

# **CRITICAL SUCCESS FACTORS FOR PROJECT SUCCESS OF CONSTRUCTION PROJECTS BASED ON DIFFERENT PROJECT OBJECTIVES**

**Dr Hamimah Adnan, Associate Professor Dr Faridah Yusuf , Mohd Arphian Salleh**

University Teknologi MARA

Shah Alam 40450, Selangor, Malaysia

Email: [hamimah698@salam.uitm.edu.my](mailto:hamimah698@salam.uitm.edu.my)

[faridahyusuf@salam.uitm.edu.my](mailto:faridahyusuf@salam.uitm.edu.my)

## **ABSTRACT**

Every construction project expects a success. In order to attain success for every project involved, issues that are related to the success of a construction project must be identified. This paper identifies those key factors, which contribute to the success of construction projects. The main factors crucial to project success were identified from a literature review and through a questionnaire survey administered to local contractors. A follow-up interview was conducted to validate the first survey and to evaluate the perception of the local contractors. An Analytical Hierarchy Model was used to obtain the final Critical Success Factors.

The identification of the critical factors related to the success of construction projects will contribute to the achievement of a particular objective which will accomplish the success of the project. Aspects that affect the success of the project are the project characteristic, contractual arrangement, parties involved in a construction project and finally, and the aspect of the project interactive processes.

*Keynote: Critical success factors, construction project success, project objectives*

## **1.0 INTRODUCTION**

The construction project success is defined with the consideration of the technical factors only. It is whether the construction project can be processed or completed without considering the budget, schedule, performance, safety measures and other factors (Kerzner, 2000) and suggested that success of construction projects consists of two factors which are the main factor and the secondary factor. The main factor signifies whether a project can be done according to the précised schedule and budget as well as at the required quality level. On the other hand, the secondary factor refers to the factor of clients' satisfaction towards the completed project.

Ashley et al. (1987) defines success as a better project result from what is expected which normally consider the factors of budget, schedule, performance, safety and satisfaction of the team involved in a project. Tuman (1986) stated that success is to produce an

expected result by considering every project expectations and own sufficient sources so it can be used when it is needed.

Lim and Mohamed (1999) explained that the success of a project can be perceived from the macro and micro perspectives. Project success from the macro viewpoint means a project is regarded as success when the client satisfaction is achieved in term of time, cost and quality. Furthermore, from the micro viewpoint, the success of a project is measured from the client, consultants and contractor perspectives derived from the project accomplishment from the time, cost, performance and safety perceptions (Liew, 2002). Overall, the majority of the success definitions closely relate to the achievement of the allocated timing, cost and quality. Thus, these three elements cannot be abandoned in order to achieve success in a construction project.

## **2.0 AIM AND OBJECTIVE OF RESEARCH**

The aim and objective of this research is to identify the critical success factors for construction projects based on each project objective ( Time, Cost and Quality)

## **3.0 PROBLEM STATEMENT**

There are many critical factors being identified from the literature review as the factor that leads to the construction project success. However, differences of factors are more critical toward different project objectives. There are no complete list of answers on what are the critical factors which lead to a success of construction project based on the objective of the project schedule, budget and performance. Therefore, this paper is to disclose the issue.

## **4.0 THE CRITERIA OF A SUCCESS CONSTRUCTION PROJECT**

The concept of Critical Success factors (CSF) was first introduced and published in 1961 by D.Ronald Daniel in his management literature on the management information system (MIS) industry (Daniel, 1961). The CSF methodology elicited the opinions of senior management in order to identify the most important elements of each business in the organizations. In 1982, Rockart and his team member from the Sloan School of Management developed the idea and formulated the method as the CSF methodology. According to Rockart:

*“Critical success factors are the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where “ things must go right” for the business to flourish. If results in these areas are not adequate, the organization’s efforts for the period will be less than desired.*

As a result, the CSFs are areas of activity that should receive constant and careful attention from management. The current status of performance in each area should be continually measured, and that information should be made available.

