**Analysis of ‘Critical Success Factors’ impacting the Project Success**

# Abstract

The objective of this paper is to find, categorize and scrutinize the comprehensive set of Critical Success Factors (CSF) using the traditional method (measurement by cost, time and scope). Critical success factors are contributions to project management which directly or indirectly leads to the success of a project. This paper identifies the CSFs for enhancing the quality of the project to be successful. This paper follows Project Management methodology for identifying the CSFs. An in-depth literature review was carried out through which thirty-one variables were identified. These variables were then categorized into four major factors namely Environment, People, Project and Organization. Out of the factors above, a high significance factors were identified through survey. Regression equation and factor analysis were used to design a framework. This study systematically investigates the CFSs for projects. Although there is abundant literature existing on Project Success Factors, very little research was found in the context of identifying and categorising CFSs for projects. This study provides insights to the Project managers so that they can evaluate the project success by in-depth study of the CSFs.

**Keywords**

Critical Success Factors (CSF), Project Quality, Project Success Factors (PSF), Project Management

# Introduction

This study emphasises the tenet that the success of a project is decided by its quality. Project environment has significantly transformed the way we work in any field. Organizations employ various engineering methodologies, agile methodologies, and other methodologies to the processes to ensure success of the projects. Despite these measures, projects are often delayed or they often fail. Obviously, for a project to be successful there are many numerous factors which contribute towards making a project successful. Many researchers have tried identifying project success factors to date. Modern business environment is very unstable which in turn reduces the rate of project success. (Andersen et. al,2006). Like many others, the researchers have also stressed upon the iron triangle (cost, time and scope) and have analysed the hard (technical) and soft(behavioural) issues concerning project success. Jayawardhana and Perera also identify scope, time and cost as the main factors for determining quality. (Jayawardena & Perera, 2010)

The most prominent measurement so far for the success of a project has been triple constraint (or iron triangle). This method was invented by Dr Martin Barnes in 1969 which is also called the traditional method. Figure 1 shows the interdependence of the three aspects of a project. This triangle has been treated as universal model for project success. However, review of literature reveals that many other factors also come into picture.

Figure 1 Iron Triangle



Han and Huang (2007) extended the traditional measurement methods by adding ‘reliability’, ‘ease of maintenance’ and ‘quality’. Quality has been termed as a long-term profitable entity (Dhirani et al., 2010).

When we discuss about quality International Organization for Standardization (ISO) comes into picture. ISO is a quality standard which is helps processes to enhance and in turn support organizations. The traditional components of a project success namely cost, time and scope can be delivered only when quality is maintained. (Bangert, 2007). Thus, quality is an essential factor for the success of a project.

The following sections discuss various additional factors that need to be considered for the successful completion of a project.

# Literature review

This section reviews some of the notable available literature on Project, Project Quality and Project Success Factor (PSF).

**2.1 Project**

Before the detailed study, it is imperative to know what is project and project management. Development of a project is a complicated process. It does not only require knowledge of technical aspects but also needs leadership and people management skills. People, also termed as stakeholders can be internal (employees) or external (vendors, suppliers) to the project or organization. Projects involve several internal and external stakeholders. Project success is highly dependent on the amalgamation of development process and project management skills (Madanayake et al., 2009). Risk management is also a vital part of the development process because of the constantly changing requirements from clients. Risk assessment needs to be done considering the PESTEL (Political, Economic, Social, Technological, Environmental and Legal) factors. From the project management perspective, “*a project is a temporary endeavour with a specific beginning and end”*. This is the standard definition of a project given by the Project Management Book of Knowledge (PMBOK). “*Project management is the application of knowledge, skills and techniques to the project tasks to meet the project prerequisites*” (Project Management Institute, 2017)

We have seen in this section about project and project Management definitions, now we need to understand project quality.

**2.2 Project Quality**

# Wateridge (Wateridge, 1995) indicates that quality plays an important role and contributes nearly 67%, to the success of a project. Pheng and Chuan (2006) assert that the quality of a project’s final product and the quality objectives of the project considerably affect the project success. Anuar and Ng (2011) agree that preserving quality is very important for the success of projects, and also recommend ensuring that the project is completed within the appropriate time and cost.

