



**Building Excellence: Harnessing the Power of Total Quality
Management to Achieve Unparalleled Excellence in the Saudi
Construction Industry**

By

Faisal Fayz Alshehri

; Prof. Dr. Mohammed Jameel

**Department of Civil Engineering, College of Engineering, King
Khalid University, Abha, Saudi Arabia**

jamoali@kku.edu.sa (corresponding author)



RHOWENA J. RAMDEEN

DESIGNATION: PhD Scholar

**DEPARTMENT: Department of Civil and Environmental
engineering,**

**COLLEGE PART TIME NAME : University of the West
Indies, St Augustine, Trinidad**

STATE: Tunapuna

PIN CODE:

E-MAIL: rhowenaramdeen@yahoo.com

**Thesis submitted to the Civil Engineering Department, College of
Engineering, King Khalid University in partial fulfillment of the
requirements for the degree of**

Master of Science in Civil Engineering

Construction Project Management

Supervised by



May, 2025



Building Excellence: Harnessing the Power of Total Quality Management to Achieve Unparalleled Excellence in the Saudi Construction Industry

By

Approved:	Accepted:
Supervisor	Department Chair
Name:	Name:
Signature:	Signature:
Date:	Date:

Dean of the College

Name:



Signature:

Date:

KING KHALID UNIVERSITY

Original Literary Work Declaration

Student Name

Faisal Fayz Alshehri

Registration number:

445816768



Building Excellence: Harnessing the Power of Total Quality Management to Achieve Unparalleled Excellence in the Saudi Construction Industry

I officially and sincerely declare that I am this original work's sole author/writer. This work does not violate any copyright rules. I at this moment assign all copyrights to this original work to King Khalid University. I fully understand that while I am doing this work, if any copyright infringement occurs, whether intentional or otherwise, it may result in legal action being taken against me, as KKU deems necessary.

Student Signature:

Date:

Disclaimer

This thesis describes the work undertaken as part of a master's program at the Civil Engineering Department, College of Engineering, King Khalid University. This is the original work of the above-mentioned student with all views and opinions expressed



therein remain the sole responsibility of the author, and do not necessarily represent those of the institute.

Copyright © King Khalid University, Abha. All rights reserved.

ACKNOWLEDGMENTS



I would like to thank the Dissertation Evaluation Committee for their guidance and support throughout this research. I extend my thanks and gratitude to my supervisor, for his supervision and assistance in every aspect of my work.

In addition, I would also like to thank my friends, fellow faculty and staff in the department for making my time at KKU College of Engineering a wonderful experience.

Abstract

Total Quality Management (TQM) is a crucial approach for enhancing efficiency, reducing costs, and improving customer satisfaction in the construction industry. This study investigates the adoption and implementation of TQM in the Saudi construction sector, focusing on its impact on project performance and its role in achieving Saudi Vision 2030 objectives. Using a quantitative research approach, data were collected from a sample of 200 construction professionals across Saudi Arabia through a structured questionnaire. The analysis, which involved descriptive and inferential statistical methods, revealed that while TQM adoption is relatively high, challenges remain in employee training and interdepartmental collaboration. Leadership commitment, worker safety improvements, and innovation emerged as key factors influencing successful TQM implementation. The study confirmed that TQM positively impacts project efficiency, reduces maintenance and rework costs, and enhances customer satisfaction. Furthermore, it plays a significant role in supporting Saudi Vision 2030 by improving construction quality, attracting foreign



investment, and promoting sustainable development. However, barriers such as resistance to change, inadequate training, and limited cross-departmental cooperation hinder its full implementation. Based on these findings, the study recommends enhancing employee training, strengthening leadership engagement, improving collaboration between departments, fostering a culture of continuous improvement, and aligning quality management strategies with national development goals. Addressing these challenges will allow the Saudi construction industry to maximize the benefits of TQM and contribute to long-term economic growth and infrastructure excellence. Future research could explore the impact of digital transformation on TQM practices and examine variations in TQM adoption across different construction sectors.

