# Optimizing Construction Project Performance In Asir, Saudi Arabia: A KPI Perspective

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**Abstract:**

This research aims to identify and evaluate key performance indicators (KPIs) used to monitor construction project performance. KPIs are essential for assessing project success by measuring primary and subsidiary indicators, providing stakeholders with critical insights for informed decision-making. They ensure projects meet time, cost, quality, and safety standards. The study identifies the most commonly used KPIs in construction projects through a comprehensive literature review, prior research analysis, and the researcher's expertise. Surveys were conducted to assess awareness and usage of performance indicators among stakeholders. Additionally, a second survey evaluated the significance of 14 widely recognized KPIs and four additional indicators identified by the researcher. To gain deeper insights, three interviews were conducted with key industry figures, including company executives and project managers, focusing on specific indicators. These discussions provided a comprehensive understanding of the role and impact of each KPI in construction project management. The analysis of survey and interview results led to the identification and ranking of 18 key indicators based on their importance in evaluating project performance. The study highlights the most significant findings and offers recommendations for best practices in KPI implementation. These recommendations aim to enhance the accuracy, clarity, and usability of performance measurement, ensuring that results are meaningful and easily interpretable for all stakeholders. By establishing a structured approach to KPI assessment, this research contributes to improving project monitoring and decision-making in the construction industry, particularly in Saudi Arabia's Asir region

**Keywords:** Key Performance Indicators (KPIs); Construction Project Performance; Decision-MakingConstruction Industry; Performance Measurement

## 1. Introduction:

The construction sector in the Kingdom of Saudi Arabia is considered one of the main objectives of Vision 2030, where the Saudi government recognizes the right of every family to own a home for security and comfort. Therefore, the Housing Program was launched in 2018, contributing to increasing the homeownership rate from 47% to 60% by the end of 2022, according to the Kingdom's Vision 2030 for Housing Despite significant and comprehensive improvements in the performance and operations of the Saudi construction market, delays and defects in construction projects still persist. This is accompanied by a negative impact on the economy, misuse of national resources, cost escalation, project delays, deficiencies in work units, conflicts among stakeholders, and ultimately unsatisfactory outcomes for clients Construction and infrastructure projects are among the most complex and costly projects globally, playing a crucial role in achieving national development and economic growth. Given the importance of these projects, there is an increasing need to continuously improve their management and efficiency Performance indicators are considered one of the key tools that contribute to achieving these objectives. They help evaluate the project's

performance comprehensively, make strategic decisions, and continuously improve operations.In summary, performance indicators contribute to achieving satisfactory outcomes for construction projects, enhancing their quality and efficiency.

### 1.1 Literature Review:

The Kingdom of Saudi Arabia's (KSA) construction industry is flourishing due to a number of government initiatives, and as international companies invest in the area, building projects are growing in size, complexity, speed, and competition (Hussain et al.,2022). With an annual expenditure of $120 million (Alotabi et al.,2019), the construction industry is Saudi Arabia's second biggest after the petrochemical sector and one of the fastest growing in the Gulf region. Construction project development calls for several collaborators, approaches, stages, and phases of work, as well as significant participation from the public and commercial sectors (Okudan et al., 2022). The success of construction industries depends on various performance indicators (Lee et al., 2013), and Construction industries may use different criteria to assess a project's success depending on their objectives (Neyestani, 2016). The success of building projects is difficult to forecast (Sun et al., 2017; Jong et al., 2019). This paper seeks to determine the significance of KPIs to construction project success, find the most crucial performance measures, and employ a set of key performance indicators (KPIs). from the KSA building sector.
Saudi Arabia's Vision 2030 includes a number of large-scale development and infrastructure initiatives referred to as "Giga projects." With the use of advanced automation and urban planning technology, the "New Enterprise Operating Model" (NEOM) seeks to construct a metropolis on the northwest shore of the Kingdom's Red Sea. Long-lasting According to Dasari et al. (2020), the NEOM future metropolis will require $500 billion in technology, zero-carbon infrastructure, and business-friendly management. "THE LINE" is a metropolis of one million people that eliminates automobiles, streets, and carbon emissions while preserving 95% of the natural environment in NEOM (Balabel & Alwetaishi, 2021). The Red Sea is the second "Giga project" in development. broad resort for tourists on the Red Sea coast of Saudi Arabia. In order to construct a complete metro system in Riyadh, the Kingdom's capital and one of the biggest cities in the Middle East, the Saudi Arabian government allotted more than $23 billion. Construction on the 176-kilometer Riyadh Metro Project, which comprises six lines and 85 stops, began in 2013 (Alshalalfah et al., 2018).

One of the "Giga projects" in the Kingdom of Saudi Arabia, the Riyadh metro project is also a component of Vision 2030 (Habibi, 2019). To achieve optimized goal of above projects the effective key performance indicator is very important.
In the construction sector, KPIs have emerged as the most popular performance measurement metric, particularly since "Rethinking Construction" (Lop et al., 2018). KPIs were first developed and launched as one of the performance assessment tools. Several building companies have introduced the use of KPIs for performance evaluation. KPIs enable the construction sector to assess organizational and project performance (Ofori et al., 2016). Traditionally, the basic factors of cost, time, and quality—which have been used as hard key performance indicators (KPIs) in construction—allow one to assess the success of a construction project (Chan & Chan, 2004). A study claims these three essential elements make up the "iron triangle" (Leong et al., 2014). The assessment of this report covered a great range of construction KPIs. The study shows a lot of present KPIs, which complicates selection for measurement for companies unacquainted with them. Though several KPIs were examined, it is obvious that some are used more frequently than the rest. The more common KPIs might be used to construction KPIs for the Saudi Building sector.

