



The Necessity of Management Team Formation and Its Effect on Civil Engineering Projects Success

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Abstract

Success of a project is one of the greatest and most important goals and concerns of managers and all people involved in a project. The purpose of state civil engineering projects success is to decrease cost and time as well as increasing the quality and satisfaction of society and government as the main customers. Many factors influence civil engineering projects success and identifying them highly help the successful implementation of civil engineering projects. As one of the most important factor, it can be referred to project management team. The main purpose of the present study is to find the effective relation between management team formation and civil engineering projects success. To this end, library and field methods have been used. To gather required data, a 15-item questionnaire has been employed and distributed among 30 managers of successful state projects, including employer, consultant and contractor. The obtained data has been analyzed using descriptive method. As the findings revealed, weakness of managerial factors avoids complete success of state civil engineering projects implementation. The study also has concluded that team formation is highly important to organize project; management team enabling is regarded necessary for organizational projects success, and work relation of team members plays an important role in project management success.

Keywords: Management Team; Management Team Formation; Success of Civil Engineering Projects; Ranking.

1. Introduction

Civil engineering projects are regarded as economic pulse of societies. Relying on these projects' credit, state investments are actualized and investments in private sector cause economic growth. Activities related to civil engineering projects of the country has been mainly followed after the formation of social-economic development plans and has been supplied by public incomes pertained to the government's budget. Therefore, the success of the mentioned plans is changed into an outstanding criterion to assess and judge governments' performance and it is regarded as a reflection of efficiency and effectiveness of management methods in Iran [1].

During the last 40 years, the concept of success in project has been gradually evolved. Most of studies on success have focused on two dimensions: a) evaluating projects success and success evaluation criteria; for example, with the golden triangle criteria including cost, time and quality and b) factors influencing success or key success factors including factors which can lead to the increase of successful results of project by resorting to them [2].

Investigating factors of state civil engineering projects success, managers' incompetency and inefficiency can be introduced as one of the critical barriers of civil engineering projects success that can influence other effective factors and cause social dissatisfaction in society.

In the present paper, defining management team and the necessity of its formation in projects, its relation with civil engineering projects success is investigated using the results obtained from the analyzed data.

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2. Management Factors (Beneficiaries)

A beneficiary in an organization is a person or group that can influence or accept organizational objectives success. The main factors of project include employer, consultant and contractor. According to the definition, beneficiary is a group or organization that can influence attitudes, resources of outputs of organization or is influenced by organization's outputs. One of the important duties of project manager is to interact with beneficiaries to achieve project objectives, leading to project success [3].

3. Teams and Dynamism

Project manager should be able to create coalition among key individuals involved in project, including manger, customers, construction team members, and suppliers. To precede project objectives, manger should make smartly use of bargaining ability. A team is a group of people that work together to achieve a set of common goals. Traditionally, team has a leader and a number of members that work on a considered se. in today institutes, teams include groups with the shared goals. They usually have no official leader; leaders may be members who do not work near each other and may change their membership frequently. Today, team work has changed into a philosophy of working together, moving towards a goal [4].

Team may be all work forces in an organization. A wider organization, on the other hand, may have many types of team in place to fulfill various activities. In desirable conditions, teams are configured and reconfigured to be appropriate for change conditions. For example, solving teams problem often include a selective group of specialists who precede a certain result through an official or non-official leader. On the contrary, unprincipled and irregular team works has no leader and team power and role is divided [5].

Modern successful teams may be often represented as a system. Since open systems allows exchanging resources with products, they actually can promote and change both and opinions and duties are appeared in their relation. Ivi believes that teams' dynamicity refers to invisible forces working among various people or groups. Teams' dynamicity can play a significant role in teams' reaction. Teams' dynamism has very complex effects. Team's dynamism can be identified by searching for powerful forces of team. These forces may include characteristic methods, team role, tools and technology, organizational culture, and flows and techniques [6].