Keywords: Total Quality Management, Construction Industry, Project Efficiency, Cost Reduction, Saudi Vision 2030, Continuous Improvement, Quality Standards.



Table of Contents

Abstract	vi
Table of Contents	viii
List of Tables	xii
List of figures	xiii
Chapter I	1



Introduction.....	1
1.1 Background of the Study	1
1.2 Research Problem.....	3
1.3 Research Objectives	5
1.5 Significance of the Study	5
1.6 Scope and Limitations	7
1.7 Structure of the Thesis	8
Chapter II	8
2.1 Introduction.....	8
2.2 Concept of Total Quality Management (TQM).....	8
2.3 Key Principles of TQM in Construction.....	9
2.3.1 Customer Focus	10
2.3.2 Leadership Commitment.....	10
2.3.3 Employee Involvement and Training.....	10
2.3.4 Process Management and Standardization.....	11
2.3.5 Continuous Improvement (Kaizen).....	11
2.4 The Importance of TQM in the Construction Industry	12
2.4.1 Enhancing Project Quality and Reducing Defects	12
2.4.2 Improving Cost Efficiency and Waste Reduction.....	13
2.4.3 Enhancing Customer Satisfaction and Reputation	13
2.4.4 Ensuring Compliance with Safety and Regulatory Standards	14
2.4.5 Facilitating Continuous Improvement and Innovation.....	14
2.5 Previous Studies	14
2.6 Research Gap	18
Chapter III	17
3.1 Research Design	17

3.2 Population and Sample Size	17
3.3 Sampling Technique	18
3.4 Data Collection Method	18
3.5 Research Instrument	19
3.6 Data Analysis Techniques	19
3.7 Ethical Considerations	20
Chapter IV	20
Results and Discussion	20
4.1 Introduction	20
4.2 Demographic Profile of Respondents	20
4.2.1 Gender Distribution	20
4.2.2 Age Distribution	22
4.2.3 Occupation Distribution	24
4.2.4 Education Level Distribution	26
4.2.5 Current Job Position	27
4.3 Assessing the Level of TQM Adoption in Construction Companies	28
4.4 Identifying Key Factors Influencing TQM Implementation	30
4.5 Evaluating the Impact of TQM on Project Efficiency, Cost Reduction, and Customer Satisfaction	33
4.6 Analyzing the Role of TQM in Supporting Saudi Vision 2030	34
4.7 Correlation Analysis	36
4.8 Discussion of Research Findings	38
Chapter V	20
Conclusions and Recommendations	20
Chapter V	38
Conclusion and Recommendations	38
5.1 Conclusion	38



5.2 Recommendations.....	39
REFERENCES	43
APPENDIX	50
QUESTIONNAIRE.....	50



List of Tables

Table 1: Gender of Respondents	21
Table 2: Age of Respondents	23
Table 3: Occupation of Respondents	24
Table 4: Education Level of Respondents.....	26
Table 5: Current Position of Respondents.....	27
Table 6: Level of TQM Adoption.....	28
Table 7: Key Factors Affecting TQM Implementation	30
Table 8: Impact of TQM on Project Performance	33
Table 9: TQM and Saudi Vision 2030.....	34
Table 10: Pearson Correlation Coefficients.....	36



List of figures

Figure 1: Gender	22
Figure 2: Age Distribution.....	24
Figure 3: Occupation	25
Figure 4: Education level	27
Figure 5: Position	28
Figure 6: Level of TQM Adoption.....	30
Figure 7: Key Factors Affecting TQM Implementation	32
Figure 8: TQM's Role in Vision 2030.....	36

ISSN: 3067-1140

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03



RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

ISSN: 3067-1140



RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11

Chapter I Introduction

ISSN: 3067-1140

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03



RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11

Chapter I

Introduction

1.1 Background of the Study

The construction industry is a key driver of economic growth and infrastructure development worldwide. In Saudi Arabia, this sector plays a fundamental role in national progress, particularly in alignment with Vision 2030, which aims to diversify the economy, reduce dependence on oil, and enhance infrastructure sustainability (Yu et al., 2024). The construction industry contributes significantly to gross domestic product (GDP), job creation, and urban development, making quality management a critical factor for success (Alghuried, 2025).