**2.3 Project Success Factors**

This section provides an overview of project success factors. There are various aspects which need to be considered while measuring project success. Many researchers have been trying to explore and design various valid approaches and methods to measure project success in a reliable way. Documentation and investigation of project success factors plays a significant role in measuring project success. There has been ample research carried out on finding the project success factors. Thomas and Ferna´ndez recommend the effective practices like - definition of success must be agreed upon, measurement should be consistent and the use of results for project success.(Thomas & Ferna´ndez, 2008). According to Jayawardhana and Perera, when all the failure factors (incomplete requirements, lack of user involvement, lack of planning, and lack of resources) are managed appropriately, it will lead to project success.(Jayawardena & Perera, 2010) A clear and well defined understanding of what needs to be achieved for project success will significantly contribute to the target of project success (Wilson and Howcroft, 2002).

Project managers should be mindful of such factors for improving the chances of their project’s success (Lankarani & Asadi, 2012). According to Clarke, a holistic approach should be taken for project success and therefore various critical factors need to be explored and assessed.

Most of the researchers agree that defining project success is not easy and it depends on many factors(Besteiro, Pinto, & Novaski, 2015). Pinto and Slevin (1989) argue that measuring project success is difficult as the definition of success often remains unclear. If the success factors are not clearly identified and analysed, it may be quite challenging to determine project success; to some it may be success and to some others, it may be failure. Terry Cooke-Davies (2002) mentions that project success factors are the contributions that directly or indirectly lead to the success of a project. This Critical Success Factor (CSF) concept attempts to identify those activities which contribute to success. (Azimi & Manesh, 2010) The term CSF originally appeared in management literature in 1960s where the main focus was on industry-related CSFs (Daniel, 1961). Rockart (1979) further refined the CSF approach and concluded that it is extremely effective in helping the executives to define their substantial information needs. On this basis, Bullen and Rockart (1981) focused on finding what outcomes were necessary to attain anticipated aims. According to Nasir and Sahibuddin (2011), CSFs can also be described as topics that if addressed correctly, can significantly increase the probability of project success.

According to Borman and Janssen, CSFs can have two approaches to support decision making – first one focused on outcomes, individuals, specificity and second on process, projects and generalizability. (Borman & Janssen, 2013)

Another interesting CSF was PMO (Project Management Office), they state that a well-defined PMO is a step forward for success of an organization. (Desouza & Evaristo, 2006)

New CSFs came into picture which were given by Teo & Ang are Top Management is committed, Information Systems (IS) Management is well-informed about business and Top Management has assurance in the IS department. (Teo & Ang, 1999)

Belassi and Tukel (1996) have grouped the factors into the four areas given below:

1. Factors directly related to the project
2. Factors connected to the project manager and team members
3. Factors linked to the organization
4. Factors related to the external environment

Belassi and Tukel indicate that a large number of project managers consider ‘quality’ to be the most important factor. It is very imperative that project managers need a better understanding of the CSFs and understand techniques to measure them.

Based on the literature review, various CFSs were analyzed and identified as the most crucial to the project success. Based on the framework given by Belassi and Tukel, the factors were classified into four categories as follows:

1. Organization
2. Project
3. People
4. Environment (Internal/External)

This section discussed about project, project management, success factors and identification of various success factors for the project. The following section outlines the framework by Belassi and Tukel.

1. **Conceptual Framework**

The framework groups the factors into four categories. Refer Figure 2.

Figure 2 Critical Factors for project success



This framework not only groups the factors but also help project managers understand the intra-relationships between the factors in different groups.

Project factors are important for good project performance. Project manager and team members’ skills are essential dimension of project success. For the successful completion of projects, full support from the organization is essential. Nature of environment for the project affect the project performance (positively or negatively) Belassi and Tukel (1996)

# Research Objective

The main objective of this research is to identify and analyze the critical success factors impacting quality of the projects.

# Research Design and Data Collection

# This exploratory study was carried out through a questionnaire survey. A well-structured questionnaire consisting of two parts was designed for the purpose of the study. The questionnaire was designed based on the factors recognized from the literature review. The first part covers the demographic profile of project managers and the second part includes items related to project management related practices. All relevant data was collected between January 2019 and April 2019. This study also involves a statistical analysis for grouping the variables and assessing the reliability of the factors.

