

Essential Project-Related Factors Influencing Major Construction Projects

Utkarsha M. Bendale¹, Dr. Prof. P. P. Bhangale²

¹Student, Dept. Of Civil Engineering, SSGBCOEIT, Bhusawal, Maharashtra, India

²Head of Dept. Of Civil Engineering, SSGBCOEIT, Bhusawal, Maharashtra, India

Abstract - This paper aims to explore the project-related factors that would be useful in gauging overall performance of Major Construction projects. This study is limited to the project-related factors in Major Construction projects. Structured interviews and questionnaire survey were conducted across stakeholders to gather their views on important project-related factors in Major projects. Relative importance index (RII) method was computed so as to rank the important factors. The study concluded that Project life cycle (RII=0.981), Planning (RII=0.963), Scope (RII=0.909), Clear and realistic goals and objectives (RII=0.890), and Quality (RII=0.781), are the top most significant project-related factors influencing the Major Construction projects. Assessment of these crucial factors can help construction companies and project managers to identify the critical project-related factors responsible for achieving the desired performance level and to avoid or reduce the cost overruns, delays, and benefit shortfalls.

Key Words: Major Construction projects, Project-related factors, Assessment, Complexity, and Mumbai.

1. INTRODUCTION

Major Construction projects often lead to cost overruns, benefit shortfalls, delays and lower-than-predicted revenues as they are unique construction projects known for their complexity, vast size, expensive cost, and long time frame compared to conventional construction projects that hinders economic growth instead of advancing it. Bent Flyvbjerg et al (2014) defined the Major projects as those projects whose costs exceeds 1 Billion US \$ and time taken for project completion by the project exceeds 5 years. 'Reference class forecasting', a method for comparing new projects to previous ones to ensure estimates about costs and timings are as accurate as possible, but it is difficult if a project is the first of its kind. Hence, benefit overestimates and cost underestimates are more likely to occur in case of Major projects. Major projects are inherently risky due to long planning horizons and complex interfaces. Being riskier, they are more expensive to finance. Major projects are more of a gamble, but in some cases, the gamble pays off. Often projects are led by planners and managers without deep domain experience who keep changing throughout the long project cycles that apply to Major projects, leaving leadership weak. Delays are a separate problem for Major

projects and delays cause both cost overruns and benefit shortfalls. For debt-financed projects this is a recipe for disaster, because project debt grows while there is no revenue stream to service interest payments, which are then added to the debt, etc. As a result, many projects end up in the so-called "debt trap" where a combination of escalating construction costs, delays, and increasing interest payments makes it impossible for income from a project to cover costs, rendering the project non-viable. Success is so rare in major project that at present it can be studied only as minor sample research, whereas failure may be studied with large samples of projects. Generally, major project planners and managers and their organizations, do not know how to deliver successful Major projects, or do not have the incentives to do so, and therefore such projects tend to "break" sooner or later, for instance when reality catches up with optimistic or manipulated estimates of schedule, costs or benefits and delays, cost overruns, etc. follow. Helping the construction companies and project managers to identify the critical project-related factors responsible for achieving the desired quality level and also the attributes adversely affecting the Major projects has been the motivating factor behind this study.

2. OBJECTIVES OF THE STUDY

The objectives of the study are as follows:

- Identify important project-related factors for the Major construction projects from the literature study.
- Conducting case studies on the Major projects.
- Analysis and discussion of the data collected for the successful implementation of Major projects.

3. RESEARCH METHODOLOGY

The methodology is a multiple case study based on questionnaire survey and personal interviews with people actually working with management of Major Construction projects. The project-related factors were firstly evaluated from literature studies based on theoretical concepts and then a questionnaire was prepared. The surveys are carried out by conducting in-person interviews of the project manager and experts with the aim of assessing the project-related factors at each project. Generally, the key ethical issues arises during data collection or interviewing due to the

sensitivity of information of the projects and in this survey prior to the interview, firstly official permission was taken from the HR managers and managing departments belonging to particular construction company for conducting the questionnaire survey and interviews for research study purpose. The intention of the survey was made clear by illustrating the respondents, the need of gathering information and how it will be used and they could withdraw from the study at any time. The questionnaire is filled by 11 experienced construction professionals and then the data collected is analyzed and the results are discussed.

4. DATA COLLECTION AND CASE STUDIES

The case study was conducted at 3 residential Major projects are considered for the survey located at Mumbai city. The time required for the completion of all projects is greater than 6 years and the costs of project are 210 Cr, 1000 Cr and 800 Cr, respectively. 18 respondents were asked to fill the questionnaire during the survey, among them 11 respondents answered the questionnaire and interviews conducted. The total response rate is 61.11% and the refusal rate of the respondents is 39%. Out of total respondents, 37% were experienced more than 25 years in construction industry, 27% respondents have experience in between 20-25 years, 27% respondents have experience in between 10-20 years and only 9% had experience less than 10 years. All the respondents were well-educated and most of them have completed their post-graduation in their relevant fields.