One of the major challenges facing the construction sector globally is poor quality management, which leads to project delays, cost overruns, and increased rework (Alsharef et al., 2024). To mitigate these challenges, Total Quality Management (TQM) has emerged as a key approach to enhancing construction project performance. TQM is a customer-focused, continuous improvement strategy that integrates quality into every stage of the construction process (Riaz et al., 2023). It emphasizes leadership commitment, employee



involvement, process optimization, and defect prevention rather than defect detection (Abdulkadir, 2023).

In the Saudi construction industry, the implementation of TQM principles remains inconsistent due to several barriers, including lack of skilled personnel, inadequate training, resistance to change, and insufficient quality regulations (Alawag et al., 2024). Additionally, many construction firms continue to prioritize short-term cost savings over long-term quality benefits, leading to poor workmanship, frequent project failures, and increased maintenance costs (Xie et al., 2022).

Despite these challenges, numerous studies have highlighted the benefits of TQM in improving construction project outcomes. A study by (Riaz et al., 2023) found that implementing TQM in construction projects leads to higher customer satisfaction, improved safety, and better cost management. Similarly, (Sheoran & Thakur, 2023) demonstrated that quality management systems reduce project risks and enhance productivity.

Furthermore, the adoption of TQM is directly linked to achieving Vision 2030 objectives, particularly in terms of infrastructure excellence, sustainability, and foreign investment attractiveness. By enhancing construction quality standards, Saudi Arabia can position itself as a regional leader in sustainable urban development and megaproject execution.



This study aims to evaluate the extent of TQM adoption in the Saudi construction sector, assess its impact on project performance and Vision 2030 objectives, and provide recommendations for overcoming barriers to effective quality management. By identifying the key factors influencing TQM implementation, this research seeks to contribute to the enhancement of construction project efficiency, sustainability, and long-term economic growth in Saudi Arabia.

1.2 Research Problem

The construction industry in Saudi Arabia is undergoing rapid expansion, driven by Vision 2030, which emphasizes infrastructure development, sustainability, and quality improvement. However, despite significant investments in megaprojects such as NEOM, the Red Sea Project, and Qiddiya, many construction companies continue to struggle with quality-related issues that lead to project delays, cost overruns, defects, and inefficiencies.

A major factor contributing to these challenges is the lack of a comprehensive Total Quality Management (TQM) framework across the Saudi construction sector. Studies have shown that many firms fail to fully integrate TQM principles, leading to inconsistencies in quality control, inefficient resource utilization, and increased rework. The absence of strong leadership commitment, insufficient employee training, and resistance to change further hinder the successful adoption of TQM.



Moreover, quality management in construction is often reactive rather than proactive, meaning defects and inefficiencies are addressed only after they occur rather than being prevented through a structured TQM approach. This reactive approach increases costs, reduces profitability, and negatively impacts customer satisfaction. As a result, many projects fail to meet international quality standards, affecting Saudi Arabia's competitiveness in attracting foreign investment and maintaining sustainable development goals.

Despite the growing recognition of TQM as a critical driver of construction excellence, there is limited empirical research assessing the extent of TQM adoption in Saudi construction companies and its direct impact on project performance and Vision 2030 objectives. While some firms have attempted to implement ISO 9001-certified quality management systems, the actual effectiveness of these systems in enhancing productivity, reducing waste, and improving safety standards remains unclear.

Given these gaps, this research seeks to investigate the current state of TQM implementation in the Saudi construction industry, evaluate its impact on project efficiency, cost management, and sustainability, and identify the barriers preventing effective adoption. The study will provide insights into how construction firms can harness



TQM to achieve unmatched excellence and contribute to the broader national objectives outlined in Vision 2030.

1.3 Research Objectives

This study aims to:

1. Assess the level of TQM adoption in construction companies in Saudi Arabia.
2. Identify the key factors influencing the successful implementation of TQM.
3. Evaluate the impact of TQM on project efficiency, cost reduction, and customer satisfaction.
4. Analyze the role of TQM in supporting Saudi Vision 2030 objectives.
5. Provide recommendations for improving TQM practices in the Saudi construction industry.