Primary data was collected from the project managers in Pune, India. The questionnaire was distributed to a total of 110 participants (As per the MCCIA -Mahratta Chamber of Commerce, Industries and Agriculture which is a database of Industries, (Micro, Small, Medium Enterprises (MSME) manufacturing data was selected for this study. Based on this data and literature review, the sample size of 110 was determined) (MCCIA, 2018).

Table 1 MSME Definition Source https://msme.gov.in/know-about-msme, 1 July 2020

|  |  |  |
| --- | --- | --- |
|  | Investment | Turnover |
| Micro | Less than 1 cr. | Less than 5 cr. |
| Small | Less than 10 cr. | Less than 50 cr. |
| Medium | Less than 20 cr. | Less than 100 cr. |

A total of 87 valid responses were obtained yielding a response rate of 79.09 per cent. The target respondents for this study were project managers.

The questionnaire was designed based on the four factors mentioned above, viz., People, Project, Environment and Organization. Questions were asked covering various variables such as resource availability, use of appropriate technology, effective project control, task allocation to resources, clear roles and responsibility, risk management, communication management and a few more variables. The comprehensive list of the variables is given in Annexure A.

These factors were assessed through a 5-point Likert scale with end points defined as Strongly Disagree (=1) and Strongly Agree (=5). The respondents were provided with adequate instructions at the beginning of both sections of the questionnaire for clarity.

Data was collected through physical forms as well as online forms. The collected data was found to be consistent through data analysis.

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# Results and Discussion

This section describes the statistical analysis of the data collected.

After reviewing the literature and identifying the factors, a systematic grouping of the variables was done based on the identified factors.

In this study, Cronbach’s α was used to check the internal consistency of the items included in the questionnaire. The threshold value of Cronbach’s alpha is 0.7. (Refer Table 1 for Cronbach Alpha for reliability of Project, People and Environment factors). It was observed that, ‘Organization’ factor failed the reliability test with Cronbach's alpha 0.343. Therefore, researchers considered only three factors People, Project and Environment for factor analysis.

(Jum Clarence Nunnally, 1978) Nunnally argued that in theoretical studies, even modest reliabilities of 0.60 or 0.50 may be acceptable. Generally, agreed lower limit for Cronbach’s alpha value is 0.70, it may decrease to 0.60 and still be acceptable, especially in exploratory studies and in research in the Social Sciences (Joseph F. Hair et al., 2010).

Table 1 Reliability of 3 Factors: People, Project and Environment.

|  |  |
| --- | --- |
| Reliability Factor | Cronbach's Alpha |
| People Factor (3 items) | 0.664 |
| Project Factor (10 items) | 0.812 |
| Environment Factor (7 items) | 0.756 |

Factor analysis is used to create a statistical model which predictive in nature. Factor analysis focuses on the formation of factors. It was done to get the loading of variables. It aims at grouping variables based on a high correlation between them. Also, there can be a possibility of lower correlation between variables. As the model is based on correlation between variables, KMO & Bartlett’s Test of Sphericity was used to measure the sampling adequacy for each variable in the model and for the complete model(Kaiser, 1970). This test acts as a practical measure of the suitability of the data available for factor analysis; The KMO test returns value on a scale of 0 to 1.

Also, this test relates to the significance of the study and shows the validity and suitability of the collected responses. If the Sphericity is less than 0.05, Factor Analysis can be used (BARTLETT, 1950).

Table 2 shows that sampling adequacy is 0.744.

This result acts as a suggestion that the correlations between the available data are sufficient.

Table 2 KMO and Bartlett's Test

|  |  |  |
| --- | --- | --- |
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0.744 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 1.47E+03 |
|  | Df | 496 |
|  | Sig. | 0 |

Out of the 31 variables, 20 variables were found to be relevant after performing Factor analysis (see Annexure A). Those 20 parameters were grouped into 4 factors and assessed for the reliability.

Referring to Table 3, a significant regression equation was found

F(3, 83) = 22.757, *p* < .000), with an Adjusted *R square* of 0.431.

Table 2 ANOVAb

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Model |  | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 19.37 | 3 | 6.457 | 22.757 | .000a |
|  | Residual | 23.549 | 83 | 0.284 |  |  |
|  | Total | 42.92 | 86 |  |  |  |

a. Predictors: (Constant), Environment Factor, People Factor, Project Factor

b. Dependent Variable: Completion of project with quality

Correlation and multiple regression analysis were conducted to examine the relationship between ‘Completion of project with Quality’ and various potential predictors. (see Annexure A).

