

CRITICAL SUCCESS FACTORS FOR CONSTRUCTION OF GOVERNMENTAL PROJECTS IN EGYPT

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ABSTRACT

The identification of Critical Success Factors (CSFs) for construction projects enables appropriate decision making to achieve the project objectives. Limited studies focused on the CSFs in previous researches particularly in Egypt. Therefore, this paper aims to explore the CSFs necessary to achieve Governmental Projects objectives in Egypt. A number of CSFs have been determined through a comprehensive literature review. These factors were grouped under five main groups: project aspects, owner, contractor, consultant, and environment. A questionnaire was developed to facilitate systematic data collection in this study. Experts with an overall average of 20 years of experience in the construction industry were invited to participate in the survey. The results of this survey were ranked based on their degrees of importance in relation to success using the relative importance index. The results can be used as a guideline to successfully handle construction projects in Egypt as well as in other developing countries.

Keywords: Construction Management; Critical Success Factor; Egypt; Governmental Projects.

1. INTRODUCTION

Different types of construction projects have been achieved in Egypt with extreme delay or cost overrun which mainly considered unsuccessful projects. On the other hand, many projects in a broad range of sectors have been successfully achieved. Deep investigations in construction projects in Egypt were performed by the authors during May 2014 to December 2014 concentrated on construction of the governmental projects. The investigation includes 85 projects of different types such as: Infrastructure, residential, and commercial about 29% of the projects were succeeded finished on time within specific budget. However, 20% of projects failed to achieve budget, and 51% failed to achieve the planned schedule, as shown Figure 1.

A number of factors combine to determine the success or failure of an infrastructure project in terms of its objectives (i.e., cost, time, and quality) (Zhang, 2005). The identification of key success criteria in the construction industry would allow construction executives and project managers to appropriately plan resource allocation (Chua *et al.*, 1999; Toor *et al.*, 2008). Consensus on key success criteria will allow monitoring of project outcomes effectively and provide an ongoing framework to assist in tracking key project results (Chan *et al.*, 2001; Toor *et al.*, 2008). The CSFs can be identified based either on quantitative measures (Chua *et al.*, 1999) or on expert opinions (Chua *et al.*, 1999).

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The aim of this paper is therefore to identify CSFs related to the construction of Governmental Projects in Egypt. It is worth mentioning this paper greatly benefited from literature and the immense data collected through questionnaire surveys that were administered to a large group of qualified experts in construction projects in Egypt.

Following the introduction to this paper, the second section provides the background information relating to the CSFs in construction projects. In the third section, the research methodology is described. Then, the fourth section presents the results of this paper. After that, the results and findings are discussed in the fifth section. Finally, the sixth section draws summary of this study.

2. CRITICAL SUCCESS FACTORS IN CONSTRUCTION PROJECTS

CSFs have been traced back to the 1960s (Rockart, 1982) and since then, it has been widely applied by many authors to identify CSFs in construction management. CSFs describe a procedure that attempts to make explicit the key areas that are essential for management success (Boynton and Zmud, 1984). Rockart (1982) defines Critical Success Factors (CSFs) as: 'those few key areas of activity in which favourable results are absolutely necessary for a manager to reach his/her goals'. Several studies have been conducted in literature to explore critical success factors (Chan and Kumaraswamy, 1996; Hwang *et al.*, 2013; Andersen *et al.*, 2006; Toor and Ogunlana, 2009), thus highlighting the importance of CSF study. For instance, Hwang *et al.*, (2013) explored the CSFs for public-private partnership (PPP) projects. Yong and Mustafa, (2013) identified 46 critical success factors in the local Malaysian construction industry. Tang *et al.*, (2012) investigated the CSFs for international market entry.

Qiao *et al.*, (2001) established eight independent CSFs in BOT projects in China such as appropriate project identification; stable political and economic situation; attractive financial package; acceptable toll/tariff levels; reasonable risk allocation; selection of suitable subcontractors; management control; and technology transfer. While many CSFs have been identified, in literature their importance relative to one another has received less attention. All are nominally regarded as 'critical' but, as some must be more important than others, it is sensible to attempt to rank them, particularly in terms of the attention that should be given to them in the development stages of projects. Chua *et al.* (1999) maintain that success of a construction project is determined by four aspects, namely: project characteristics, contractual arrangements, project participants, and interactive processes. Among the earlier, project characteristics the most common in literature. Project characteristics include external (e.g., political and economic risks, impact on public efficiency of technical approval authorities, adequacy of funding, and site limitation and location) and internal characteristics (e.g., constructability, pioneering status, and project size). Project characteristics contribute to certain project risks, including financial risks and schedule delays (Diekmann and Girard, 1995). Despite the enormous literature on CSFs, there are very little mentioned studies to identify CSFs in the Egyptian construction industry, particularly governmental projects.

