

Key Performance Indicators for Measuring Construction Performance in India

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ABSTRACT

The goal of the present study is to analyze and analyses a set of performance criteria judged useful by artificial specialists, with the most important indications being those pertaining to overall design quality. This paper presents the findings of a review of metrics for assessing the performance of building systems in India. A list of performance measurement systems has been compiled, which is supported by a comprehensive review of the literature. These factors, which are divided into 11 categories and called Crucial Performance Indicators, are utilized to develop a check questionnaire, which is then used to anatomize the check results and determine the relative relevance and ranks of various KPIs. Cost, time, security, output, satisfaction, quality, knowledge, and maintenance are the most essential Critical Performance Pointers for measuring the effectiveness of building systems, according to the research (in descending order).

Keywords-: Key Performance Indicators (KPI), Performance Indicators, Crucial Construction Indicators

1. INTRODUCTION

Any project's performance metric serves as a foundation for continuous improvement. Construction directors are always improving the effectiveness of their systems due to the highly competitive nature of the sector and substantial technological advances. The performance of a project in terms of cost, time, and quality is commonly considered as a measure of design success (1). The construction industry is labor-intensive, employing millions of people in direct and indirect roles. Given the diversity of construction systems across all sectors of the economy, such as energy, housing, and transportation, it is required to establish a set of common KPIs and develop a measurement scale to normalize construction project performance metrics.

The purpose of the provided research is to evaluate the efficiency of the project performance procedure. This study will provide references for process improvement based on the study's findings. Key Performance Indicators (KPI) were identified as a result of research on the functioning of the Indian housing industry. The research also suggests ways to improve existing work routines.

2. OBJECTIVE OF RESEARCH

Examine the current performance measurement framework in use in the construction industry and by governments in industrialized nations, including the performance measurement process, project phases, project stakeholders, CSFs, PMs, and PSMs; In the implementation of residential building projects, investigate and identify the performance measuring procedure, CSFs, PMs, and PSMs; Finalize the study's findings and make recommendations for additional research in the areas of residential building project performance measurement and related topics.

3. LITERATURE REVIEW

"Performance measurement is at the heart of continuous development," according to [2]. Benchmarking is, in general, the next step in improving the efficiency and effectiveness of goods and processes." [3], [4], [5], [6] describe project success and related key performance metrics in previous research. However, in order to successfully verify the validity of the suggested performance measurement method, it is necessary to ask how success/performance is commonly measured. This is frequently owing to the extensive timelines required in real-world projects and the potential effect of project management control activities on the various processes [7].

A Key Performance Indicator (KPI) is a metric that measures the effectiveness of an activity that is critical to a company's success. They're a collection of knowledge metrics that won't help you evaluate the efficiency of a building project. [8]. The goal of KPI is for profitable firms to execute projects on schedule, on budget, with no faults, effectively and safely. Cost of

capital, construction time, predictability, flaws, accidents, productivity, and turnover & profitability are the seven performance measures outlined by [2]. With seven organizations, [9] established a KPIs Framework for the United Kingdom housing industry. Time, cost, quality, client happiness, client changes, company success, and health and safety are the factors to consider. [10]. Identifies the following eight KPIs for all construction:

- (1) Client satisfaction (product, service and value for money);
- (2) Defects;
- (3) Predictability (cost and time);
- (4) Profitability;
- (5) Productivity;
- (6) Safety;
- (7) Construction cost; and
- (8) Construction time.

Some behaviors, according to the data, have an influence on project performance. The most important of them are the processes involving scope management, such as regulating the contract document's standard, the quality of the answer to be perceived, and the variations and degree of contract revisions. The cornerstone for performance improvement initiatives is performance measurement, which is an important component of performance management. In order to increase performance, organizations should measure and compare their performance to benchmarks [12]. However, performance evaluation may not necessarily lead to improved performance. These are techniques for determining if an operation has yielded the desired result. Performance measurement may help companies discover areas where they need to make adjustments in their operations.

4. METHODOLOGY

The current study's performance indicators (PI) were acquired from the literature review. They were then rationalized by merging some, deleting some because they were very detailed, and separating a few to increase measurement accuracy. The 59 PIs were reduced to 40 for the purposes of this inquiry. These performance indicators were classified under 11 performance perspectives (KPIs) by conducting a preliminary survey of five housing industry experts, including project managers, engineers, and academicians, including cost, time, satisfaction, quality, people, legal, knowledge, safety, productivity, service, and risk. The 40 grouped PIs sparked the idea for a questionnaire survey (as stated in Table 1). There are four sections to the questionnaire. Inquiries about the fine print of the construction company and, as a result, the reply, are included in the major portion. Respondents were asked to rate each PI on a five-point Likert scale based on its influence on project performance in the second segment, which included questions on the scope, importance, and process of utilising PIs in construction projects. Supplementary observations are included in the third part, and the KPIs for assessing development activities in India are ranked in the fourth section.