5. ANALYSIS OF SURVEY RESULT

The detailed information of the project and respondents was collected through questionnaire and interviews and the data and statistics were reduced and analyzed. The survey and interviews were carried out in order to provide multiple perspectives and for more comprehensive and comparative results from the survey. Likert scale was used in questionnaire for the survey research, as shown in Table no. 1.

Table -1: Likert scale used for data measurement

Item	Very less important	Less important	Moderately important	More important	Very much important
Scale	1	2	3	4	5

The weightings to each factor were given by respondents according to their significance and the numbers are merely numerical labels and do not indicate any absolute quantities.

5.1 Relative Importance Index (RII)

RII is a statistical method which has been used in this study to determine the ranking of important project-related factors. The relative importance index is computed by the following formula,

$$\text{RII} = \frac{\sum W}{A \times N}$$

Where, 'W' is Weight given to each factor by the respondents (ranging from 1 to 5), 'A' is the highest weight, and 'N' is total number of respondents. RII value should range between 0 to 1 (0 not inclusive). Higher the value of RII, more important is the project-related factor for Major Construction projects.

5.2 Data Analysis

Table -2: Calculation of Mean of weightings given to each factor, their RII and Ranking of the factors

Sr. No.	Project-Related Factors	$\sum W$	Mean $\frac{\sum W}{N}$	RII $\frac{\sum W}{A \times N}$	Ranking
1	Scope of project	50	4.545	0.909	3
2	Complexity	42	3.818	0.763	6
3	Size of Project	41	3.727	0.745	7
4	Project Life cycle	54	4.909	0.981	1
5	Singularity (Uniqueness)	38	3.4545	0.690	9
6	Clear and realistic goals and objectives	49	4.4545	0.890	4
7	Planning	53	4.8181	0.963	2
8	Quality	43	3.909	0.781	5
9	Project Value	34	3.0909	0.618	11
10	Risk and Uncertainty	33	3	0.600	12
11	Innovations	37	3.3636	0.672	10
12	Profitability	39	3.5454	0.709	8

6. RESULT AND DISCUSSION OF RESEARCH FINDINGS

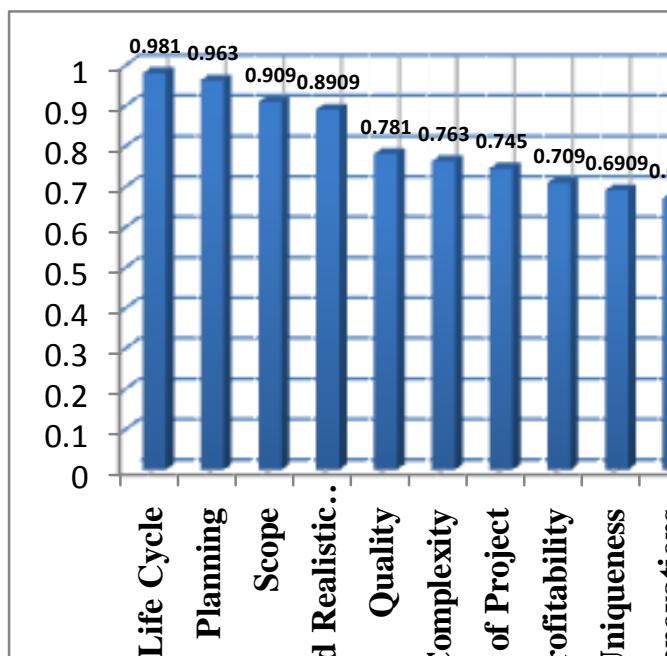


Chart -1: Project-Related factor for Major Construction projects

Table -3: Ranking of Project-related factors

Project-related factors	RII	Rankings
Project Life Cycle	0.981	1
Planning	0.963	2
Scope of the project	0.909	3
Clear and Realistic goals and objectives	0.8909	4
Quality	0.781	5
Complexity	0.763	6
Size of project	0.745	7
Profitability	0.709	8
Uniqueness	0.6909	9
Innovations	0.672	10
Project Value	0.618	11
Risk or Uncertainty	0.600	12

- i. **Project Life Cycle:** Managers often use life-cycle concept as a valuable tool for better understanding of stages in a project. During the early conceptualization and planning stages, effort requirements are minimal, increasing rapidly

during late planning and project execution, before diminishing again in the project's termination. As a result, the concept of project life cycles can be quite useful to a manager, not only in terms of distinguishing among the stages in the project's life, but also through indicating likely resource requirements to be expected at each stage.