1.5 Significance of the Study

This study is significant as it explores the critical role of Total Quality Management (TQM) in enhancing the efficiency, sustainability, and competitiveness of the Saudi construction industry. As Saudi Arabia undergoes rapid infrastructural expansion under Vision 2030, achieving high construction quality, minimizing defects, and ensuring cost efficiency are



crucial for long-term economic growth. However, despite the increasing adoption of quality management frameworks, many construction firms struggle with inconsistent TQM implementation, leading to project delays, budget overruns, and compromised structural integrity. By examining the extent of TQM adoption and its impact on construction project performance, this research will provide empirical insights into how quality management practices can be optimized to meet international standards and national development goals.

From an industry perspective, this study will benefit construction companies, project managers, engineers, and policymakers by identifying the key barriers to effective TQM implementation and offering practical recommendations for overcoming them. A well-structured TQM approach can lead to improved resource utilization, enhanced safety standards, reduced rework, and higher client satisfaction, ultimately contributing to the sector's long-term sustainability. Moreover, with the Saudi government actively seeking to attract foreign investment in its construction sector, strengthening TQM practices can enhance the credibility and global competitiveness of Saudi construction firms, positioning them as leaders in quality-driven construction and infrastructure development.

Academically, this study contributes to existing literature on quality management in construction, specifically within the context of Saudi Arabia, where research on TQM's direct impact on project performance and Vision 2030 objectives remains limited. By



bridging this knowledge gap, the findings will support future research and policy formulation aimed at fostering a culture of continuous improvement in the Saudi construction industry. Ultimately, this study serves as a valuable reference for both academics and industry professionals seeking to align TQM principles with national economic and infrastructural goals, ensuring the long-term excellence of construction projects in the Kingdom.

1.6 Scope and Limitations

This study focuses on the implementation and impact of Total Quality Management (TQM) in the Saudi construction industry, with an emphasis on its role in enhancing project performance, sustainability, and alignment with Vision 2030 goals. The research primarily examines construction companies operating in Saudi Arabia, including government projects, private sector developments, and infrastructure initiatives. It assesses the extent of TQM adoption, challenges faced by construction firms in implementing quality management practices, and the perceived benefits of TQM on efficiency, cost reduction, and client satisfaction. The study employs a quantitative research approach, utilizing a structured questionnaire to collect data from project managers, engineers, quality control officers, contractors, and suppliers.



Despite its contributions, the study has several limitations. First, it is geographically limited to Saudi Arabia, meaning the findings may not be directly generalizable to other countries with different regulatory frameworks, economic conditions, and construction practices. Second, the study relies on self-reported data through questionnaires, which may introduce respondent bias, as participants might provide socially desirable responses rather than fully objective assessments of TQM implementation in their organizations. Third, the study primarily focuses on quantitative data, which, while valuable for measuring trends and correlations, may not fully capture the in-depth qualitative experiences of construction professionals regarding the challenges and benefits of TQM. A mixed-method approach, incorporating interviews or case studies, could provide deeper insights.

1.7 Structure of the Thesis

This thesis is structured as follows:

- Chapter One: Introduction – Provides an overview of the research, including the background, problem statement, objectives, research questions, significance, and scope.
- Chapter Two: Literature Review – Reviews relevant literature on TQM principles, implementation challenges, and its impact on construction projects. It also explores the relationship between TQM and Vision 2030.



- Chapter Three: Research Methodology – Details the research design, data collection methods, sampling techniques, and data analysis approach.
- Chapter Four: Results and Discussion – Presents the findings from the questionnaire and discusses their implications in relation to previous studies.
- Chapter Five: Conclusion and Recommendations – Summarizes key findings, discusses their practical implications, and provides recommendations for improving TQM implementation in the Saudi construction industry.