CSFs are those few key variables that affect the manager in achieving his goals for his current or future areas of activity. These key variables can be used in the company's planning process, in helping to improve communication among the managers or as an aid in the information system planning.

Rockart's methodology consists of identifying the most important goals from the organization's strategies and objectives where these factors are considered to be critical (Owen, 2002). Bullen & Rockart later broadened the definition of CSFs and proposed that when using the CSF method as a planning tool, the managers from senior levels of an organization must be interviewed.

The procedure is as follows:

- 1) Each interview begins with the interviewer outlining the concept and methodology of CSFs; the interviewee will then describe the company's mission and the role they play in the company.
- 2) CSFs will only be developed following the discussion of the interviewee's goals, which are designed to best facilitate the interviewee in meeting the goals.
- 3) The interviewee would then prioritize the identified CSFs before attempts are made at determining suitable measures for each CSF.
- 4) The collective sets of CSFs from all interviewees are reviewed to check for area, which some interviews might have failed to cover. This collective set of factors would then be analyzed to identify the general areas considered as critical for success. The final set of CSFs was used to develop the required information databases.

The concept of CSFs has been embraced by businesses and academics since the early 1980s. CSF concepts have been utilized by many organizations to develop their own particular sets of CSFs.

Successful criteria is always changeable as it is related to the type of a project, the party involved in a project, the provided service facilities, the project size, the clients' satisfaction level on the design and other related factors. The involvement of different parties in a construction project is the most important factor to determine the criteria of a successful construction project. Hence, the assumption and expectation of every party which are the owner, the designer and the contractor will be used as a foundation to indicate or determine the criteria of a successful construction project (Sanvido et al., 1999). He contended that the owner's criteria for measuring success is: work according to the arranged schedule, work result in the expected budget; function to intend use (which satisfy the owner and the customer); quality product and outcome; esthetically value; profitable investment; building must be marketable (image and financial); and minimizing the aggravation which will badly effects the project during construction process in progress.

As for the designers, the criteria for measuring success of a construction project are: satisfied client (to obtain the potential of getting more projects from the client); quality

architectural product form the building design; in the pace of designing fee and intended profit goal; staff professionalism achievement (obtain experience and learn new skills); building completed in the investment restraint and designated project schedule and high market demands (depend on the sales and the clients' reputation); minimal construction problems (easy to operate and constructible design); no liability claims (building function as intended; payment from the client (reliability); and well defined scope of work (the contract and scope compensation match) (Sanvido et al., 1999)

For the constructors, they suggested that the criteria of success are: met schedule (at the level of pre-construction, during construction and designing); profitable (under budget); to obtain or achieved further than the expected quality specification; no added claims (owner and sub-contractor); obtain the outlined safety level; to fulfill the clients' satisfaction; good direct communication (expectations of all parties clearly defined); and none or minimize the unexpected issues when the project is in progress (Sanvido et al., 1999)

This means that every party involved has the unique success criteria to each other. For example, the designers are more focused on the factor whether a project can increase the professionalism level and produce a professional satisfaction on the work done by their employees (Sanvido et al., 1999)

## **5.0 RESEARCH METHODOLOGY**

Following a literature review research on the project success, data were also gathered from the questionnaire survey to the respondents which consisted of contractors, the consultant representatives and the developers. The purpose of the questionnaire survey was to discover which companies have experience of different project objectives.

Collected data were analyzed to identify the critical factors for a construction project based on different project objectives. Analytical Hierarchy Process' (AHP) model was used. AHP is a procedure created by Saaty (1980) which is widely used especially in qualitative data analysis (such as the use of respondents' views in the research) and contains various criteria (for instance, in this research the involvement of various project objectives which are influenced by various success factors in the research).

## **6.0 DATA ANALYSIS AND RESEARCH FINDING**

Results show that there were 1824 construction projects which were involved by thirty-nine (39) respondents. On average, every firm of the respondents have involved in forty seven (47) construction projects. The majority of them had been involved in many projects, for instance, there are nine (9) firms that had been involved in more than fifty (50) construction project and twenty (22) firms had been involved in between 20 to 50 construction projects. This is due to the firms' long period of establishment and good relationship between the firm and other parties. Fifty one (51) of the total projects were completed successfully according to the estimated time, cost and quality. Twenty-seven (27) firms determined that all projects involved by their firms were completed within the

estimated time, cost and quality. Most of them who made the statement were the contractors.