## 2. Methodology

This study employs a mixed-methods approach to investigate key performance indicators (KPIs) in construction projects in the Asir region, Saudi Arabia. The research integrates surveys, interviews, and statistical analysis to provide a comprehensive understanding of KPI awareness, usage, and effectiveness. This research combines quantitative and qualitative methods to Assess awareness and utilization of KPIs in construction projects and to Identify key KPIs that are critical for project monitoring and performance

evaluation. Moreover, it also analyze the impact of KPIs on construction project success. Two structured surveys were conducted ie.,KPI Awareness Survey (Distributed to 64 construction professionals to evaluate their familiarity with and use of KPIs) and KPI Importance Survey ( Conducted with 114 participants to assess the significance of 18 selected KPIs, rated on a five-point scale).Structured interviews were also conducted with experts from key organizations to gain in-depth insights into KPI implementation. The interviewees were done in Project Management Office in Asir. Vision 2030 Realization Office and Major Contracting Companies. Survey data was processed using descriptive and inferential statistics to determine patterns, trends, and correlations related to KPI implementation.Interview responses were analyzed using thematic analysis to identify key insights, common themes, and best practices in KPI measurement.To ensure accuracy, validity, and reliability, the following measures were taken:

- Selection of KPIs: Based on an extensive literature review and expert consultation.
- Survey Validation: Questions were reviewed and tested for clarity and relevance before distribution.
- Expert Review: Statistical analysis and interpretation were validated by specialists.
- Diverse Data Sources: Data was collected from both government and private sector stakeholders for a comprehensive perspective.

This research focuses exclusively on construction projects in the Asir region, Saudi Arabia. While the findings provide valuable insights, they may not be directly generalizable to other regions or industries. Future studies should expand the scope by including additional geographic locations and sectors for broader applicability.This study integrates quantitative and qualitative research methods to comprehensively assess KPI awareness, usage, and effectiveness in construction project management. By combining survey data with expert interviews, the methodology ensures a holistic and data-driven approach to understanding KPIs and their impact on construction project performance. Figure 1 shows the research flow chart  The most important and most common performance indicators used in projects shown in table number (1).