4. Barriers and Problems of Civil Engineering Projects

There are many barriers to successfully implement civil engineering projects. Managerial problem is the most important barrier in this regard. Macro civil engineering projects framework is defined in the form a set of technical and executive operations that require people with special skill and competency and demands certain harmony. Generally, a group and team activity requires capable management. Mainly, civil engineering projects contractors pay attention to physical fulfillment and equipment. Consultants control technical properties and standards of project. Employers mainly consider financial resources and control project progress.

Table 1. The proportion of various factors in national civil engineering projects delay [7]

| Factors | Proportion (%) | Factors | Proportion (%) |
|------------------------|----------------|---------------------------|----------------|
| Land | 8.3 | Contractor | 7.6 |
| Study | 1.4 | Equipment and machineries | 3.1 |
| Executive organization | 12.5 | Credit | 43.7 |
| Project consultant | 3.8 | Others | 6.15 |
| Project supervisor | 1.3 | - | - |

The role of management to organize and guide each set of contractor, consultant and employer is clear for all individuals involved in civil engineering projects. In his/her set, contractor requires a capable executive manager with management knowledge; consultant need a technical manager with a good knowledge of modern science, and employer needs a project manager with a good knowledge of project management. Unfortunately, in no civil engineering projects workshops, a specialized manger is not seen in contractor and consultant set. In general, civil engineering projects are handled traditionally [1].

The weakness of executive manager of state organizations and lack of balance between ongoing works and executive capacities (shown in Table 1) is the second factor in projects delay. It is a fact that is stipulated in various reports of planning and management organization [8].

As reported by planning and strategic supervision deputy of the president, the average credit allocation from public resources place for national civil engineering projects was above 70.2 such that 95.9% of it was spent. In 2011, about 59.5% of 1-year predicted goals of executive organizations regarding national projects were actualized. In this year, out of 4986 national visited projects, 23% has been finished; 71.1% is under implementation; 2.7% has been stopped,

and 3.2% has not been yet started. Regarding the level of physical progress in the national civil engineering projects visited in 2011, it can be stated that 29% of the have progressed with the financial weight of 19.3% according to the determined schedule; 95% of the projects with the financial weight of 15.6% averagely is ahead of the schedule as much 17.6% and the rest 61.5% constituting 65.1% of total financial weight, on average, is behind the schedule as much 19.9% [9].

One of the important causes of civil engineering projects delay is credit problems, lack of specialist, weak payment, and disability in absorbing credits. Meanwhile, credit problems have had a proportion of 62.9%. In 2001, 1460 projects were added to the national civil engineering projects. Practically, out of 2507 visited national projects, 1142 projected have been finished [10].

Among provinces, Azarbayjan Sharghi, Alborz and Ghazvin have obtained the highest success in the national projects, respectively. Industries and Mines Ministries, agricultural Jihad and sport and youth ministry have been outreached compared to other organizations.

5. Methodology

The present study used library and field methods to gather required data. The research was also a non-experimental, descriptive and survey study using correlation method. The research was conducted during the following stages:

1. Library studies (reviewing related literature)
2. Library studies (identifying and listing main and secondary variables)
3. Primary field studies (extracting qualitative indices)
4. Analyzing obtained data
5. Identifying and listing the final variables related with identifying weaknesses and strengths as well as threats and opportunities
6. The final field studies
7. Analyzing the obtained data
8. Concluding and presenting recommendations and strategies
9. Composing the material

This project has been performed among state projects; therefore, the obtained results should be cautiously generalized (e.g. for private companies).

The research instrument has been mostly questionnaire. Other methods like interview and observation have not been used.

6. Data Collection Instrument

Questionnaire was the most important instrument used in the study to obtain the required data. Also a semi-structured interview was employed to gain more detailed information. Also, the sample was asked to provide some confidential data in the questionnaires. Notably, each of the 30 respondents included governmental and semi-governmental managers and employers and their consensus comments were considered. The employed questionnaire included 15 items evaluating type of activity, education and work experience. The 15 items were organized in two sections; 7 items related to project success and 8 items related to the necessity of management team formation.