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11

ISSN: 3067-1140



Chapter II

Literature Review

ISSN: 3067-1140

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03



RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11

Chapter II

Literature Review

2.1 Introduction

With an eye towards Saudi Arabia specifically, this chapter offers a thorough assessment of pertinent material on Total Quality Management (TQM) in the building sector. The chapter opens with looking at TQM's conceptual framework, main ideas, and applicability for the building industry. It then covers the advantages. The chapter also looks into earlier research on TQM in building.

2.2 Concept of Total Quality Management (TQM)

Total Quality Management (TQM) is a comprehensive management approach that focuses on continuously improving processes, products, and services by integrating quality-focused strategies across an organization (Ali Ibrahim Bisho & Bin Mohd Sam, 2022). This customer-driven attitude stresses the involvement of all employees, the standardization of procedures, and the use of data-driven decision-making to improve operational efficiency and attain lasting competitive advantages (Abdulkadir, 2023).

TQM is widely recognized as an effective methodology for reducing waste, improving productivity, and increasing customer satisfaction (Aition et al., 2024). Unlike



conventional quality control techniques that concentrate mostly on spotting flaws, TQM adopts a proactive approach by including ideas of continuous improvement into every facet of a company so that goods and services constantly either meet or surpass consumer expectations (Snongtaweepon et al., 2020). TQM is very important in the building sector since it helps reduce project delays, cost overruns, safety risks, and infrastructure development flaws. A well-organised TQM system guarantees that quality is maintained throughout all stages of project life, from design and planning to implementation and conclusion, considering the complexity and scope of the building projects (Nasereddin, 2015).

2.3 Key Principles of TQM in Construction

Total Quality Management (TQM) is founded on several key principles that ensure continuous improvement, customer satisfaction, and process efficiency. In the building sector, where projects are complicated, involving several stakeholders, and demand rigorous adherence to quality and safety criteria, these values are especially important. Using TQM in building helps to minimize flaws, lower project delays, and best use resources (Egbebi, 2024). The following key principles define the application of TQM in construction:



2.3.1 Customer Focus

The fundamental idea of TQM is customer satisfaction since building firms have to make sure projects satisfy client expectations and legal criteria. Customers in the building sector comprise project owners, government agencies, investors, and end users depending on first-rate infrastructure. Knowing client demands and including them in project planning and execution guarantees that quality criteria are satisfied, therefore building more client confidence and long-term business success (Alawag et al., 2024).

2.3.2 Leadership Commitment

TQM's successful application depends on strong leadership commitment. Setting clear goals, giving required resources, and creating a work environment that supports ongoing development helps top management build a quality-driven culture (Ahmed & Sajid, 2023). In the construction industry, project managers and senior executives play a critical role in ensuring that quality policies are effectively communicated and implemented at all levels of the organization (Alawag et al., 2024).

2.3.3 Employee Involvement and Training

TQM stresses how actively every staff member participates in the process of quality improvement. Workers, engineers, and site managers must learn quality management



strategies to ensure they adhere to the highest standards in construction. Regular training, seminars, and skill development initiatives empower employees, thereby improving output and reducing mistakes on construction sites. Including staff members in decision-making also helps them to feel responsible and in control in preserving quality standards (Afzal et al., 2022).

2.3.4 Process Management and Standardization

Efficient process management is a fundamental TQM principle that focuses on optimizing workflows and eliminating inefficiencies. In construction, this entails simplifying procurement, material processing, on-site execution, and quality checks to guarantee that every phase of the project uses accepted practices (Nasereddin, 2015). By using quality management systems, standardizing helps reduce variability, improve safety, and guarantee adherence to international building codes (Okonta et al., 2024).

2.3.5 Continuous Improvement (Kaizen)

Continuous improvement, or "Kaizen," is a core TQM principle that emphasizes incremental enhancements in construction processes to achieve long-term efficiency and quality (Singh & Singh, 2015). In construction projects, this entails routinely analysing performance indicators, spotting areas that need work, and putting remedial action in place



to improve project results. Strategies for ongoing improvement help lower waste, maximise resource use, and increase general project effectiveness (Ibrahim et al., 2024).