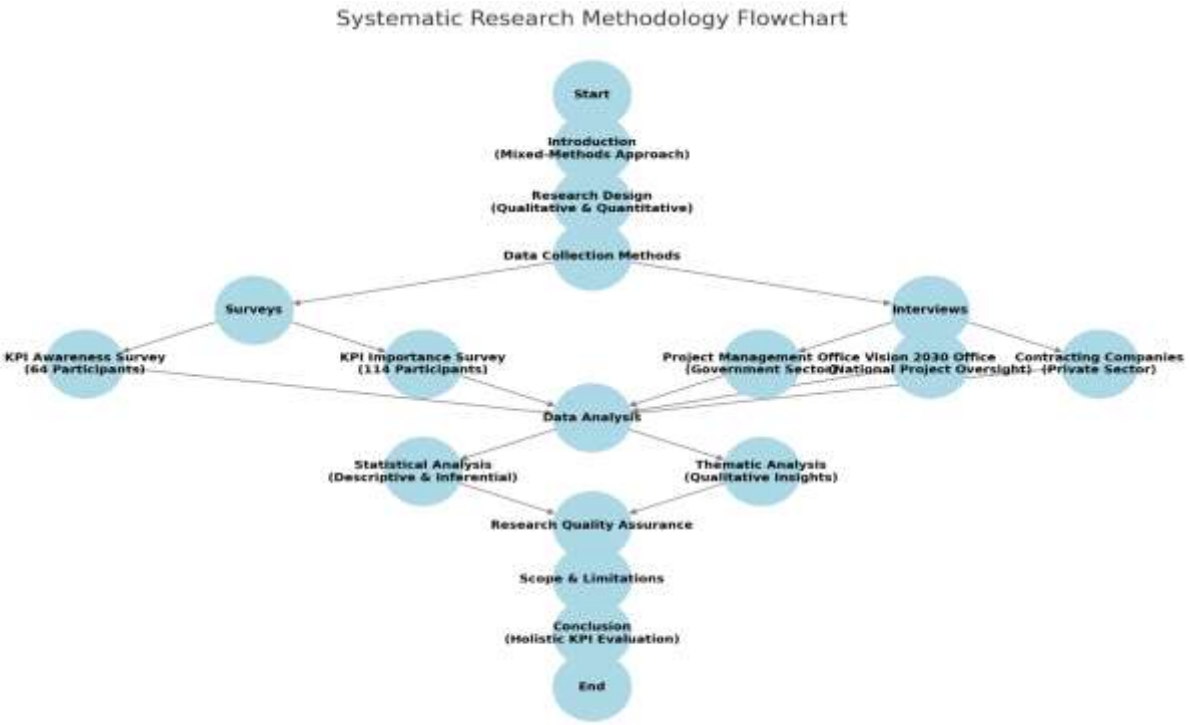

**Figure 1. Systematic research methodology**

| Author and year | Performance indicators | Country |
|---|---|---|
| (Gustinia,1997) | 1. Customer satisfaction 2. Planning period 3. Staff experience 4. Communications 5. Safety 6. Proximity to budget 7. Profitability 8. Payment 9. Claims | Kingdom of Saudi Arabia |
| (Egan,1998) | 1. Predictability - time and cost 2. Construction cost 3. Construction time 4. Productivity 5. Profitability 6. Safety 7. Defects 8. Customer satisfaction | United kingdom |
| (Key Performance Indicators Working Group, 2000) | 1. Cost 2. Time 3. Business Performance 4. Customer Satisfaction 5. Change Orders 6. Health and Safety 7. Quality | United kingdom |
| (Pillay et al., 2002) | 1. Benefit 2. Risk 3. Project status 4. Decision effectiveness 5. Production 6. Cost effectiveness 7. Customer commitment 8. Stakeholders 9. Project management | India |
| Cheung et al.,2004 | 1. Human resources 2. Cost 3 times 4. Quality 5. Safety 6. Customer satisfaction 7. Communications 8. Environment | China |
| (Wang et al.,2007) | 1. Profitability 2. Return on Capital 3. Cash Flow 4. Reliability 5. Customer Focus 6. Market Cut 7. Quality 8. Internal Business 9. Innovation and Learning 10. Environment | United States of America |
| (Corago, Biden, Badu - 2014) | 1.Productivity 2.Innovation 3.Business Quality 4.Customer Performance 5.Customer Satisfaction 6.Financial 7.Meeting Customer Requirements 8.Delivery to the Customer 9.Employee Learning | United kingdom |
| (Yasser Zakaria ,2019) | 1. Construction cost2. Construction time3. Quality and defects4. Customer satisfaction5. Health and safety6. Productivity7. End User Satisfaction 8. Regulatory Compliance9. Ability to predict construction time10. Profitability11. Ability to predict construction costs12. And business performance 13. Human resources | Kingdom of Saudi Arabia |

Table 1: The most important and most common performance indicators used in Construction Project

The most important performance indicators used in construction projects have been identified based on previous scientific studies, articles, and literature. Fourteen key indicators have been determined to understand and monitor project progress, aiding in making informed decisions after reviewing the data provided by these indicators, which in turn contribute to the success of projects. These indicators encompass various aspects of project performance, including:

1. Construction cost
2. Construction time
3. Defects and quality
4. Health and safety
5. Customer satisfaction
6. Cost prediction capability
7. Time prediction capability
8. Productivity
9. Profitability
10. Change orders
11. Communications
12. Innovation and learning
13. Environment
14. Project responsiveness to emergent variables (Risk management)

## 3. Results and Discussion

This research work reviews the results of the surveys and interviews conducted in the Asir region, with the aim of achieving several key objectives. The research aims to determine the extent of the spread of understanding the concept of performance indicators and their importance in the construction project sector in the region, as well as to identify the most important indicators and the best ways to use them to achieve the desired benefits of the measurement process.

### 3.1 Results of a questionnaire on the prevalence of the term measuring performance indicators

The survey included a sample of 64 individuals working in construction companies, institutions, and organizations, as well as individuals directly involved in projects, government entities, and organizations. A number of questions were carefully selected to achieve the objectives of the survey, and they were reviewed by experts to ensure their accuracy and effectiveness in achieving the specified objectives. The percentage of participating members are shown in figure 2


**Figure 2. Percentage of participating members**

The survey results reveal a notable gap between awareness and effective use of Key Performance Indicators (KPIs) in project management. While 84% of participants have heard of KPIs, only a small portion—just 11%—apply more than four KPIs beyond the traditional metrics of time, cost, and quality. This over-reliance on the "Iron Triangle" suggests limited adoption of more comprehensive performance measurement frameworks that address areas such as stakeholder satisfaction, risk, innovation, or sustainability. Government entities showed the highest awareness, with 100% familiarity, yet only 17% of them used broader KPIs. Institutions and companies followed with moderate awareness and slightly better adoption of diverse KPIs. The limited usage across all groups indicates a general lack of training or emphasis on modern project performance tools.To enhance project outcomes and reduce risks, there is a clear need to promote the use of expanded KPI sets through training, policy integration, and practical toolkits. By shifting focus beyond traditional metrics, organizations can better monitor performance, improve decision-making, and increase project success rates.

### 3.2 Survey results measuring the importance of selected performance indicators

The survey included a sample of 114 individuals working in construction companies, institutions, government entities, and organizations, as well as consulting engineers and consulting offices and other individuals . The survey was designed to use a system with 5 main options to measure the importance of each indicator (Very Important, Less Important, Not Important, Not Important at All, I don't know), in order to facilitate the data collection process and increase the number of participants to achieve the survey's objectives. Figure 3 shows Percentage of members participating in the second survey