- ii. **Planning:** Most of the projects had cost overrun as a result of the poor planning and misinformation in the preplanning and planning phase. Major projects must assess clarity and evaluate especially at the preplanning phase and at the board members, executive level and even at project management team level. Major projects pre-planning takes long time to plan and it is complex and risky due to the existence of different authorities around projects site. Complexity and advancement of technology complicates the project's design at the preplanning or planning phase. As long as we only focus on the life cycle itself, we miss the critical early planning stage that more accurately typify the responsibilities of the project owner and the project manager.
- iii. **Scope of the project:** The project scope is fundamental for planning and execution. The changes in scope often require adjustments in other project objectives like cost, time, quality, etc. Scope impacts on the project cost and time and when any change in scope occurs, it leads to inability to meet the original budget and schedule. Without clarity of scope, projects can encounter large number of difficulties including scope creep, lack of support, inability to satisfy customer needs, inability to reach conclusion.
- iv. **Clear and Realistic goals and objectives:** Setting goals and objectives for projects is an essential step, because they identify the destination and also provide a road map for getting there. Projects will only succeed, if they have clear goals and objectives. Thus, goals can be motivational and increase performance. Setting individual performance goals provides a framework for translating the goals of the organization into smaller chunks that are assigned or delegated to individual employees. If employees know what they need to accomplish, they can look at their results as they go and identify barriers to achieving those goals.
- v. **Quality:** Poor quality can hurt the reputation of company and country, in case of Major projects, and if the company continues in the same way it might

have to close its shop for want of new projects. Moreover, major project quality issues for small and medium companies that intend to build high quality Major projects.

- vi. **Complexity:** Understanding the complexity of the project is important for project management, because it is associated with difficulties in decision-making and goal attainment. The complexity of a project, along with the level of uncertainty is the characteristic most commonly associated with Major projects. Relationships between complexity and risk, i.e. uncertainty, which can be categorized in the three groups: Uncertainty and complexity are independent characteristics; Complexity is compounded by uncertainty; Project complexity is the source of uncertainty in project; the level of complexity is determined by limiting factors, uniqueness and uncertainties. The larger the size and complexity of the project; the more uncertainties and risks in all its form surround it.
- vii. **Size of project:** If the size of the project is large, the limited number of project people may not be able to do justice in all areas and this may adversely affect the project quality. Project size is a key management variable addressed as part of project definition and process scope. When it comes to project fast tracking, sizing is essential to adapt appropriate management practices and achieve optimizing benefits. Sizing is also critical to determine and negotiate realistic project priorities. And, of course, sizing continues throughout the project lifecycle as changes occur.
- viii. **Profitability:** The first and major issue affecting project profitability is linked to discrepancies between what should be included or excluded from the scope of a project. Clients tend to consider a broader scope than project leaders and this difference in perception often leads to problems and conflicts that eventually affect project profitability. Spending the necessary time to define and share the scope of a project is a key factor in project profitability.
- ix. **Uniqueness:** Uniqueness of the project activities requiring high technical know-how in the failure attributes indicates that if a project involves certain unique activities that the project people have not performed on previous projects it contributes negatively to achieving the desired quality. Uniqueness bias impedes managers learning,

because they think they have nothing to learn from other projects as their own project is unique. This lack of learning may explain why managers who see their projects as unique perform significantly worse than other managers.

- x. **Innovations:** The impact of innovation can also be measured by its degree of novelty. Because of the uniqueness, all construction is innovative. Major projects have high investment and low variable costs in innovations.
- xi. **Project Value:** Value is defined as meeting client's requirements with a minimum of waste, i.e. non-value added activities. Value generation in projects is must to realize all and only what is required by the client stakeholders to fulfil their needs.
- xii. **Risk or Uncertainty:** Major projects are highly risky. Risks play a significant role in decision making and may affect the performance of a project. Risk is an exposure to consequences of uncertainty. There are two types of uncertainty in a project: the uncertainty of the objectives i.e., how many objectives have been defined and the uncertainty of the method i.e., how many methods have been defined for achieving the objectives on the basis of which different methods of management and running the project are proposed.

