.0. The result of the paired samples T-test can be seen in Table VII.

TABLE VII.   RESULT FROM THE PAIRED SAMPLES T-TEST

Paired sample statistics				
	Mean	**N**	**Std. deviation**	**Std. error mean**
Pair 1 — Private financing	101.03	160	15.773	1.247
Pair 1 — Public financing	95.01	160	13.539	1.070

Paired Samples Test		**Mean**	**Std. deviation**	**Std. error mean**	**Lower**	**Upper**	**t**	**df**	**Sig. 2-tailed**
Pair 1	Private financing – public financing	6.025	14.201	1.123	3.808	8.242	5.367	159	0.000

The hypothesis states that the effectiveness of the first method is equal to that of the second. Since the average effectiveness of the second method is higher than the first method's, the second method is considered better.

VIII. CONCLUSION

In this study, the factors that evaluate the efficiency of public and private financing were collected from previous studies and an open questionnaire survey. The study population was relevant to the subject and the questionnaire was designed and arbitrated by experts. Statistical methods were used in data analysis such as descriptive statistics and T-test. Since the average effectiveness of the second method is higher compared to the first method, the second method is considered better. We can conclude that PPP methods are more efficient than public financing methods regarding the construction of residential complex projects in Iraq.

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