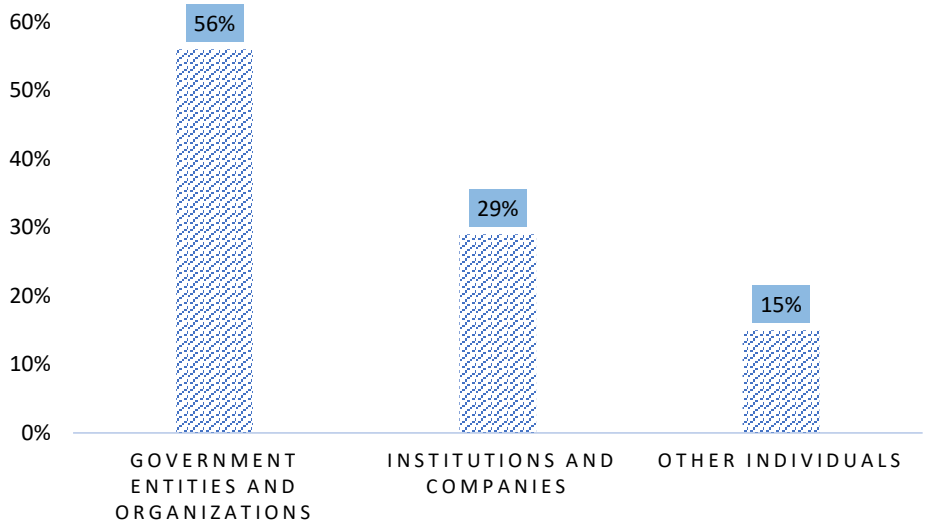


**Figure 3: Percentage of members participating in the second survey**

To facilitate the interpretation of the results, the following method was used to determine the level of response to the tool's items: weights were assigned to the alternatives (Very Important = 4, Less Important = 3, Not Important = 2, Not Important at All = 1, I don't know = 0). To interpret the results, the study relied on calculating the arithmetic mean as follows (4-1=3), and then dividing it by the highest value to obtain the cell length (3/4=0.75). After that, this value was added to the lowest value in the survey alternatives, in order to determine the upper limit of this cell as shown in table 2

**Table 2: Criteria for determining performance indicators for construction projects**

| | Real Limits of the Mean | |
|---|---|---|

| Alternative Value | Maximum Limit | Minimum Limit | Verbal Significance |
|---|---|---|---|
| 1 | 1.75 | 1.00 | Not important at all |
| 2 | 2.50 | 1.76 | Not important |
| 3 | 3.25 | 2.51 | Less important |
| 4 | 4.00 | 3.26 | Very important |

The survey results were presented in a ranking from 1 to 18 for 18 questionnaire shown in Table 3 (surveys) and table 4 (Ranking)

The most important statistical analyses were used (table 4) to ensure the quality of the results and to provide accurate and clear data. These analyses and commands include:

1. Ranking: To understand the data ranking and determine the maximum and minimum values.
2. Median: To determine the median and average value of the data.
3. Standard Deviation: To measure the deviation of the data from its average and understand its variance.
4. Percentage: To convert the data into percentages.
5. Frequency: To understand the quantity of value repetitions in a dataset.
6. Mean: To calculate the average value of a set of numbers.
7. Agreement Degree: To measure the agreement of data or individuals in a specific study.
8. Variance: To measure the degree of variance of data in a specific set.

**Table 3: Surveys of 18 performance indicators**

| NO | Performance indicators | mean/ percentage | agreement level | | | | | frequency |
|---|---|---|---|---|---|---|---|---|
| | | | I don't know | Not Important at All | Not Important | Less Important | Very Important | percentage |
| 1 | Cost of construction | 3.807 95.2% | 0 | 0 | 2 | 18 | 94 | K |
| | | | 0.0 | 0.0 | 1.8 | 15.8 | 82.5 | % |
| 2 | Construction time | 3.789 94.7% | 2 | 0 | 1 | 14 | 97 | K |
| | | | 1.8 | 0.0 | 0.9 | 12.3 | 85.1 | % |
| 3 | Defects and quality | 3.824 95.6% | 0 | 0 | 4 | 12 | 98 | K |
| | | | 0.0 | 0.0 | 3.5 | 10.5 | 86.0 | % |
| 4 | Health and safety | 3.771 94.3% | 0 | 0 | 7 | 12 | 95 | K |
| | | | 0.0 | 0.0 | 6.1 | 10.5 | 83.3 | % |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | Innovation and learning | 3.254<br>81.4% | 2 | 1 | 11 | 52 | 48 | K |
| | | | 1.8 | 0.9 | 9.6 | 45.8 | 42.1 | % |
| 6 | Change orders | 3.298<br>82.5% | 5 | 1 | 8 | 41 | 59 | K |
| | | | 4.4 | 0.9 | 7.0 | 36.0 | 51.8 | % |
| 7 | Communication | 3.701<br>92.5% | 0 | 2 | 3 | 22 | 87 | K |
| | | | 0.0 | 1.8 | 2.6 | 19.3 | 76.3 | % |
| 8 | Actual usage of equipment and materials and the rate of waste | 3.526<br>88.2% | 1 | 2 | 5 | 34 | 72 | K |
| | | | 0.9 | 1.8 | 4.4 | 29.8 | 63.2 | % |
| 9 | Customer satisfaction | 3.771<br>94.3% | 0 | 0 | 1 | 24 | 89 | K |
| | | | 0.0 | 0.0 | 0.9 | 21.1 | 78.1 | % |
| 10 | Productivity | 3.745<br>93.6% | 0 | 0 | 4 | 21 | 89 | K |
| | | | 0.0 | 0.0 | 3.5 | 18.4 | 78.1 | % |
| 11 | Profitability | 3.666<br>91.7% | 0 | 0 | 4 | 30 | 80 | K |
| | | | 0.0 | 0.0 | 3.5 | 26.3 | 70.2 | % |
| 12 | Technology diffusion | 3.386<br>84.6% | 3 | 0 | 5 | 48 | 58 | K |
| | | | 2.6 | 0.0 | 4.4 | 42.1 | 50.9 | % |
| 13 | Project responsiveness to emergent variables (risk management) | 3.552<br>88.8% | 2 | 0 | 5 | 33 | 74 | K |
| | | | 1.8 | 0.0 | 4.4 | 28.9 | 64.9 | % |

