

Identification of the Relationship between Pre-project Planning and Project Success Criteria in Civil Section of Iranian Offshore Oil & Gas projects

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Abstract. Iranian offshore oil and gas building projects suffer significantly from inappropriate pre-project planning (PPP) activities throughout their project life cycle. The main purpose of this research is to find out the effects of pre-project planning (i.e. all activities that should be undertaken before the project execution) on the project success in Offshore Oil and Gas Projects. Typically the project success is measured by three critical criteria: extent of project cost overrun, extent of project schedule slippage and extent of project scope changes.

This research is a quantitative research and data gathering is undertaken by focused discussions and interviews with project managers according to PDRI building score sheets. Regression analysis is the most significant statistical method used for analysis of the relationship between those two variables (success criteria as dependent variable and PDRI total score as independent variable). Research shows that there is a positive, strong and statistically significant linear correlation between each of the main pre-project planning factors and the project success criteria for the building projects of Iranian offshore oil company.

Keywords: Pre-project Planning, Project Success, Regression Analysis Model

1. Introduction

Iranian offshore oil company (IOOC) is one of the subsidiaries of National Iranian Oil Company (NIOC) that is responsible for exploration, development, production and transmission of oil, gas and other upstream by-products in the offshore areas of Iran. One of the most important problems of project execution is that these projects are not completed on time and within budget, leading to huge amount of cost overrun and time slippage that cannot be easily compensated and justified. This research intends to study the relationship between the building projects performance that is defined by three independent indicators and the extent of pre-project planning activities undertaken in these projects to identify the improvement areas and finally develop improvement recommendations.

2. Literature Review

Pre-project planning that sometimes called front-end loading include all of the activities that are undertaken before the project sanction or appropriation for expenditure. In the other word pre-project planning is a process to provide enough information that will help the project owner to address the project risks and undertake the project in a way that minimizes the probability of failure (The construction industry institute 1999)[1]. Pre-project planning is a terminology that is called differently in different literatures. It is called inception and feasibility by Hughes (1991) [2], Othman et al. (2004) [3], Al-Reshaid et al. (2005) [4], pre project stage by Kagioglou et al. (1998) [5], pre-design stages by Best and Valence (1999) [6], project initiation stage by smith and Jackson (2000) [7] and pre-project planning by Gibson et al. (2006) [8].

Project definition rating index (PDRI) is a tool developed by construction industry institute (CII) and employed to assess the extent to which the project scope definition is undertaken completely. There are two version of PDRI; one is applicable in industrial projects and the other in building industries (Chung-Suk and Gibson 2001) [9].

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It is noticeable that success criteria vary from one project to another. It is completely related to the nature of the projects, industry and also can be different from different stakeholders' point of view. Therefore, it is not possible to provide a universal cluster of project success criteria that cover the projects as a whole. (Lim et al.1999)[10].

Table 1 indicates some project success criteria from different literatures:

TABLE 1: Project success criteria

Result areas “Project Excellence Model”	Wateridge (1998)	Kerzner (1992)	Lim et al (1999)	Turner (1997)
1- Project results Time Cost Quality/scope 2-Appreciation client 3-Appreciation project personnel 4-Appreciation users 5-Appreciation contracting partners 6-Appreciation stakeholders	Produced to specification Project achieve: Its objective Meet quality Be profitable Team satisfaction Users satisfaction Profitable for contractors Stakeholder satisfaction	Immature: On time Within budget According to spec. Mature: Min. scope change Without changing the corporate culture Does not disturb the client processes	Short term success: On time Within budget According to spec Team satisfaction Profitable for contractors Long term success: Alignment with business concept	On time Within budget According to spec Owner satisfaction Achieve its purpose and objectives Teams, users, stakeholders and sponsors satisfaction

Construction Industry Institute (CII) researches showed that there is a cut-off point for PDRI score that distinguishes successful projects from unsuccessful ones. PDRI score of 200 or in the other words 20% of the applicable scores will be a target level. The summary of cost, schedule and change order indicators for the projects that get PDRI score lower than 200 and more than 200 are indicated in the Table 2.

TABLE 2: PDRI score ranges and project performance

Performance	<200	>200	Difference
Cost	1% above budget	6% above budget	5%
Schedule	2% behind schedule	12% behind schedule	10%
Change order	7%of budget	10% of budget	3%

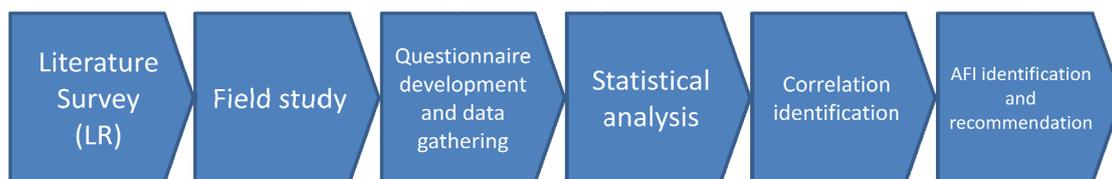
Although there are lots of researches regarding the relationship between pre-project planning and project success but these researches do not concentrate on a specific type of project and consider for instance a general portfolio of building projects in different industries.

Also, as far as offshore oil & gas building projects of Iran is considered, there are not enough evidences that show that the similar researches are undertaken in this field.

3. Research Methodology

Following is the steps that should be undertaken to do the research (Figure 1).

Fig. 1. Steps undertaken to do the research



Information gathering instrument is a questionnaire that is designed according to un-weighted PDRI score sheets to gain after the fact information from the 20 completed projects. The questionnaires are distributed between project managers.