1	2	3	4	5	6	7
Not Important	Slightly Important	Somewhat important	Moderately important	Important	Very Important	Extremely Important

Table 1: Likert scale [4]

Sr. No.	KPIs	Performance Indicators
1	Cost	Total construction cost Profitability Variance cost
2	Time	Total project duration Schedule/Time performance
3	Safety	Health and safety Recordable accident rate Labor safety management Lost workday case incident
4	Productivity	Productivity Supplier performance Resource management

5	Satisfaction	Client satisfaction Contractor satisfaction End-user satisfaction Project team/ participant satisfaction
6	Quality	Quality control Quality management Number of non-conformities
7	Knowledge	Staff experience Contractor experience Innovation and improvement/learning Project management
8	Service	Environmental performance Sustainability Functionality Site management Extent of sub-contracting
9	People	Motivation Communication/Effective communication Trust and respect Harmonious working relationship Employee's attitude Decision effectiveness Long-term business relationships Professional image establishment Top management support
10	Risk	Effectiveness of risk management
11	Legal	Claim avoidance Litigation avoidance

Table 2: Classification of Performance Indicators according to KPIs [4]

5. FINDINGS

All PIs met the criterion for trust ability based on Cronbach's alpha value. With Cronbach's alpha values ranging from 0.944 to 0.948 and negligible deviations, the check's opinions are mostly in accord. To define the order of KPIs for design performance measurement, the mean of PIs categorized under each KPI was computed and placed in decreasing order as shown in Table 4. The top eight KPIs were picked based on their weightage's additive likelihood. Project success is said to be defined by how well a project succeeds in terms of cost, time, and quality (13). In this study, quality is the sixth most important KPI.

Sr. No.	Performance Indicators	Mean	Std. Dev.	Variance	Rank
1	Total Project Duration	5.68	0.57	0.32	1
2	Project Management	5.68	0.65	0.42	2
3	Health and Safety	5.64	0.79	0.62	3
4	Client satisfaction	5.55	0.80	0.64	4
5	Quality control	5.55	0.80	0.64	5
6	Total Construction Cost	5.50	0.60	0.36	6
7	Labor safety management	5.50	0.91	0.83	7
8	Variance Cost	5.45	0.80	0.64	8
9	Quality management	5.41	0.85	0.73	9
10	Communication/ Effective communication	5.36	0.90	0.81	10
11	Recordable accident rate	5.36	0.90	0.81	11
12	Resource management	5.36	0.73	0.53	12

13	End user satisfaction	5.32	0.89	0.80	13
14	Decision effectiveness	5.32	0.84	0.70	14
15	Top management support	5.32	0.95	0.89	15
16	Supplier performance	5.32	0.89	0.80	16
17	Site management	5.32	0.95	0.89	17
18	Profitability	5.27	0.83	0.68	18
19	Productivity	5.27	0.83	0.68	19
20	Functionality	5.23	0.75	0.56	20
21	Staff experience	5.14	0.89	0.79	21
22	Project team/ Participation satisfaction	5.09	0.87	0.75	22
23	Innovation and improvement learning	5.09	0.81	0.66	23
24	Professional image establishment	5.05	1.21	1.47	24
25	Environmental performance	5.05	0.72	0.52	25
26	Effectiveness of risk management	5.00	0.87	0.76	26
27	Sustainability	5.00	0.93	0.86	27
28	Contractor experience	4.95	0.95	0.90	28
29	Claim avoidance	4.95	0.84	0.71	29
30	Extent of subcontracting	4.95	0.95	0.90	30
31	Long term business relationships	4.91	1.06	1.13	31
32	Schedule/ Time performance	4.91	1.06	1.13	32
33	Motivation	4.86	1.08	1.17	33
34	Trust and respect	4.82	1.05	1.11	34
35	Lost workday case incident rate	4.82	1.22	1.49	35
36	Harmonious working relationships	4.82	1.05	1.11	36
37	Number of non-conformities in audits	4.82	0.91	0.82	37
38	Litigation avoidance	4.73	1.12	1.26	38
39	Contractor satisfaction	4.73	0.94	0.87	39
40	Employee's attitude	4.68	1.17	1.37	40

Table 3: Ranking of Performance Indicators

Sr. No	KPIs	Mean	Rank
1	Cost	5.40	1
2	Time	5.37	2
3	Safety	5.33	3
4	Productivity	5.31	4
5	Satisfaction	5.27	5
6	Quality	5.24	6
7	Knowledge	5.15	7
8	Service	5.15	8
9	People	5.11	9
10	Risk	4.07	10
11	Legal	4.84	11

Table 4: Ranking of Key Performance Indicators (KPIs)

Although the UK working groups on KPIs identified ten parameters for benchmarking systems in response to the Egan report (1998) (Takim & Akintoye, 2002345), the experimenter identified six new parameters for this study after conducting a thorough literature review, which were also included in the questionnaire. According to the data, design operation, material ordering, handling and operation, threat assurance, and quality assurance are all considered key indicators in the Indian construction business. The KPIs given below had never been included in prior studies of this sort, demonstrating that Indian construction assiduity is dynamic. Cost, time, and quality are the initial and most important performance indicators in construction projects, followed by safety, functionality, and satisfaction. Time, money, and quality are the three most essential performance elements, according to this study.

6. CONCLUSION

Because of the huge number of points involved and the significant quantity of data that must be gathered on a constant basis for acceptable and adequate delicacy situations, the research finds that, while vital, the performance component is a tough task for building systems. Only a limited number of the highest-ranked indicators may be used to analyses performance based on KPI ranking, making the process easier. A counted indicator may be created to summaries performance in a single number while accounting for the importance of each of the indicators. Individual indicator location measurements will help establish corrective behavior and keep the project on track.

According to the examined literature, the most significant key performance indicators for building systems are range and quality. Further analysis found that the three most critical performance metrics in building systems are cost, time, and reliability, followed by safety, utility, and consumer satisfaction. According to data collected using a well-structured questionnaire, the ten most important crucial performance indicators for construction systems in India are building projects time, revenue growth, design operation, resource ordering, handling and operation, threat operation, quality control, customer satisfaction (product), safeness, time predictability (design, design, construction), productivity, and customer satisfaction (service). Nonetheless, these KPI studies revealed that in the Indian construction industry, design operation, material ordering, management and operation, threat assurance, and quality assurance are all considered essential indicators. Because the following KPIs had not been included in earlier studies of this type, it proved that the Indian casing industry is dynamic.

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