| NO | Performance indicators | mean/ percentage | agreement level | | | | | frequency |
|---|---|---|---|---|---|---|---|---|
| | | | I don't know | Not Important at All | Not Important | Less Important | Very Important | percentage |
| 14 | The use of alternative materials of good quality | 3.526<br>88.2% | 0 | 0 | 8 | 38 | 68 | K |
| | | | 0.0 | 0.0 | 7.0 | 33.3 | 59.6 | % |
| 15 | TIME predictability | 3.482<br>87.1% | 0 | 0 | 6 | 47 | 61 | K |
| | | | 0.0 | 0.0 | 5.3 | 41.2 | 53.5 | % |
| 16 | | 3.543 | 0 | 0 | 6 | 40 | 68 | K |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Cost predictability | 88.6% | 0.0 | 0.0 | 53 | 35.1 | 59.6 | % |
| 17 | Environment | 3.552<br>88.8% | 0 | 0 | 7 | 12 | 95 | K |
| | | | 0.0 | 0.0 | 4.4 | 36.0 | 59.6 | % |
| 18 | Compliance between project execution and government regulations, requirements, and standards | 3.649<br>91.2% | 1 | 0 | 3 | 30 | 80 | K |
| | | | 0.9 | 0.0 | 2.6 | 26.3 | 70.2 | % |

**Table 4: Ranking of Performance indicators based on mean percentage**

| NO | Performance indicators | agreement level | ranking | standard deviation | variance | frequency | median |
|---|---|---|---|---|---|---|---|
| 1 | Cost of construction | Very important | 2 | 0.438 | 0.193 | 4 | 4 |
| 2 | Construction time | Very important | 3 | 0.630 | 0.398 | 4 | 4 |
| 3 | Defects and quality | Very important | 1 | 0.465 | 0.217 | 4 | 4 |
| 4 | Health and safety | Very important | 4 | 0.549 | 0.302 | 4 | 4 |
| 5 | Innovation and learning | Less Important | 15 | 0.807 | 0.652 | 3 | 3 |
| 6 | Change orders | Very important | 1 | 0.967 | 0.937 | 4 | 4 |
| 7 | Communication | Very important | 6 | 0.608 | 0.370 | 4 | 4 |
| 8 | Actual usage of equipment and | Very important | 11 | 0.743 | 0.552 | 4 | 4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | materials and the rate of waste | | | | | | |
| 9 | Customer satisfaction | Very important | 4 | 0.441 | 0.195 | 4 | 4 |
| 10 | Productivity | Very important | 5 | 0.512 | 0.262 | 4 | 4 |
| 11 | Profitability | Very important | 7 | 0.543 | 0.295 | 4 | 4 |
| 12 | Technology diffusion | Very important | 13 | 0.803 | 0.646 | 4 | 4 |
| 13 | Project responsiveness to emergent variables (risk management) | Very important | 9 | 0.741 | 0.550 | 4 | 4 |

| NO | Performance indicators | agreement level | ranking | standard deviation | variance | frequency | median |
|---|---|---|---|---|---|---|---|
| 14 | The use of alternative materials of good quality | Very important | 11 | 0.626 | 0.393 | 4 | 4 |
| 15 | TIME predictability | Very important | 12 | 0.598 | 0.358 | 4 | 4 |
| 16 | Cost predictability | Very important | 10 | 0.597 | 0.356 | 4 | 4 |
| 17 | Environment | Very important | 9 | 0.581 | 0.338 | 4 | 4 |
| 18 | Compliance between project execution and government regulations, requirements, and standards | Very important | 8 | 0.623 | 0.389 | 3 | 3 |

Table 3 and 4 summarizes the results and Figure 4 shows the arithmetic mean of performance indicators (18 indicators). Table 5 shows mean and ranking of 18 performance indicators. Figure 5 shows the arithmetic mean of performance indicators (18 indicators) arranged in order of importance.The overall arithmetic mean for determining performance indicators for construction projects is 3.602, with a percentage of 90.1% and a standard deviation of 0.174. The agreement level is considered very important. The performance indicators are ranked as follows:

Top 5 Most Important Indicators (based on mean score and ranking): Defects and Quality – Mean: 3.824 | Rank: 1,Followed by Cost of Construction – Mean: 3.807 | Rank: 2 then Construction Time – Mean: 3.789 | Rank: 3 ,Health and Safety – Mean: 3.771 | Rank: 4,Customer Satisfaction – Mean: 3.771 | Rank: 4 (tie). These indicators reflect a strong emphasis on the traditional "Iron Triangle" (time, cost, quality), with health, safety, and customer satisfaction gaining recognition as critical success factors. The Moderately Rated Indicators:

Communication (Mean: 3.701, Rank: 6) and Productivity (Mean: 3.745, Rank: 5) These indicators suggest growing awareness of soft skills and output efficiency.The Lower-Ranked but Still Relevant Indicators: Technology Diffusion – Mean: 3.386 | Rank: 13, Project Responsiveness to Risk – Mean: 3.552 | Rank: 9, Compliance with Regulations – Mean: 3.649 | Rank: 8 and Least Rated Indicators: Innovation and Learning – Mean: 3.254 | Rank: 15 Change Orders – Mean: 3.298 | Rank: 18 Despite their significance in adaptive and evolving project environments, these were rated the lowest.The results indicate a clear prioritization of traditional KPIs like cost, time, and quality. However, indicators such as innovation, adaptability to change, and technology use are not yet fully appreciated—potentially due to limited awareness or resistance to change.These are important for modern, resilient project management, yet appear underemphasized.