6. CONCLUSION

The objective of the study is to shed lights on important project-related factors and their evaluation in the initial phases of construction. Different project participants will have different perceptions of project-related factors depending on what criteria they have most focused on. Assessment of all important project-related factors is not only an operationally important activity but also a strategically important activity. Prior knowledge of these factors at various stages in project life cycle can save huge amount of money and time in Major projects. According to survey results, the 'Project Life Cycle', 'Planning', 'Scope', 'Clear and realistic goals and objectives', and 'Quality' are ranked as top 5 most significant project-related factors influencing Major Construction projects. The best crew, with experience from other complex projects - lead by an excellent project manager with great managerial skills seem to be more important in Major complex projects. The project manager must distinguish the project-related factors which need higher attention and thus by assessing relationship between them can ensure higher gain. In order to succeed in Major projects, all the participants in the project need to archive the aim and objective of the project. The empirical

findings of this study hopefully will help the construction players to identify the critical project-related factors that would be useful in assessing the implementation of Major projects.

ACKNOWLEDGEMENT

I would like to express my profound gratitude and great appreciation to my guide Prof. P. P. Bhangale, HOD of Civil Engineering Department for his encouragement, valuable advice, constructive suggestions and guidance throughout this work.

REFERENCES

- [1] Abdulaziz Ali M. Albishri, 2015, "Mega-Project Engineering-Management Processes: Pre-Planning Phase Evaluation for Construction and Mining", Curtin University, December, 284.
- [2] Albert P. C. Chan, David Scott and Ada P. L. Chan, 2004, "Factors Affecting The Success Of A Construction Project", Journal Of Construction Engineering And Management © ASCE, January-February, pp. 153-155.
- [3] Ayman Ahmed Ezzat Othman, 2013, "Challenges of mega construction projects in developing countries", Organization, Technology and Management in Construction- an International Journal, pp 730-746.
- [4] Bent Flyvbjerg, 2014, "What You Should Know about Megaprojects and Why: An Overview", Project Management Journal, vol. 45, no. 2, April-May, DOI:10.1002/pmj.21409, pp. 6-19.
- [5] Christian Brockmann, Horst Brezinski, 2016, "Innovation in the Construction of Mega-Projects", Journal of Construction Engineering and Management (ASCE), Volume 142, Issue 11, November, pp. 13.
- [6] El-Sokhn, N.H. And Othman, A.A.E., 2014, "Project Failure Factors and Their Impacts on the Construction Industry: A Literature Review", Proceedings of the 10th ICCAE-10 Conference, May, pp. 1-19.
- [7] Ivana Burcar Dunovi, Mladen Radujkovi, Kristina Ana Skreb, 2014, "Towards a new model of complexity - the case of large infrastructure projects", 27th IPMA World Congress, Procedia - Social and Behavioral Sciences 119, pp. 730 – 738.
- [8] K. N. Jha & K. C. Iyer, 2006, "Critical Factors Affecting Quality Performance in Construction Projects", Total Quality Management, Routledge, Vol. 17, No. 9, November, pp. 1155-1170.
- [9] Md. Asrul Nasid Masrom, Mohd Hilmi Izwan Abd Rahim, Sulzakimin Mohamed, Goh Kai Chena, Riduan Yunus, 2015, "Successful criteria for large infrastructure projects in Malaysia", The 5th International Conference of Euro Asia Civil Engineering Forum (EACEF-5), Procedia Engineering 125, pp. 143-149.
- [10] Neringa Gudienėa, Audrius Banaitisa, Nerija Banaitiene, Jorge Lopes, 2013, "Development of a Conceptual Critical Success Factors Model for Construction Projects: a Case of Lithuania", 11th International Conference on Modern Building Materials, Structures and Techniques, MBMST 2013, *Procedia Engineering* 57, pp. 392-397.
- [11] Odesola, I.A., Otali, M. And Ikediashi, D.I., 2013, "Effects of Project-Related Factors on Construction Labor Productivity in Bayelsa State of Nigeria", Ethiopian Journal of Environmental Studies and Management, Vol. 6, pp. 817-826.
- [12] Saleh Samir Abu Shaban, "Factors Affecting the Performance of Construction Projects in the Gaza Strip", April 2008.
- [13] S. M. Renuka, C. Umarani, S. Kamal, 2014, "A Review on Critical Risk Factors in the Life Cycle of Construction Projects", Journal of Civil Engineering Research, Vol. 4(2A), pp. 31-36.
- [14] S. Pretorius, H. Steyn & T.J. Bond-Barnard, 2017, "Exploring Project-Related Factors That Influence Leadership Styles And Their Effect On Project Performance: A Conceptual Framework", South African Journal Of Industrial Engineering, December, Vol. 28(4), pp. 95-108.
- [15] Youcef J.-T. Zidanea, Agnar Johansenb, Anandasivakumar Ekambaram, 2013, "Megaprojects - Challenges and Lessons Learned", 26th IPMA World Congress, Procedia - Social and Behavioral Sciences 74, pp. 349-357.