Six (6) respondents stated that less than 10 % projects involved by their firms were completed within the allocated time, cost and quality. However, it can be concluded that the significance of the analysis result is high since those who answered the questionnaire were fully-experienced and are aware of the success factors of a construction project based on the different project objectives because the majority of the respondents, which is thirty-five (35) respondents or eighty-five percent (87 %) of the respondents had been involved in the completed construction project according to the allocated time, cost and quality.

The contractor and the consultants suggested that the most crucial objective in affecting the success of the project is cost followed by time and quality. The developers, however, they suggested that time is the most important objective in affecting the success of a project, followed by cost and quality ( Table1).

Nevertheless, as a whole, all the three parties ( contractors, consultants and developers) agreed that the three project objectives are crucial in affecting the success of a construction project. The average ranking for project objective were gained from the analysis using the *analytical hierarchy process (AHP)*.

**Table 1 : Importance of the Project Objective In Affecting the Success of a Project**

No.	Project Objective	Average Ranking (From AHP Analysis)	Organization Ranking		
			Contractor	Consultant	Developer
1.	Cost	1	1	1	2
2.	Time	2	2	2	1
3.	Quality	3	3	3	3

**6.1 The Analysis of the Critical Success Factors of a Construction Project based on the TIME objective**

Table 2 shows that planning is the main critical success factor of a construction project, based on the time objective. This is followed by monitoring and controlling. This shows that the two factors, which can be considered as interactive processes are crucial to achieve the objective of time. The next critical factor is the factor of adequacy of plan and specification. This is followed by the factor of Contractor who plays major role in a

construction project and the factor of communication effectiveness between the parties involved in a construction project. In addition, the aspects of the project characteristic such as site limitation and location also contribute to the project success in the estimated period. The responsibility and the authority of a project manager are also important to achieve the objective of time. Risk identification and risk allocation as well as sufficient funding are also identified as critical factors to a project within the allocated time. Finally, constructability factor also plays a vital role in leading the project towards success from the aspect of time objective achievement.

From the organization ranking if it is viewed from the perspective of the Contractor, they think that the factor of site limitation and location, adequacy of plan and specification as well as constructability of a project are three most influenced factors to the completion of project within the allocated time. As for the consultants, project planning, adequacy of plan and specification, as well as the role played by the Contractor represent the factor that contribute greatly to the success of the project within the allocation time. However, the developers stated that the interactive processes which are monitoring and control, planning as well as the factor of Contractor's roles give the biggest influence to the success of the time objective. In conclusion, the interactive process of a project especially the planning, monitoring and control of the project are the most critical in affecting the success of the time objective.

No.	Success Factor	Average Ranking (From AHP Analysis)	Organization Ranking		
			Contractor	Consultant	Developer
1.	Planning	1	4	1	2
2.	Monitoring and controlling	2	9	4	1
3.	Adequacy of plan and specification	3	2	2	-
4.	Contractor	4	-	3	3
5.	Communication	5	-	-	5
6.	Site limitation and location	6	1	-	6
7.	Project Manager	7	-	5	7
8.	Risk identification and risk allocation	8	10	-	-
9.	Adequacy of funding	9	5	9	8
10.	Constructability	10	3	-	-
11.	Realistic obligations and	-	6	6	-

	clear objectives				
12.	Authority Approval	-	7	-	-
13.	Economical risk	-	8	-	-
14.	Project organization	-	-	7	9
15.	Sub-Contractor	-	-	8	4
16.	Consultants	-	-	10	10

**Table 2 : The Critical Success Factors of a Construction Project based on TIME Objective (Top Ten Ranking Table from AHP analysis)**

**6.2 The critical success factors of a construction project based on the COST objective (top ten ranking table) from AHP analysis**

