

Review of Affective Factors on Cost, Time and Quality of Construction Projects in Developing Countries

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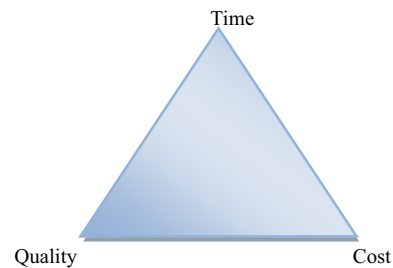
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Abstract— Nowadays, project management in different fields, has a significant effect on time and costs and also stabilizing the quality of projects. A considerable part of projects is the construction part which takes a noticeable portion of governmental and private budget in developing countries. According to the presented statistical results, many civil projects have failed: delay in finishing the project, additional costs to the initial cost estimation and a fall in the quality followed by downfall of the efficiency of the project. With regards to the importance of the subject and the stated problem, managers have done many researches in years and presented different solutions: one of them is the project management triangle (cost, time, quality). During these years, civil project managers have been using this triangle in managing their projects, but because of the effects of different factors on the construction industry this triangle is not of great help in management problems anymore. In this article, it has been tried to clarify the various factors which influence the construction industry and their relation with each other, according to the survey taken from statistical community, consisted of important construction companies and managers of major civil projects.

Keywords—project management; iron triangle; construction project, cost, time; quality

I. INTRODUCTION

A project is a temporary effort to provide a unique product or service[1]. A project is different from a productive business; it has a defined beginning and end [2]. Until 1940 project management did not receive much attention, but from 1980 until early 21st century, defined and considered more than before [3]. Project management is the most important part of a successful project. Projects need to be performed and delivered under certain constraints, traditionally called “scope”, “time” and “cost” [4]. These are referred to as the “Project Management Triangle” where each side represents a constraint. One side of the triangle cannot be changed without affecting the others [5]. In projects that aim of them is clear quality can be replace by scope.



1. Fig Iron triangle

The time constraint refers to the amount of time to complete a project. The cost constraint refers to the amount of budget available for the project. The scope constraint refers to what must be done to produce the project’s end results. These three constraints are often competing constraints: increased scope typically means increased time and increased cost, tight time constraint means increased cost and reduced scope and a tight budget could mean increased time and reduced scope.

Planning in construction industry is an economic and competitive activity in managing and performing construction projects. A good construction plan is a basis for optimizing the schedule and budget of the project. As we know a significant portion of the assets of any country especially developing ones, is dedicated to the civil and infrastructural projects.

Studies by the World Bank show that between 3% to 8% of GDP in developing countries is dedicated to the construction industry. Also employment in the construction industry of developing countries is 3.2% of the whole employment [6]. Until 1900 civil engineering projects were generally managed by creative architects and engineers themselves. By the time of the Second World War formal and disciplined civil project management had appeared. “Construction industry needs an information manager as much as materials”, this was first stated by Mr. John Hilling in 1990 and it was expressed again by the head of the Wimpey Construction Company at the “Information Technology in Construction Industry” Meeting in 2000. All the people involved in projects especially the project managers, always try to perform a project in the shortest time with the possible least cost and of course the desired level of quality [7].

Often construction projects fail to achieve the desired time, cost and quality. This convinces us to try to find the influential factors in these failures. Morris and Hugh conducted a research in 1980 and visited more than 400 construction projects. They could hardly find a project which was finished on time. The delay was due to unexpected problems and deviations from the original plan during the project's performance [8]. In different studies conducted in some developing countries, different factors which were important in achieving the quality success of the projects has been studied [9,10, and 11]. Also in other researches, the time [12, 13] and cost [14] failure of the projects were studied. Regarding the causes of failure, despite having the project management triangle, lack of a clear definition of factors influencing each side of the triangle causes the management triangle not to be practically useful in managing civil projects. This research has tried to get to the factors which influence the sides of the project management triangle and suggest a geometric, 3-dimensional pattern, so by using it civil project managers can improve the scope, time and cost of the projects.

II. Methods:

The research methodology contained: Thirty-four [34] causes of Defeat at the time, cost and quality.(table 1)

were identified through literature review and discussion with some companies and Professors involved in construction industry. A questionnaire was developed in order to evaluate the frequency of occurrence, severity and importance of the identified causes. Sample and Statistical Society was selected between Contractors construction companies were involved in projects that one million dollars or more in developing countries.

Data were gathered through a survey, analyzed by using frequency, severity and importance indices, taking in view owners, contractors and consultants. Agreement on the ranking of the importance of the causes of Defeat at the time, cost and quality between each two groups of parties was also tested. Recommendations for minimizing Defeat at the time, cost and quality in construction projects were emphasized in view of the results of the study.