7. Data Analysis

After collecting required data using the questionnaire, the data was coded and entered into SPSS Software. Then, classifying them, descriptive statistics were computed and finally, appropriate tests were run to test the research hypotheses. To analyze the collected general data and demographic data (age, education and work experience), Excel Software was used. To analyze the research questions, various inferential statistics (cronbach's alpha to determine the questionnaire reliability; K-S test to determine dependent variables' normality; single sample t-test to test the hypothesis) were also used. The reliability of the research questionnaire was computed 0.88.

7.1. Significance Test

To select the type of statistical statistic of the research hypotheses, data normality was firstly tested. Using K-S test, it was observed that the questionnaire scores in all the components are normal. Therefore, parametric tests can be used to test them.

7.2. The Diagram of the Normal Data Distribution

The obtained data was analyzed using descriptive and inferential statistics. Given to the data normality test results, it was found that the data distribution (project success and the necessity of team management formation) is normal since the p-value of the entire the questionnaire is greater than 0.5 (Figures 1 and 2). Therefore, to prove the research hypotheses, parametric tests such as single sample t-test can be used.

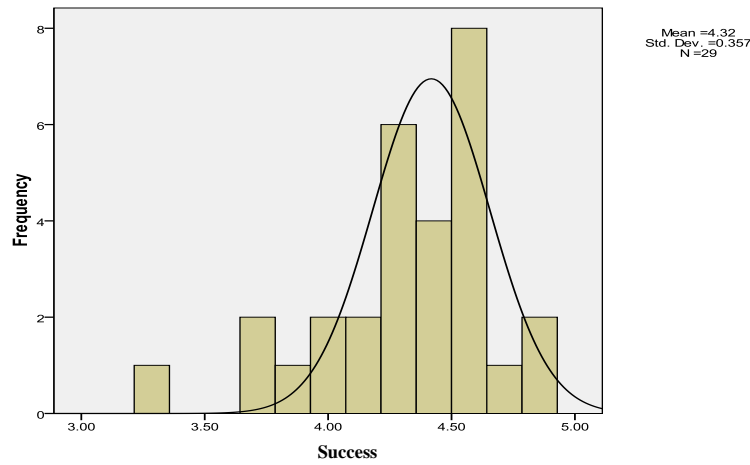


Figure 1. Normal distribution of project success

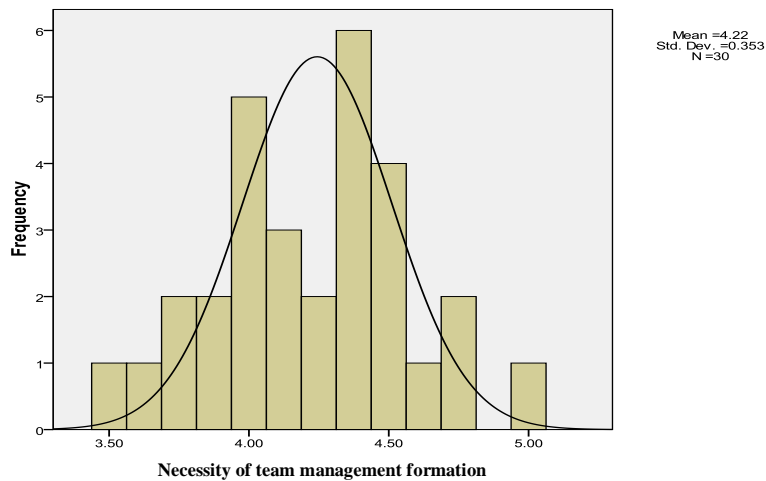


Figure 2. Normal distribution of the necessity of team management formation

7.3. Data Description

To better recognize the nature of the studied society and recognizing the research variables, before analyzing data, the data should be described. In the following, a complete description of the sample including dispersion indices (standard deviation and variance) and central tendency indices (mean and median) is provided.