No.	Success Factor	Average Ranking (From AHP Analysis)	Organization Ranking		
			Contractor	Consultant	Developer
1.	Planning	1	4	1	9
2.	Contractor	2	9	3	1
3.	Adequacy of plan and specification	3	2	5	7
4.	Project Manager	4	-	5	2
5.	Monitoring and controlling	5	3	2	5
6.	Risk identification and risk allocation	6	1	8	3
7.	Supplier	7	-	-	4
8.	Realistic obligations and clear objectives	8	6	-	-
9.	Communication	9	4	10	-
10.	Consultants	10	-	9	6
11.	Adequacy of funding		7	-	-
12.	Formal dispute resolution process		8	-	-

13.	Economical risk		10	-	-
14.	Project organization		-	4	-
15.	Sub-Contractor		-	7	8
16.	Subcontractor		-	-	10

**Table 3 : The Critical Success Factors of a Construction Project based on COST Objective (Top Ten Ranking Table) from AHP analysis**

Table 3 shows that the average ranking of the most affecting factor towards the success of a construction project based on the cost objective which is the planning factor. The aspects of the project participant in the construction project are also a critical factor in achieving the objective of cost. These include Contractor, project manager, supplier and the consultants as the success factors.

In the aspects of contractual arrangement, the adequacy of plan and specification, the risk identification and risk allocation as well as the realistic obligations and clear objectives, has many to contribute towards the project success in the sense of cost. However, the aspects of interactive processes, which the factor of monitoring and controlling as well as the effectiveness of communication, are said to be the factor that cannot be dismissed if the success of the project need to be achieved within the allocated budget.

From the organization ranking in perspective of the Contractor, they think that the aspects of contractual arrangement in a project contribute a lot to the success of the project within the allocated cost. This includes the identification and risk allocation as well as the adequacy of plan and specification. Apart of that, the consultants think that the aspects of the project interactive processes which are the factor of planning, monitoring and controlling are the most vital in leading the project towards success within the allocated budget.

As for the developers, they mentioned that the role of the parties involved in a construction project, which are the role of the Contractors and the project managers is the most critical factor in achieving the objective of cost. In conclusion, the ranking shows that different group of people involved in a project have different opinion on the factors that bring the achievement of the cost objective in a project.

### 6.3 The Critical Success Factor of a Construction Project based on the QUALITY Objective

No.	Success Factor	Average Ranking (From AHP Analysis)	Organization Ranking		
			Contractor	Consultant	Developer



1.	Project Manager	1	-	1	4
2.	Constructability	2	2	10	5
3.	Communication	3	4	-	10
4.	Adequacy of plan and specification	4	3	9	-
5.	Project organization	5	-	8	-
6.	Adequacy of funding	6	6	7	8
7.	Monitoring and controlling	7	10	3	1
8.	Contractor	8	-	2	9
9.	Site limitation and location	9	8	-	7
10.	Planning	10	-	6	3
11.	Pioneering status	-	1	-	-
12.	Risk identification and risk allocation	-	5	-	-
13.	Realistic obligations and clear objectives	-	7	-	-
14.	Authority Approval	-	9	-	-
15.	Consultants	-	-	4	2
16.	Subcontractor	-	-	5	5

**Table 4 : The Critical Success Factors of a Construction Project based on QUALITY Objective (Top Ten Ranking Table) from AHP analysis**

Table 4 shows that on average, the roles and responsibility of a project manager has a major influence on the quality of a construction project. Other than the project manager, the Contractor also plays a vital role in controlling the quality of a construction project. Other critical aspects that influence the success of the construction project are the constructability factor, the sufficient funds factor and the factor of the site limitation and location. The aspects of the interactive processes which involve the factors of communication, project organization, monitoring and controlling as well as the planning factor are crucial in affecting the success of the project according to the allocated quality. In addition, the factor of adequacy of plan and specification is also vital in achieving the quality of a construction project.