To analyze the statistical results of the survey, SPSS software was used.

TABLE I. (important factors on construction project)

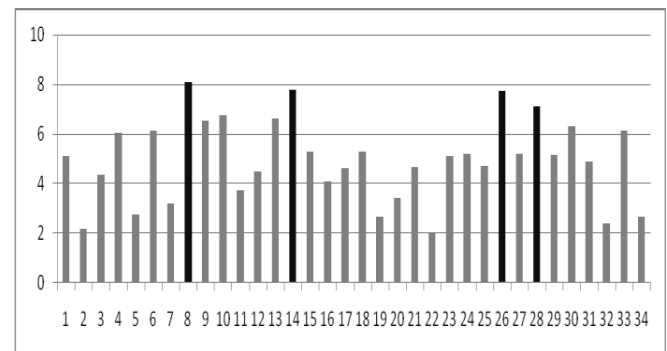
Number	Factor
1	human resources (Quantity)
2	Appropriate ethical relationship between engineering teams and working
3	Skills and specialty of workers
4	Skills and specialty of the engineering team
5	Create motivate in human factors
6	Innovation and creativity during the performance
7	Correctly of division tasks
8	Project management
9	Time management
10	Crisis management
11	Inventory management
12	Monitoring device of project

13	Risk-taking
14	Unanticipated inflation
15	Local criteria and regulations construction
16	Grade of consultation
17	Speed and quality service in providing materials
18	Completion and final approval of the plan before starting the project
19	Organizational chart of contracting companies
20	Laboratory sampling facilities
21	Select the correct method of project by the contractor
22	Quality of design maps and executive details
23	Contractor familiar with the new software and technologies
24	Use of new technologies in non-favorable conditions
25	Climate and weather
26	Machinery
27	Cash Flow
28	financial problems contractor
29	critical activities delay
30	economic policy of the society
31	Time and quality control of imported materials
32	Overlap in the implementation of activities
33	Project site accessibility (distance , traffic)
34	Open space for work maneuvering

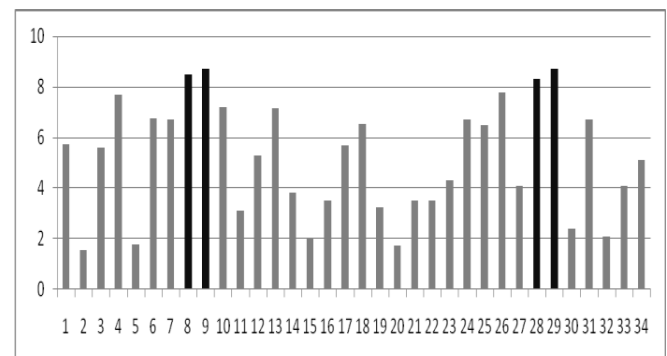
III. Results:

In the questionnaire the important factors (table 1) were put in separate tables according to "time", "cost" and "quality" indexes. The interviewees scored the parameters from 1-9.

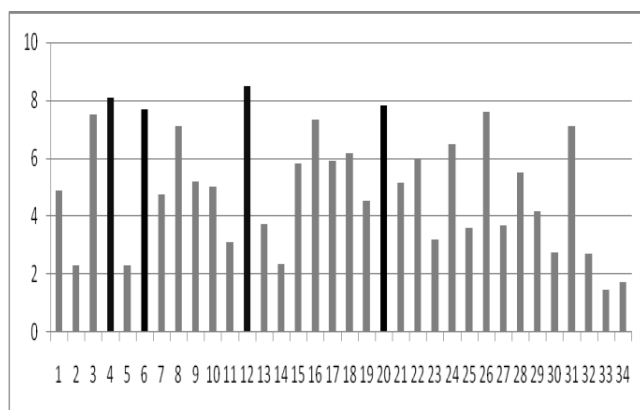
I. CHART (the importance of different influential factors on the cost)