3. RESEARCH METHODOLOGY

In the first stage, a comprehensive literature review was conducted to establish the foundation of this paper. In the following stage, extensive historical data has been reviewed and investigated of 85 succeed and failed governmental projects in Egypt. Based on the aforementioned stages; a list of CSFs has been developed in order to get the opinion of the experts in the Egyptian construction industry.

In the following stage, a questionnaire survey was demonstrated to collect the opinion of experts in the construction industry. Questionnaire survey has been recognised as the most cost-effective and most popular means of collecting information (Gravetter and Forzano, 2012). The questionnaire consisted of two main sections. The first section included questions about general background of the respondents. In the second section, the respondents were asked to rate the relative significance of the CSFs using a scale of 0-5, where, 0 being not applicable, 1 being not significant, 2 being fairly significant, 3 being significant, 4 being very significant, and 5 being extremely significant. The five-point scale has been widely used in construction management studies (Shen *et al.*, 2001; and Sun *et al.*, 2008) because it yields better dispersion than the three-point scale (Curtis and Carey, 2012).

A total of 114 questionnaires were sent out, between January and April 2015. All potential respondents were contacted before hand to make sure that they are willing to take part. A total of 50 complete questionnaires were returned, representing a response rate of 43.8 %, which is acceptable according to (Moser and Kalton, 1971; and Ott and Longnecker, 2010). About 28 of the responses were from contractors, 14 responses were from consultants, and 8 responses were from governmental authorities.



Figure 1: Distribution of Percentage Success and Failed Projects

4. SURVEY RESULTS

The main purpose of the aforementioned investigation is not to just identify a list of CSFs but to ascertain the key CSFs that can significantly influence the delivery of construction governmental projects in Egypt. Hence, in many researches which seeks to determine the most important factors, only the top ten ranked ones were chosen as key factors (McIntosh and McCable, 2003; Tam et al., 2004). In this research it is assumed the most CSFs based on the calculated relative significance index. Fourteen CSFs were considered as significant, where $SI \geq 80\%$, following section explain how the relative significance index were calculated for each CSF.

4.1. SIGNIFICANCE INDEXES OF CRITICAL SUCCESS FACTORS

It is useful to analyze the relative significance of the CSFs (Zhang, 2005). The relative significance indexes of the each CSF are calculated separately. The following simple formula is developed to convert linearly the 0-5 scale used in the questionnaire survey to a 0-100 scale with 0 representing the lowest and 100 the highest significance. This means that “5”, “4”, “3”, “2”, “1” and “0” have significance indexes of 100, 80, 60, 40, 20 and 0 respectively.

$$\text{Significance index } Si = \frac{Ri0 \times 0 + Ri1 \times 20 + Ri2 \times 40 + Ri3 \times 60 + Ri4 \times 80 + Ri5 \times 100}{Ri0 + Ri1 + Ri2 + Ri3 + Ri4 + Ri5} = \frac{20Ri1 + 40Ri2 + 60Ri3 + 80Ri4 + 100Ri5}{Ri0 + Ri1 + Ri2 + Ri3 + Ri4 + Ri5}$$

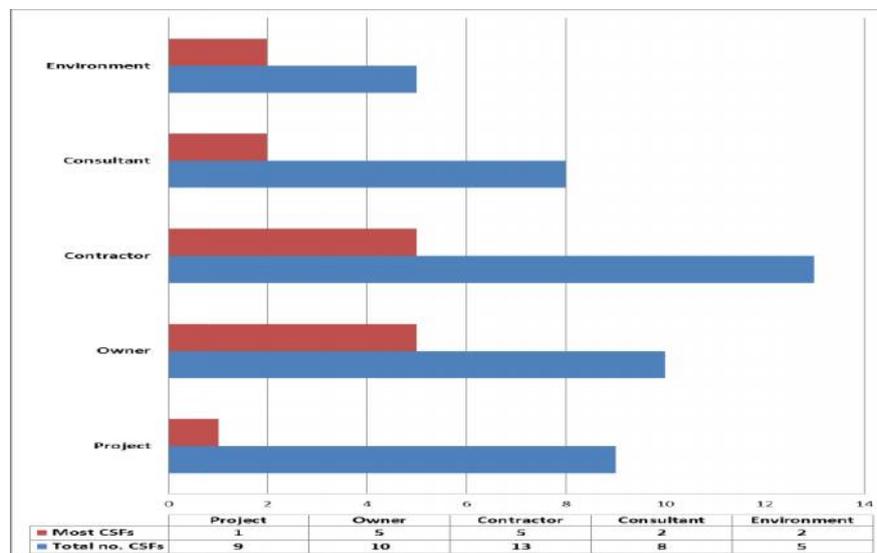


Figure 2: Number of Most Significant CSFs vs Total Number of CSFs in Each Group

Where S_i = significance index for the i^{th} factor;

R_{i0} = number of responses as “0” for the i^{th} factor;

R_{i1} = number of responses as “1” for the i^{th} factor;

R_{i2} = number of responses as “2” for the i^{th} factor;

R_{i3} = number of responses as “3” for the i^{th} factor;

R_{i4} = number of responses as “4” for the i^{th} factor;

and R_{i5} = number of responses as “5” for the i^{th} factor.