The analysis of Table 3 and 4 reveals that construction project stakeholders place the highest importance on traditional performance indicators such as defects and quality, cost of construction, and construction time, which ranked first, second, and third respectively. These results highlight a continued reliance on the "Iron Triangle" for evaluating project success.

Indicators such as customer satisfaction, health and safety, and productivity also received high importance ratings, reflecting growing attention to user experience and operational efficiency. However, modern and strategic indicators like innovation and learning, technology diffusion, and change order management were ranked significantly lower, indicating a gap in recognizing their relevance to long-term project success.

The low ranking of indicators related to risk management, environment, and regulatory compliance suggests that while these areas are important, they may not yet be fully integrated into performance evaluation practices. Overall, the results underscore the need to expand awareness and application of comprehensive performance indicators that go beyond time, cost, and quality to achieve more sustainable and adaptable construction project outcomes.

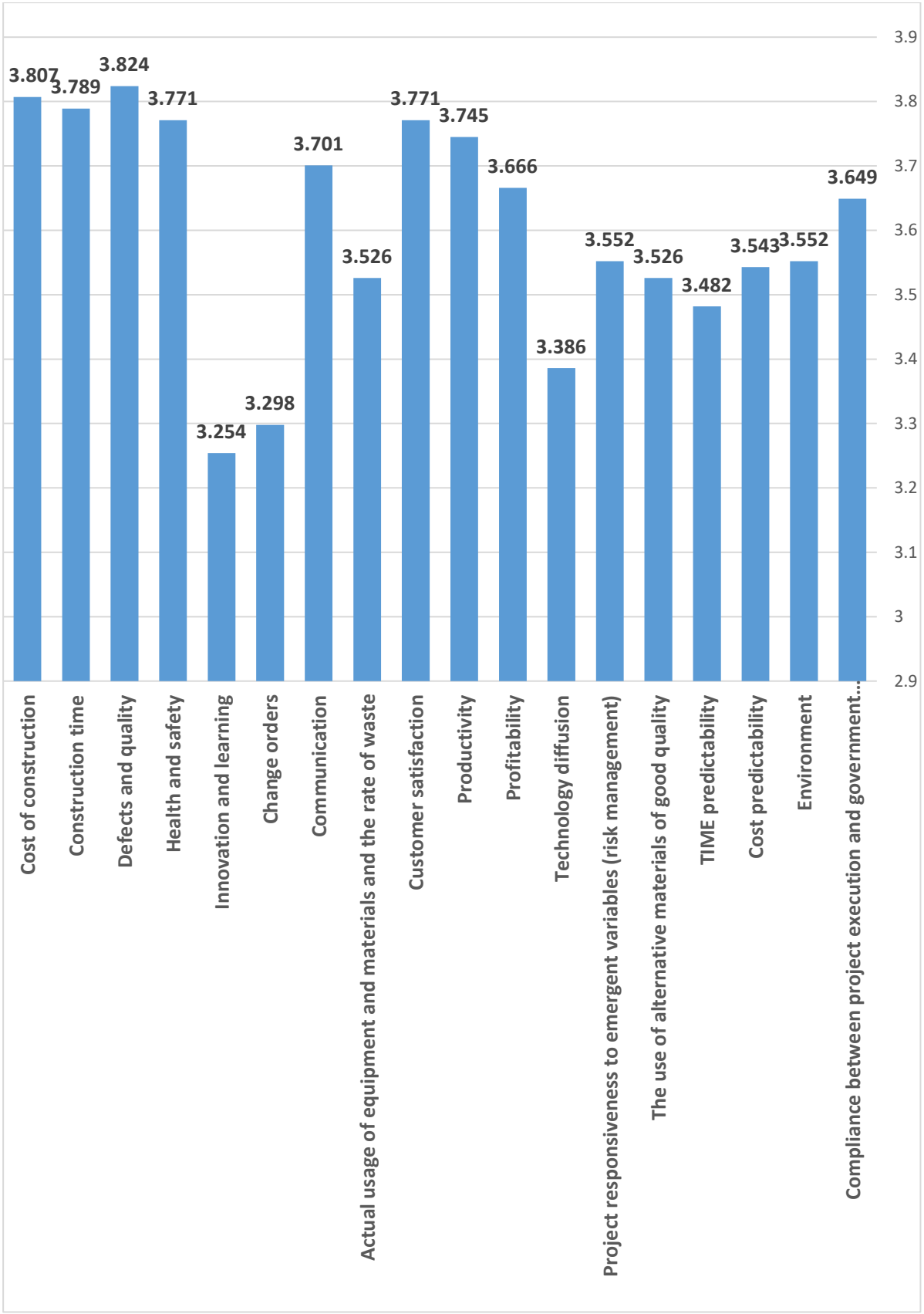


**Figure 4: Arithmetic mean of performance indicators (18 indicators)**

**Table 5: Ranking of indicators according to importance (18 indicators)**

| Average | Performance Indicator | Ranking of Indicator Importance |
|---|---|---|
| 3.824 | Defects and Quality | 1 |
| 3.807 | Construction Cost | 2 |
| 3.789 | Construction Time | 3 |
| 3.771 | Health and Safety | 4 |
| 3.771 | Customer Satisfaction | |
| 3.745 | Productivity | 5 |