In order to get information regarding the project success criteria as it is mentioned in the research methodology; three indicators is used and supplemented to the questionnaire. Project success criteria are percentage of change in the project actual cost in relation to the budget, percentage of change in the project duration against the project baseline schedule and percentage of change in the project scope during project execution. These three criteria are used to determine whether there was a successful project or not.

3.1. Statistical Analysis and the Results

3.1.1. Analyzing the Relationship between Dependent and Independent Variables

As it is mentioned in the methodology section of the research, PDRI score is considered as independent variable that can be broken down into three sub-categories as follows:

- Basis of project decision
- Basis of design
- Execution approach

And the project success criteria are considered as dependent variables.

It is intended to test the relationship between each of independent variables and the project success one by one and then testing the simultaneous influence of all independent variables on each dependent variable.

Regression analysis is employed to find out the relationship (positive or negative), its strength by correlation coefficient (R) and the extent to which future outcomes can be predicted by the model by coefficient of determination (R^2).

Also analysis of variance (ANOVA) is used to find out the statistical significance and testing the hypothesis by F-test.

The F-test is applied to assess the hypothesis whether a proposed regression model fits the data well.

3.1.2. Summary of the Statistical Analysis Results are as follows

- Statistical analysis showed that the questionnaire and the responses are valid and reliable
- There is a positive and strong correlation between each of the main PPP factors and the project success criteria for the building projects of Iranian offshore oil company
- The linear relationship is statistically significant and the linear regression model has fitted the data appropriately
- “project execution approach” indicated the maximum correlation to each project success criteria
- There is a positive and strong correlation between the PDRI score and project success criteria for the building projects of Iranian offshore oil company
- The linear relationship is statistically significant (between PDRI score and the project success criteria) and the linear regression model has fitted the data appropriately.
- “Project execution approach” is the only factor that its effect on the project success is significant when all of the PPP factors simultaneously influence the project performance.

3.2. Areas for Improvement Identification and Recommendations

Based on the results of the research, improving the pre-project planning processes of an offshore building project in IOOC will lead to improve the project performance. Therefore it is required to find out the main weaknesses in PPP to be enhanced and improved.

The first step is identification the weakest areas (sections) of PPP and then the weakest categories should be determined.

Second step is recommendation provision to enhance the shortcomings.

Table 2 indicates that section 3 (project execution approach) is the weakest section with 54.24% of the total score (159) on average. Also this section is the most correlated area with significant influence on the project performance. Therefore more emphasis of improvement should be on this section of the PPP to get more advantage in project success.

TABLE 2: Ranking of independent variables (PDRI sections)

	Sec#1(basis of project decisions)	Sec#2(basis of design)	Sec#3(execution approach)
Average score of the sample projects	193.25	208.75	86.25
Percentage of weakness	$193.25/413=46.79\%$	$208.75/428=48.77\%$	$86.25/159=54.24\%$
Rank	3	2	1

Categories K, H, L, B, D and J are the ones that got more than 50% of the total score available for that category. It means that, these categories are the weakest ones that require improvement.

It is interesting that four categories out of six are related to the project execution approach section of the pre-project planning which should be focused upon precisely.

3.3.1. Recommendations for improvement

Recommendations are provided based on the issues that are identified as the critical success factors (CSFs) of the pre-project planning. Categories of K and L and their related sub-elements are the CSFs of the pre-project planning processes of building offshore projects. Summary of recommendations regarding K&L sections are provided below:

- **K: project control**

- **K1: project quality assurance and control**

- 1- To establish a centralized QC function in the formal organizational structure of IOOC in order to provide QC policies, procedures and instructions to be applied on all of the projects and facilitate the strategic co-ordination between QC department of each project.
- 2- Including quality control and inspection duties within the job description of construction management in the contractual terms and conditions.

- **K2: project cost control**

- 1- To employ project cost accounting system based on the up-to-date standards (such as SSAP9 or other structured standards) and provide enough support and commitment for its implementation.
- 2- To establish “earned value management system” as one of the cost performance evaluation and variance analysis systems that also help for future project cost estimation.
- 3- Provide a structured and flexible cost reporting system to provide interim-based and ad-hoc project cost reports.
- 4- Separating project cost control function from the financial directorate of the company that is more engaged with the financial accounting rather than project cost accounting issues.

- **K4: risk management**

Following are some of the recommendations to enhance the mentioned shortcomings:

- 1- Employ a management consultant firm to establish a structured procedure for project risk management. This issue should be defined as a project with close participation of all project managers.
- 2- To establish a project risk management function within the formal structure of the company to make relevant policies and strategies that provide co-ordination and consistency between all of the IOOC’s projects in this regards.

- **K5: safety procedures**

- 1- To provide company-wide buy-in toward HSE
- 2- Effective rewarding and coercive actions should be established to encourage the HSE culture and compliance with HSE policies.
- 3- To invest further in safety equipment in projects.

- **L: project execution plan**

- **L2: owner approval requirements**

In this regard there is a comprehensive document provided to specify the approvals that are required by the owner, its time period and deadlines of approvals.

This document is executing and implementing properly and no major improvement required in this regard.

4. Conclusion

The results of the statistical analysis by the use of linear regression analysis model showed that three pre-project planning variables that are “basis of project decision”, “basis of project design” and “project execution approach” all influence the three project success criteria positively and strongly with a linear relationship. The correlation coefficients are more than 80% with coefficient of determination more than 70%.

More areas for improvement are regarding the section of “project execution approach” and elements of “project control”, “procurement strategy”, “project execution plan” and “owner philosophies” are the four weakest elements of the pre-project planning (PPP) efforts for building projects.

Now they are aware of the four weakest areas of PPP efforts and know that any improvement of these factors will influence the project success strongly.

It is recommended for future researches to consider different project success criteria for different projects, or the weighted success criteria could be used to evaluate different project performance.

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