The significance indices and the rank of the CSFs were based on the responses appear in Table 1. Out of 45 CSFs, only 15 CSFs are considered as most significant 33% as shown in Table 1. Figure 2 is showing number of most significant CSFs versus total number of CSFs in each Group.

Table 1: The Significance Indexes and Rank of the CSFs

Success Factor	SI	Rank	Overall Rank
Group 1 : Project			
Accuracy of the contractual duration of the project	87.2	1	5
Clarity terms of the contract	78.4	2	19
The existence of detailed study of the project to ensure there are no conflicts or differences between the various project documents	78	3	20
Clarity and determine the scope of work of the project	54.4	4	35
Suitable contract for the project type	52.8	5	36
Place implementation of the project (easy access - the availability of basic materials - Security ... etc.	48.4	6	41
The application of technology or implementation of a new style for the first time applied	46.8	7	42
The existence of the project next to sensitive sites and as important as the military districts, embassies, sovereign bodies	46.6	8	43
How over the public accept the project	34.8	9	45
Group 2 : Owner			
The availability of project budget and easily extracts exchange procedures.	96.8	1	3
Continuous monitoring and effective control	86.8	2	6
Harmony and good coordination between the departments involved in the project to achieve the project objective	86.4	3	7
Flexible policies to manage the project	81.2	4	12
Relative power and authority	80.8	5	13
Capability to change subcontractors in case of backwardness	77.2	6	21
Continuity and poise organizational structure during the period of implementation of the project	70	7	31
Independence from the regulators.	52	8	37
The relative importance of the project for the top-level decision-making	51.2	9	38
Ease of communication between the different levels have Owner	50	10	39
Group 3 : Contractor			
Availability of financial capacity	100	1	1
Sufficient experience and capability of technical personnel	99.6	2	2
The ability to provide adequate raw materials required quickly	85.6	3	8
Adequate plant and equipment to do the work properly	80	4	14

Success Factor	SI	Rank	Overall Rank
Ability to control and organize the contract	80	5	15
Adequate of labor skill and labor's Experience	75.2	6	22
Good assessment of pre-qualification	75.2	7	23
Cost overrun due to planning estimation	72.8	8	25
Capability to manage subcontractor.	72.4	9	26
Capability of Trouble shooting	72	10	27
Performed projects of the same type and scale	64.8	11	32
The ability to respond quickly to change order of the project	60	12	33
The familiarity with owner procedures	57.2	13	34
Group 4 : Consultant			
Competency and commitment of consultant proposed team	84.8	1	9
Relevant experience in the implementation of projects	84	2	10
The ability to good communication between the contractor and the owner through the implementation of the project	79.6	3	16
Technical background	78.8	4	17
Ability to coordinate and trouble shooting	74.4	5	24
Undelay in performing testing and inspection by the consultant	72	6	28
The ability to respond to changes that occur during project	70.8	7	29
Continuity and poise organizational structure during the period of implementation of the project	70.4	8	30
Group 5 : Environment			
Political environment	88	1	4
Economic environment	83.2	2	11
Technical approval authorities	78.8	3	18
Technological environment	49.6	4	40
Social and physical environment	41.6	5	44

5. RESEARCH FINDINGS AND DISCUSSION

The result of survey questionnaire from the project parties perspectives (owner, consultant, and contractor) which listed the most CSFs in the construction of governmental projects in Egypt imply that;

CSFs related to owner group: This group percentage the high percentage group of success group with total percentage 50%.The results showed that “the availability of project budget and easily payment procedures” is the most important success factor under the owner group. This was due to, in case of unavailability of project budget, it will directly affect on the contractor cash. Consequently, it may cause negative impact on the project performance or sometimes work suspension.

The second CSF under the owner group is “Continuous monitoring and effective control”. Therefore the owner should have sufficient technical staff with extensive experience enabling them to manage and control in all project stages. In addition, the owner should have adequate monitoring and control system. The monitoring and control system could produce reports, Key Performance Indicators (KPIs), and dash board, all can provide the decision maker a precise status that enabling to take effective decisions.