| 3.701 | Communication | 6 |
| 3.666 | Profitability | 7 |
| 3.649 | Compliance with Regulations and Government Requirements | 8 |
| 3.552 | Project Responsiveness to Emergent Variables (Risk Management) | 9 |
| 3.552 | Environment | |
| 3.543 | Cost Prediction Capability | 10 |
| 3.526 | Actual Usage of Equipment and Materials and Waste Rate | 11 |
| 3.526 | Use of Good Quality Alternative Materials | |
| 3.482 | Time Prediction Capability | 12 |
| 3.386 | Technology Adoption | 13 |
| 3.298 | Change Orders | 14 |
| 3.254 | Innovation and Learning | 15 |

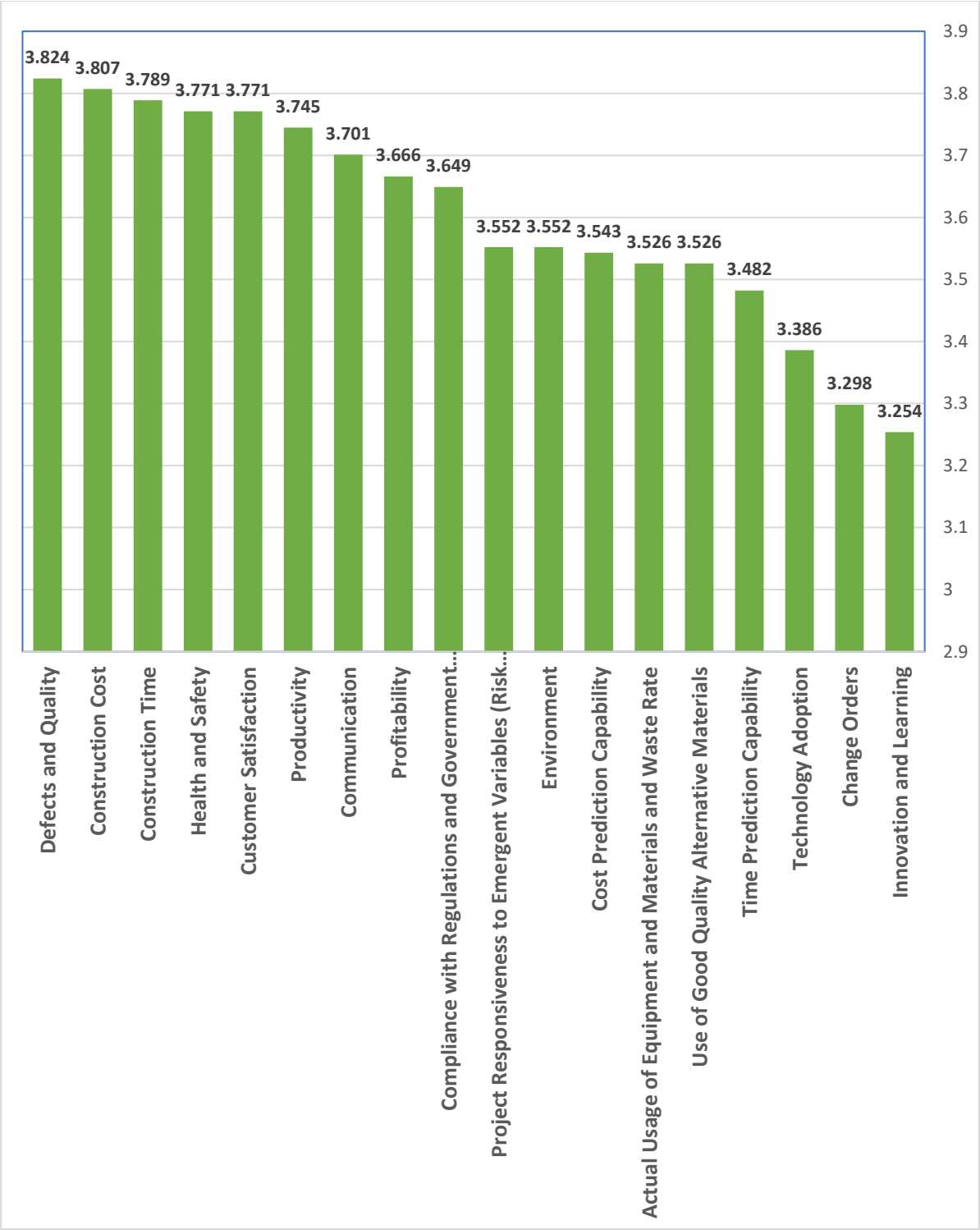


**Figure 5: The arithmetic mean of performance indicators (18 indicators) arranged in order of importance**

Conclusion: The study emphasizes a significant knowledge of performance metrics in building projects, especially among governmental organizations. Nonetheless, practical application is confined to conventional KPIs—time, cost, and quality—while more comprehensive metrics are insufficiently employed. Principal problems are insufficient awareness, reluctance to change, constrained resources, and

inadequate data analytic capabilities. These obstacles impede efficient performance monitoring and decision-making, elevating the risk of project inefficiency and failure. The poll revealed that essential variables, including risk management, environmental impact, innovation, and technology adoption, are underestimated, despite their significance in contemporary project success. To rectify these deficiencies, there is an evident necessity for training, cultural transformation, and the use of sophisticated technology to provide a more thorough and efficient application of performance indicators in the construction industry.