From the Contractor's perspective, they think that the critical success factor of the project which are the pioneering status and the factor of the project constructability have a lot to influence the project quality. The developers suggested that the factor of monitoring and controlling, planning and the role of the consultants had a lot to influence the project towards success in achieving the objective of quality.

#### 6.4 : The Comparison of the Critical Success Factors of a Construction Project based on the TIME Objective

This Research	This Research	Chua et al. research √ show the same factors was identify	Ranking (Chua's research)
<b>Planning</b>	<b>1</b>		
<b>Monitoring and controlling</b>	<b>2</b>	√	<b>7</b>
<b>Adequacy of plan and specification</b>	<b>3</b>	√	<b>1</b>
<b>Contractor</b>	<b>4</b>	√	<b>9</b>
<b>Communication</b>	<b>5</b>		
<b>Site limitation and location</b>	<b>6</b>		
<b>Project Manager</b>	<b>7</b>	√	<b>3</b>
<b>Risk identification and risk allocation</b>	<b>8</b>		
<b>Adequacy of funding</b>	<b>9</b>	√	<b>2</b>
<b>Constructability</b>	<b>10</b>		

**Table 5: The Comparison of the Critical Success Factors of a Construction Project based on TIME Objective**

Table 5 shows that a total of five (5) *critical success* factors of the project based on the project objective of time which had been identified in this research came out the same as the research by Chua et al. (1999). The same research results are the factors of project monitoring and controlling, adequacy of plan and specification, the Contractor and the project manager roles as well as the factor of constructability.

This shows that 50% of the critical success factors analysis results based on the objective of time for Malaysia is similar to Singapore. However, all the similar results have the different ratings with the research of Chua et al. (1999). The result of this research shows that the factor of monitoring and controlling is the second most important factor in

affecting the project success in the term of time. It is followed by the factor of adequacy of plan and specification as the third, and the factor of constructors' and the project managers' roles are the fourth and the seventh, as well as the factor of Adequacy of funding on the ranking 9<sup>th</sup> most important. The research results of Chua et al. otherwise shown that the most crucial in affecting the success of the project based on time objective is adequacy of plan and specification followed by the factor of Adequacy of funding at the second place, the factor of project manager at the third place, the factor of monitoring and controlling at the seventh place and the roles of a contractor at the ninth place. However, it can be said that the result of this research is consistent with Chua et al. (1999).

### 6.5: The Comparison of the Critical Success Factors of a Construction Project based on the COST Objective

This Research	Ranking (This Research)	Chua et al. research √ show the same factors was identify	Ranking (Chua's research)
Planning	1		
Contractor	2		
Adequacy of plan and specification	3	√	1
Project Manager	4	√	5
Monitoring and controlling	5	√	7
Risk identification and risk allocation	6	√	10
Supplier	7		
Realistic obligations and clear objectives	8		
Communication	9	√	2
Consultants	10		

**Table 6 :** The Comparison of the Critical Success Factors of a Construction Project based on the COST Objective

Table 6 shows that there are 5 critical success factors identified in this research which is similar to the research result done by Chua et al. (1999). Some of the similarities are the factor of adequacy of plan and specification, project manager, monitoring and controlling of the project, risk identification and risk allocation as well as realistic obligations and

clear objectives. This shows that 50% of this research result is similar to Chua et al. (1999) research result. However, the ranking of the same factors is different from each other. This research shows that the factor of adequacy of plan and specification is the third most important in affecting the project success in the term of cost. This is followed by the factor of the project manager's role at the fourth place, the monitoring and controlling at fifth, the identification and risk allocation of risk at sixth as well as the realistic obligations and clear objectives at eighth. As for the research of Chua et al. (1999), the most important factor in affecting the success of a project based on the objective of cost is the adequacy of plan and specification. This is followed by realistic obligations and clear objectives as the third, the role of a project manager as the fifth, the factor of monitoring and controlling as the seventh as well as the factor of identification and risk allocation as the tenth. However, it can be suggested that this research result is very consistent with the research result of Chua et al. (1999).