Table 2. Descriptive characteristics of the research variables

| Variable | Mean | Median | Standard deviation | Variance |
|---------------------------------|--------|--------|--------------------|----------|
| Project success | 4.3202 | 4.3744 | 0.35124 | 0.123 |
| The necessity of team formation | 4.2208 | 4.2500 | 0.35307 | 0.125 |

7.4. Investigating the Sample’s Demographic Variables

Figure 3 shows the frequency of the respondents’ educational degree.

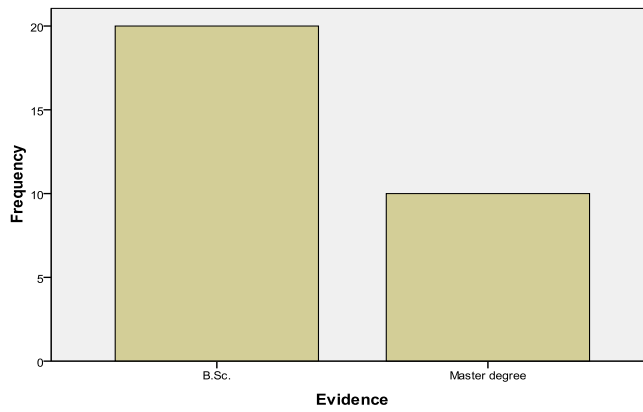


Figure 3. Descriptive characteristics of the research variables

As shown in Figure 3, about 67% of the respondents have BA degree and 33% of them have MA degree.

7.5. Investigating the sample’s demographic organizational unit variable

Table 3 presents the frequency of the respondents’ organizational unit variable.

Table 3. Investigating demographic organizational unit variable

| Education | Percentage | Frequency |
|------------|------------|-----------|
| Employer | 23.3 | 7 |
| Consultant | 16.7 | 5 |
| Contractor | 60.0 | 18 |
| Total | 100.0 | 30 |

As shown in Table 3, 33% of the respondents are employer, about 17% is consultant and 60% is contractor.

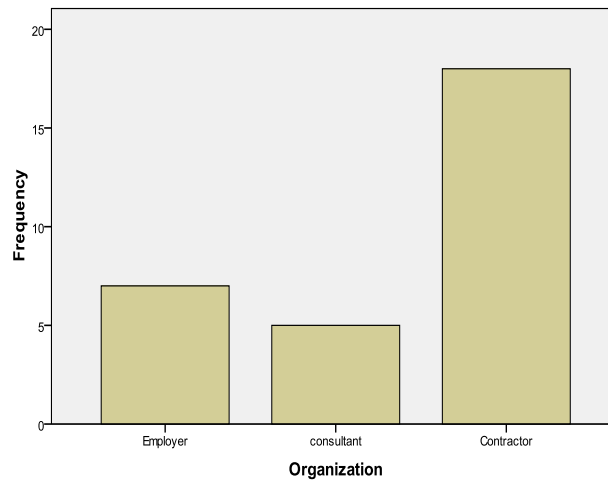


Figure 4. Descriptive characteristics of the research variables

7.6. Investigating the sample’s demographic work experience variable

Table 4 presents the frequency of the respondents’ work experience.

Table 4. Investigating demographic work experience variable

| Education | Percentage | Frequency |
|---------------|------------|-----------|
| Below 5 years | 6.7 | 2 |
| 5-15 years | 36.7 | 11 |
| 15-25 years | 33.3 | 10 |
| 25-30 years | 23.3 | 7 |
| Total | 100.0 | 30 |

Shown in Table 4, about 7% of the respondents have a work experience of below 5 years. About 37% has a work experience of 5 to 15, about 33% has a work experience between 15 to 25 years, and about 23% has a work experience of 25 to 30.

7.7. Inferential Statistics

The data obtained from the questionnaire are analyzed using inferential statistics. The final goal of statistical analyses is to reject or confirm the research hypotheses. Since the employed questionnaire is Likert scale and the mean of each group is compared with the other group, single sample t-test is used.