The third ranked CSF is “Harmony and good coordination between the departments involved in the project to achieve the project objective”. It is mandatory for the owner’s entity to maintain the performance of the project. Also, any conflict between different departments will lead to a decrease in the project performance. Furthermore may lead to work suspension.

The fourth ranked CSF is “Flexible policies to manage the project”. Internal regulations in the governmental authorities have to be adequate to facilitate the low interpretation to solve and clarify the misunderstanding issues, thereby avoid any losing or waiting time.

The fifth ranked CSF is “Relative power and authority”. Most contracts states that acquiring the required approval and permits are the owners’ responsibility. The approvals and permits risk in a matter of concern for the contractors working in the Egyptian construction industry (Orabi, 2003). The owner may have adequate relative power and authority to avoid the delay of those approvals from the governmental authorities.

CSFs related to Environment group: This group represents the second highest percentage success group with total of 40%. The results showed that “Political environment” is the highest CSF in this group. This factor is out of project parties’ control but it affects the project success. Many causes related to the political environment may lead to a project failure such as: political instability, revolution, strikes, corruption, regional war, and civil war. Furthermore, the economical environment is vulnerable to the political environment. Hence, instability of political environment will lead to instability in economical environment.

The second CSF under this group is “Economical environment”. Likewise this factor is out of project parties’ control and may cause failure to the project. There are many causes related to economical environment such unexpected inflation of construction material, unavailability of foreign currency, unexpected increasing in currency exchange, and implementing additional taxes, etc.

CSFs related to contractor group: This group represents the third highest percentage success group with total of 38%. The results showed that “Availability of financial capacity” is the highest CSF under contractor group. The contractors working in construction projects suffer from lack of cash which could affect their ability to finance their acquired projects and thus affect their performance (Zabel, 2007).

The second CSF under this group is “Sufficient experience and capability of technical personnel”. The contractor should have sufficient experience in similar type of the projects. In addition, the competent of contractor’s staff that will enable the contractor to carry out the works properly and effectively. Hence, if a contractor cannot provide adequate experience, the project performance will be extremely affected.

The third ranked CSF is “The ability to provide adequate raw materials required quickly”. The contractor should have solid database of credible supplier to provide him the required material on time and with required specifications. Any delay of material procurement will cause negative impact on the project performance.

The fourth ranked CSF is “Adequate plant and equipment to achieve the work properly”. Construction projects in Egypt are suffering from equipment quality risks. This is due to inadequate equipment management plans, inefficient equipment, and unqualified equipment’s operators (Zabel, 2007). Hence contractor should have sufficient equipment/plants that required to achieve the project properly.

The fifth ranked CSF is “Capability to control and organize the contract” the contractor has to develop proper monitoring and control systems that will enable him to monitor the performance of the project. In addition the contractor could implement quality assurance and control that lead to effective decision making and proactive management.

CSFs related to consultant group: This group represents the fourth highest percentage success group with total of 25%. The results showed that “Competency and commitment of consultant proposed team” is the highest CSF under the consultant group. The consultant should have extensive experience and relevant technical background to enable him to solve the technical issues properly. Furthermore the consultant could direct the contractor to the right way. In addition, the consultant has to lead the relation with the client in a proactive way.

The second CSF under this group is “Relevant experience in the implementation of projects”. The consultant should have relevant extensive experience to the same type of the project, to enable him to solve the technical issues properly. Therefore, it will help the project owner to identify the potential significant risks relevant to the project.

CSFs related to project group: This group represents the fourth highest percentage success group with total of 11%. The results showed that “Accuracy of the contractual duration of the project” it is the most of CSF under the group. The under estimation of project duration lead to develop a tight project schedule contains high percentage of critical activities. Thus, it will cause cost overrun and will affect quality of the performed work. Moreover, it may cause disputes between project parties and may lead to a project failure.

6. SUMMARY

Deep understanding of CSFs is essential in order for construction governmental projects to take proper success management strategies. This research paper has systematically examined CSFs affecting the construction of governmental projects in Egypt. In this paper, 45 CSFs were evaluated and ranked according to their significance index. Forty five CSFs have been identified through literature review, questionnaire survey, and historical review of construction projects in Egypt.

These CSFs are further analysed, distilled, coded, and finally categorized into five main CSF groups: (1) Project, (2) Owner, (3) Contractor, (4) Consultant, and (5) Environment,

The performed analysis shows that fifteen CSFs have S.I 80%, which considered most significant CSFs. Brief discussion for each factors of the most significant CSFs were presented to help the decision makers of the construction governmental projects in Egypt to recognize the root causes of the most significant CSFs.

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