We refer to the Table 4: Coefficients table to assess the contribution and significance of three predictors People Factor, Project Factor and Environment Factor.

Table 3 Coefficients

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Model |  | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|  |  | B | Std. Error | Beta |  |  |
| 1 | (Constant) | 0.407 | 0.637 |  | 0.639 | 0.525 |
|  | People Factor | -0.183 | 0.056 | -0.384 | -3.26E+00 | 0.002 |
|  | Project Factor | 0.124 | 0.022 | 0.762 | 5.68E+00 | 0.000 |
|  | Environment Factor | 0.042 | 0.025 | 0.184 | 1.69E+00 | 0.096 |

a. Dependent Variable: Completion of project with quality

The *Sig* column contains the p-values for each of the independent factors. People Factor (p = 0.002) and Project Factor (p = 0.000) are significant predictors of ‘Completion of project with quality’. There was a significant relationship between the People Factor and ‘Completion of project with quality’ (p < 0.05) and Project Factor and ‘Completion of project with quality’ (p < 0.05). Environment Factor (p = 0.096) is insignificant and does not impact much on ‘Completion of project with quality’ as (p > 0.05).

Completion of project with quality (y) = 0.407 - 0.183 \*(PeopleFactor) + 0.124\*(ProjectFactor) + 0.042\*(EnvironmentFactor)

1. The above multiple regression equation shows that if People Factor is increased by 1 unit, Completion of project with quality will go up by 0.183 controlling for the effect of Project Factor and Environment Factor.
2. The above result shows that if Project Factor is increased by 1 unit, Completion of project with quality will go up by 0.124 controlling for the effect of People Factor and Environment Factor.
3. The above result shows that if Environment Factor is increased by 1 unit, Completion of project with quality will go up by 0.042 controlling for the effect of People Factor and Project Factor.

Referring to the Table 5, Adjusted R *square* value of 0.431 indicates that 43% of the variation in ‘Completion of project with quality’ can be explained by the model containing EnvironmentFactor, PeopleFactor and ProjectFactor. Predictions from the regression equation are fairly reliable. It also means that 57% of the variation is still unexplained so adding other independent variables could improve the fit of the model.

Table 4 Model Summary

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .672a | 0.451 | 0.431 | 0.533 |

a. Predictors: (Constant), Environment Factor, People Factor, Project Factor

## Research limitation

In order to design a generic model for Project Success Factors, more fields can be explored and assessed. The sample is not comprehensive in context of any other industry.

# Conclusion

This paper has attempted to explore and evaluate major factors that affect the project success. It has focused on building a framework of critical success factors for any industry. Similar research can be done in the context of Power, Banking, oil and gas industry sector. This empirical research will help the companies in measuring the project success. The results obtained suggest that success variables should not be taken from one particular factor; they should be taken from different factors like people and organization- external/internal. The paper concludes that the Project Manager needs to focus on the Environment Factor, People Factor, and Project Factor for a successful project. The result of the study will be valuable to the industry practitioners in developing better tools and practices for project success. The managers who are working on projects can benefit from the these success factors and the categories. This article suggests some guidelines for the project managers to sort out and prioritize project resources. The analysis shown in the article could provide good insights for improving the functioning of the project. Organizations face considerable challenges in implementing Project Management concepts, this study has examined the success factors of a project and how these factors play an important role in the success of the project. We have seen in this study that apart from triple constraint- time, cost and scope, there are other factors which impact the project success.

**Annexure A: Predictors impacting quality of project**

|  |  |
| --- | --- |
| **Factor** | **Variable** |
| People | Clear roles and responsibilities |
| Availability of resources with the right skills |
| Project manager’s ability to deal with constraints |
| Project | Robust planning and design |
| Right task allocation |
| Effective project controls (Monitoring and Control) |
| Effective implementation/deployment of the project |
| Risk awareness/management |
| Completion of project within estimated cost |
| Completion of project within estimated time |
| Internal communication (within the Project team) |
| Use of appropriate Technology, Tools and Techniques |
| Effective communication management |
| Environment | Internal stakeholders management |
| External stakeholder management |
| Internal stakeholders satisfaction |
| External stakeholders satisfaction |
| End user satisfaction |
| External communication (with other Projects, suppliers, support groups) |
| Consideration of PESTEL factors |

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