7.7.1. The First Hypothesis

The purpose of the state civil engineering projects success is to decrease cost and time and increase the quality as well as the society and government’s satisfaction as the main customers. To test this hypothesis, single sample t-test is used. The alternative and null hypotheses are as following:

H₀: The purpose of the state civil engineering projects success is not to decrease cost and time and increase the quality as well as the society and government’s satisfaction as the main customers.

H₁: The purpose of the state civil engineering projects success is to decrease cost and time and increase the quality as well as the society and government’s satisfaction as the main customers.

Table 5 presents the descriptive characteristics of the research variable.

Table 5. The descriptive characteristics of the research variable

| Civil engineering projects success | Standard deviation | Mean | N |
|------------------------------------|--------------------|--------|----|
| | 0.35124 | 4.3202 | 30 |

Table 6 presents single sample t-test to compare the mean of the sample group.

Table 6. Single sample t-test to compare means

| Civil engineering projects success | Confidence level of 95% | | Mean difference | Sig. | Degree of freedom | t |
|------------------------------------|-------------------------|-----------|-----------------|-------|-------------------|--------|
| | High limit | Low limit | | | | |
| | 1.4514 | 1.1890 | 1.32020 | 0.000 | 29 | 20.587 |

According to Table 6, since the obtained p-value (0.000) is less than 0.05, the null hypothesis is rejected, indicating that the purpose of the state civil engineering projects success is to decrease cost and time and increase the quality as well as the society and government’s satisfaction as the main customers.

7.7.2. The Second Hypothesis

Weakness of managerial factors hinders successful state civil engineering projects implementation. To test this hypothesis, single sample t-test is used. The alternative and null hypotheses are as following:

H₀: Weakness of managerial factors does not hinder successful state civil engineering projects implementation.

H₁: Weakness of managerial factors hinders successful state civil engineering projects implementation.

Table 7 presents the descriptive characteristics of the research variable.

Table 7. The descriptive characteristics of the research variable

| Weakness of managerial factors | Standard deviation | Mean | N |
|--------------------------------|--------------------|---------|----|
| | 0.06446 | 0.35307 | 30 |

Table 8 presents single sample t-test to compare the mean of the sample group.

Table 8. Single sample t-test to compare means

| Weakness of managerial factors | Confidence level of 95% | | Mean difference | Sig. | Degree of freedom | t |
|--------------------------------|-------------------------|-----------|-----------------|-------|-------------------|--------|
| | High limit | Low limit | | | | |
| | 1.3527 | 1.0890 | 1.22083 | 0.000 | 29 | 18.939 |

According to Table 8, since the obtained p-value (0.000) is less than 0.05, the null hypothesis is rejected, indicating that Weakness of managerial factors hinders successful state civil engineering projects implementation.

Table 9 shows the mean of ranking and descriptive characteristics of the research variables.

Table 9. Rank mean

| Variables | Maximum | Minimum | standard deviation | Mean | Rank mean |
|---------------------------|---------|---------|--------------------|--------|-----------|
| Project success | 4.86 | 3.29 | 0.35124 | 4.3202 | 2.37 |
| Management team formation | 5.00 | 3.50 | 0.35307 | 4.2208 | 1.82 |

7.7.3. Ranking Questions

To rank the questionnaire items, Friedman analysis test was used. Table 10 shows the results of ranking test.

Table 10. Friedman test

| | |
|-------------------|---------|
| Number | 29 |
| Chi square | 171.106 |
| Degree of freedom | 34 |
| Sig. | 0.000 |

As shown in Table 10, Friedman test results reveal that there is a significant difference between mean of the items ranking at the error level less than 0.05. So, it can be stated that:

1. The importance and relation on team formation in organizing project with project success has the highest rank mean.
2. Enabling management team as one of projects success factors is necessary at organizational place of contractor.
3. Work relation of team members highly influence project management.