**References**


1. Hussain, S., Hasmori, M. F., Abas, N. H., Balasbaneh, A. T., & Khan, M. W. (2022). Key Performance Indicators For Project Success In Saudi Arabian Construction Industry.
2. Alotabi, A., Edum-Fotwe, F. T., & Price, A. (2019). Identification Of Social Responsibility Factors Within Mega Construction Projects. International Journal Of Engineering Management And Economics, 13(1).
3. Okudan, O., Budayan, C., & Arayici, Y. (2022). Identification And Prioritization Of Key Performance Indicators For The Construction Small And Medium Enterprises. Teknik Dergi, 33(5).
4. Lee, M. R., Ismail, S., & Hussaini, M. (2013). Key Performance Indicator (Kpi) Of Contractor On Project Performance For Housing Construction In Malaysia, 1st Int. Conf. On Human Capital And Knowledgemanagement (Hckm 2013), Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia
5. Neyestani, B. (2016). Impact Of Iso 9001 Certification On The Projects' Success Of Large-Scale (Aaa) Construction Firms In The Philippines. International Research Journal Of Management, It And Social Sciences (Irjmis), 3(11), 35-45.
6. Sun, C., Jiang, S., Skibniewski, M. J., Man, Q., & Shen, L. (2017). A Literature Review Of The Factors Limiting The Application Of Bim In The Construction Industry. Technological And Economic Development Of Economy, 23(5), 764-779.
7. Jong, C. Y., Sim, A. K., & Lew, T. Y. (2019). The Relationship Between Tqm And Project Performance:Empirical Evidence From Malaysian Construction Industry. Cogent Business & Management
8. Dasari, H. P., Desamsetti, S., Langodan, S., Krishna, L. R., Singh, S., & Hoteit, I. (2020). Air-Quality Assessment Over The World's Most Ambitious Project, Neom In Kingdom Of Saudi Arabia. In Iop Conference Series: Earth And Environmental Science (Vol. 489, No. 1, P. 012025). Iop Publishing
9. Balabel, A., & Alwetaishi, M. (2021). Towards Sustainable Residential Buildings In Saudi Arabiaaccording To The Conceptual Framework Of "Mostadam" Rating System And Vision2030. Sustainability, 13(2), 793
10. Alshalalfah, B., Nafakh, J., Al Banna, Y., & Kaysi, Traffic Management Of Mega Infrastructure Construction Projects: Success Story And Lessons Learned From The Riyadh Metro Project. International Journal Of Transport Development And Integration (2018).
11. Habibi, N. (2019). Implementing Saudi Arabia's Vision 2030: An Interim Balance Sheet. Middle East Brief, 127, 1-9.
12. Lop, N. S., Ismail, K., Isa, H. M., & Khalil, N. (2018). An Effective Approach Of Performance Measurement Systems (Pms) For Adoption In Construction Projects. Journal Of Engineering Science And Technology, 13(12), 3951-3963
13. Ofori-Kuragu, J. K., Baiden, B. K., & Badu, E. (2016). Key Performance Indicators For Project Success In Ghanaian Contractors.
14. Chan, A. P., Scott, D., & Chan, A. P. (2004). Factors Affecting The Success Of A Construction Project. Journal Of Construction Engineering And Management, 130(1), 153-155.
15. Leong, T. K., Zakuan, N., Mat Saman, M. Z., Ariff, M. S. M., & Tan, C. S. (2014). Using Project Performance To Measure Effectiveness Of Quality Management System Maintenance And Practices In Construction Industry. The Scientific World Journal
16. Gastania, J,1997 D. Dissertation At The University Of Texas On "Performance Evaluation And Measurement"
17. Egan, J. (1998) Rethinking Construction: Report Of The Construction Task Force On The Scope For Improving The Quality And Efficiency Of Uk Construction. Department Of The Environment, Transport And The Region, London
18. The Kpi Working Group. (2000). Kpi Report To The Minister Of Construction. London: Department Of Environment, Transport, And Region
19. Pillai, As, Joshi, A., Rao, Ks, 2002. Supply Chain Management, 1st Edition. Elsvier Limited, Great Britain. Pillai, As, Joshi, A., Rao, Ks, 2002. Performance Measurement Of Research And Development Projects In A Concurrent Engineering Environment. Process Intensity. Project Management Journal.Top Of Form
20. Chung, K. K. W., 2004. A Web-Based Performance Monitoring System For Construction Projects. Automation In Construction.

21. Wang, 2010. The Level Has A Binary Framework Measuring Performance To Improve The Productivity Of Construction Institutions. Constr. Precision. Orphaned
22. Ofori-Kuragu, J. K., Baiden, B. K., & Badu, E. (2014). Factors Affecting Ghanaian
23. Yasser Zakaria-2019 .Master's Thesis In Key Performance Indicators For Construction Contractors In Saudi Arabia