### 6.6 : The Comparison of the Critical Success Factors of a Construction Project based on the QUALITY Objective

This Research	Ranking (This Research)	Chua et al. research √ show the same factors was identify	Ranking (Chua's research)
Project Manager	1	√	4
Constructability	2		
Communication	3	√	8
Adequacy of plan and specification	4	√	1
Project organization	5		
Adequacy of funding	6		
Monitoring and controlling	7	√	3
Contractor	8	√	9
Site limitation and location	9		
Planning	10		

**Table 7 : The Comparison of the Critical Success Factors of a Construction Project based on the QUALITY Objective**

Table 7 shows that 50% of this research results are similar to the research result of Chua et al. (1999). The same factors are the role of a project manager and the Contractor, communication, adequacy of plan and specification as well as monitoring and controlling

of the project. However, it was found that these similar factors have different ranking in affecting the success of a project according to the allocated quality. This research result has shown that the role of a project manager is the most critical factor in bringing the project to achieve the project objective of quality. This is followed by the factor of communication as the third, the factor of adequacy of plan and specification as the fourth, the factor of monitoring and controlling as the seventh and the role of a Contractor as the eighth. As for the research result of Chua et al. (1999), the factor of adequacy of plan and specification is the most critical factor in helping the project towards the achievement of the objective of quality. It is then followed by the factor of monitoring and controlling as the third, the role of the project manager as the fourth, the factor of communication as the eighth as well as the role of the Contractor as the ninth. However, it can be concluded that the result of this analysis is very consistent with the research result of Chua et al. (1999).

## **7.0 CONCLUSION**

The success of a construction project can be accomplished by achieving the project objectives. The main objectives of a project are time, cost and quality. The objectives are closely related to each other. However, the determination of the objective includes complicated matters. Therefore, it is required to identify the ways to determine the objectives and to take action of the successful objective criteria besides analysing the objectives of a client, which is the most important aspect of a construction project.

The identification of the critical factor related to the success of construction projects will contribute to the achievement of an objective which will accomplish the success of the project. Aspects that affect the success of the project are the project characteristic, contractual arrangement, parties involved in a construction project and finally, the aspect of the project interactive processes.

This paper, the result of the analysis confirms that the factors that there is one set of different critical success factors for the different objective which are time, cost and quality. However, there are 6 factors that can be considered as critical to achieve for the composite of the three objectives. The factors are planning, monitoring and controlling, communication, project manager's role, contractor's role as well as the adequacy of plan and specification.

## **8.0 REFERENCES**

- Ashley, D.B and Alarcon, L.F (1996) Modelling project performance for decision making, *Journal of Construction Engineering and Management*, ASCE, 122(3), pp.265-273
- Chua, D.K.H Kog, Y.C and Loh, P.K (1999) Critical Success Factors for Different Project Objectives', *Journal of Construction Engineering and Management*, Vol. 125, No.3, pp. 142-150
- Kerzner, H (1989) *Project Management, Third Edition*, New York: Van Norstrand Reinhold Publishing

- Lim, E.C (1993) Influence of management and labour on construction productivity in Singapore, pp. 296-303
- Rockart, JF (1982) The Changing Role of the Information Systems Executive: A Critical Success Factors Perspective. Sloan Management Review, Fall 1982, pp. 3-13
- Saaty, t.L (1980) the analytic hierarchy process: Planning, priority setting, resources allocation, McGraw-Hill, London, England
- Sanvido, V, Parfitt K, Guveris, M and Coyle, M (1992) Critical Success Factors for Construction Projects, Journal of Construction Engineering and Management. Vol. 118, No. 1, pp.94-111.
- Owen, K (2002) Critical Success Factors on Private Finance Initiatives, Unpublished PhD thesis, The Nottingham Trent University, United Kingdom
- Daniel, R (1961) Daniel(1961) Management Information Crisis. Harvard Business Review. Sept-Oct, pp.111- 121Henderson,
- Rockart and Sifonis (1984) A Planning Methodology for Integrating Management Support Systems. Sloan Working Paper No. 1591-84, Sept. 1984