Table 11 presents rank mean of each item:

Table 11. Ranking the importance and necessity of team formation

| | Items | Rank mean |
|----------------------------------|--|-----------|
| Project success | 1 To what extent the importance of team formation in project organization influence civil engineering projects success? | 24.33 |
| | 2 Is management team enabling as one of projects success factors in organization place of employer necessary? | 21.66 |
| | 3 Is management team enabling as one of projects success factors in organization place of consultant necessary? | 21.03 |
| | 4 Is management team enabling as one of projects success factors in organization place of contractor necessary? | 23.57 |
| | 5 To what extent is the relation between team work competency and civil engineering projects success? | 19.59 |
| | 6 To what extent evaluating team work competency in civil engineering projects create added value or profit? | 16.69 |
| | 7 Is there selection limitation to select management team members in state civil engineering projects? | 12.95 |
| Management team formation | 8 Can we mention knowledge and dominance to identify and manage the risk of the respective process as an important factor of team success? | 16.91 |
| | 9 To what extent work relation of team members influence successful project management? | 23.14 |
| | 10 To what extent affective relation of team members influence successful project management? | 13.67 |
| | 11 To what extent motivational relation of team members influence successful project management? | 18.41 |
| | 12 To what extent the attention of manager to team and human resources, compared to other resources (financial, equipment and machineries) influence projects success? | 17.12 |
| | 13 Should be the skill of management team members as a main item to select members? | 17.31 |
| | 14 Should be the work experience of management team members as a main item to select members? | 18.33 |
| | 15 Does management team in civil engineering projects influence organization or company (shareholders -beneficiaries) from macro perspective? | 21.45 |

8. Conclusion

The purpose of the present study was to show the importance of management team formation and its effect in state projects success. In this regard, using questionnaire, the required data was gathered from 30 successful project managers. The research findings revealed that management team formation has a positive effect in civil engineering projects success. In the following, the research hypotheses have been separately investigated and some recommendations have been presented.

The research findings revealed that there is a significant positive difference between the mean of the sample and the population. In other words, it can be stated that the purpose of the state civil engineering projects success is to decrease cost and time and increase the quality as well as the society and government's satisfaction as the main customers. To explain the mentioned hypothesis, it can be stated that the success of a project depends on making balance between three important factors of time, employed resources and work results to present an appropriate level of services to customers. Project serves for customer's satisfaction. Therefore, three important factors should be considered and an appropriate balance should be made between them. The relation among the three factors including time, cost and quality is a balance relation. That is, change in each factor causes the change in other factors. To achieve a good quality, cost (and sometimes time) is increased. To decrease the time of project implementation, the quality should be decreased or the cost of using more resources should be increased. Additionally, it is obvious that decreasing cost leads to low quality and high time of implementation.

Further, it was found that there is a significant positive difference between the mean score of the sample and the population. In other words, it can be stated that weakness of managerial factors hinders successful state civil engineering projects implementation. To explain the mentioned hypothesis, it can be stated that macro civil engineering projects goals and framework is defined in the frame of a set of technical and executive operations and require specialist and competent individuals. Project management, in general, refers to the process of investigating, defining, guiding, organizing, designing, and implementing activities of a project. The efficiency of project management system depends on project manager's competency and dominance on executive mechanisms and techniques of a project. Project manager deals with five basic factors including work, money, equipment-facilities and time. Project manager with appropriate resources (money, equipment, facilities, and human force) in time bed (important non-physical resource) creates a value. In successful projects, this value resulted has a higher weight than the employed resources. Therefore, weakness in each of managerial factors hinders successful state civil engineering projects implementation. Accordingly, weakness of executive organizations management and lack of balance between ongoing works volume and executive capacity is the second factor in projects delay. It is the fact that is stipulated in various reports of planning and management organization.

Given to Table 11, it can be concluded the importance of management team formation, team enabling in organizational place of contractor and work relation with team members are the most effective factors in project success and the necessity of team formation, respectively.

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