II. CHART (the importance of different influential factors on the time)

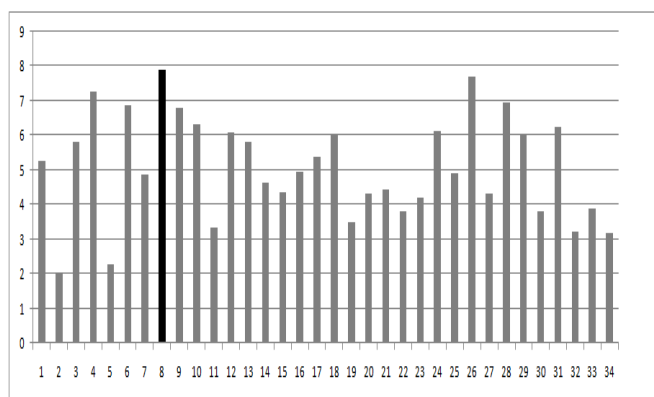


III. CHART (the importance of different influential factors on the quality)



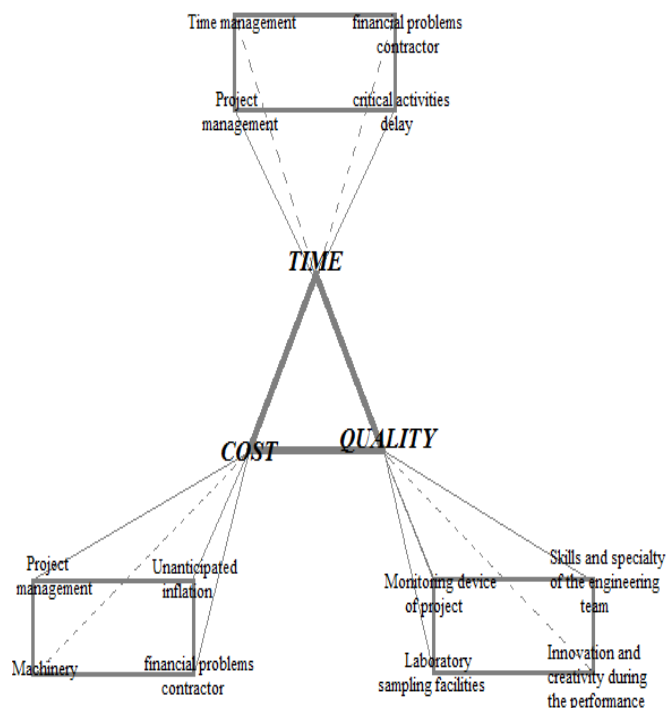
Also, with rates averaging three factors each factor was evaluated to chart 4

IV. CHART (is the average of the scores of each agent in all three factors)



IV. Discussion:

In this research 34 important factors were studied and according to the results four more influential factors on each side of the project management triangle were determined. These factors are highly interrelated and influence the project management triangle and like in geometry, any change in each side of the triangle causes changes in other sides. So in this research, a new way of showing the relation between these factors and the sides of the triangle is determined which shows the level of importance and influence of each factor in the project. After statistical analysis of the answers to the questionnaires, the following results are taken:



2. fig completed and corrected civil project management)

For example, as it is shown in the figure, the component factors of time pyramid (project management, time management, contractor's financial problems and delays in performing critical actions) directly affect the time of the project. And when the time (one side of the project management triangle) changes, the other sides (scope and cost) will change. So, a change in time pyramid (any component of time pyramid) affects the time of the project directly and also the scope and cost of the project indirectly and causes changes in the efficiency and outcome of the project. We can observe these effective relations in other sides as well.

V. Conclusion:

It's been tried to study the causes of the failure of project in the past and determine the most effective ones, then regarding the non-practicality of the project management triangle, a practical complementary pattern was presented. By close observation of the pattern, we can find the reasons of many failures of the projects in developing countries.

- "The engineers' expertise" is one of the most important factors in the scope pyramid. The engineers' unfamiliarity with the scientific and practical issues and their lack of expertise are the reasons of many projects' failure. The roots of these problems are in non-practical academic educations.
- "Final completion and confirmation of the plan before beginning the project" is a factor present in both time and cost pyramids. Changes in the plan during performing it, lack of detailed estimation and some non-executable parts of the plan in the primary estimation cause an increase in both time and cost.

- “The contractor’s financial problems” are seen in both time and cost pyramids. Late pays to the contractor cause pause in performing the project and the contractor’s financial inability to fill this gap leads to increased time and cost.

- “Project supervision” is an effective factor in the scope of the project. Most of the projects which fail to achieve the desired scope suffer from weak supervision.

- “Unexpected inflation” is a very influential factor on cost. Regarding the economics of developing countries, sometimes there are great inflations which increase the cost of projects.

Considering figure 4, it can be seen that the average score of the project management in all three factors is higher than the others. So it can be concluded that it’s the most important factor. Importance of project manager on all projects, whether private, public, mass building and even small projects is evident in this article.

Thus, it is suggested to the developing countries that there must be a project manager in most civil projects as there is a supervisor.

We hope by presenting this article and by paying more attention to the mentioned influential factors, we can time, scope and cost success and better efficiency of all projects.

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