2.4 The Importance of TQM in the Construction Industry

Total Quality Management (TQM) plays a vital role in the construction industry by improving project efficiency, ensuring compliance with quality standards, reducing costs, and enhancing customer satisfaction. TQM offers a methodical strategy to preserve consistency, minimise flaws, and promote ongoing development, considering the complexity of building projects that involve many parties, different procedures, and large financial inputs. When TQM is successfully implemented in construction, it leads to improved project outcomes, increased competitiveness, and sustainable development (Nasereddin, 2015).

2.4.1 Enhancing Project Quality and Reducing Defects

One of the most significant benefits of TQM in construction is its ability to enhance project quality by reducing defects and rework. Construction defects, whether in design, materials, or workmanship, can lead to costly delays, safety hazards, and legal liabilities (Alawag et al., 2024). Using TQM ideas, including process standardization, quality inspections, and staff training, helps building companies find and fix flaws early in the project's life



(Hathiwala & Pitroda, 2021). This results in improved structural integrity, compliance with industry regulations, and increased client satisfaction.

2.4.2 Improving Cost Efficiency and Waste Reduction

TQM contributes to cost efficiency by minimizing waste, optimizing resource utilization, and reducing unnecessary rework. Construction projects often suffer from material wastage, inefficient labor allocation, and budget overruns due to poor planning and quality control (Alawag et al., 2024). Lean construction ideas applied under TQM help businesses to reduce non-value-added tasks, simplify processes, and increase output. Studies have demonstrated that effective TQM use can greatly lower project costs generally while preserving excellent standards (Dara et al., 2024).

2.4.3 Enhancing Customer Satisfaction and Reputation

Customer satisfaction is a key objective of TQM, as construction projects must meet or exceed client expectations. Satisfied clients are more likely to award repeat contracts, provide positive referrals, and contribute to the long-term success of a construction firm (Nasereddin, 2015). TQM guarantees that projects fit client needs by concentrating on quality, timely delivery, and open communication, thus strengthening connections and improving the company's profile in the market (Jimoh et al., 2019).



2.4.4 Ensuring Compliance with Safety and Regulatory Standards

Safety and regulatory compliance are critical in the construction industry, where accidents and hazardous conditions can lead to severe consequences. TQM emphasizes the importance of safety management by incorporating risk assessments, employee training, and adherence to international safety standards such as ISO 45001 (Ladewski & Al-Bayati, 2019). By prioritizing safety, construction firms can reduce workplace incidents, improve worker morale, and avoid legal penalties associated with non-compliance.

2.4.5 Facilitating Continuous Improvement and Innovation

TQM fosters a culture of continuous improvement, where organizations constantly evaluate and enhance their processes to achieve better outcomes. Through regular performance assessments, benchmarking, and feedback mechanisms, construction firms can identify weaknesses and implement corrective actions (Zehir & Zehir, 2023). TQM also promotes creativity in project management, material choice, and building procedures so that companies may remain competitive in a sector changing quickly (Alawag et al., 2023).

2.5 Previous Studies

Research on Total Quality Management (TQM) has demonstrated its advantages, challenges, and application techniques in various areas of the building sector. Many



empirical research studies have shed light on how TQM improves project efficiency, customer satisfaction, and cost-effectiveness as well as the challenges in its acceptance. These studies underline how effective TQM adoption calls for active employee involvement, disciplined policies, and strong management commitment.

Emphasizing that TQM improves organisational performance through improved processes, services, and products to fulfil customer expectations, Alawag et al. (2020) examined TQM methods and their implementation in construction companies. According to the study, TQM helps enable ongoing performance enhancements, thereby supporting project success and corporate excellence. It also underlined how effective TQM use in construction depends on a dedication to quality at all organisational levels, in addition to well-defined quality rules and processes. The report also underlined how companies using TQM gain from stronger supplier connections, greater project coordination, and lessening of defects.

In Yemen, Saeed & Hasan (2012) investigated how TQM affected building project performance. Based on a thorough study of the literature, the research created a TQM framework and tested it in the Yemeni building industry. TQM reportedly improves client satisfaction, construction quality, teamwork satisfaction, and general project performance. The results implied that businesses that apply TQM techniques with effectiveness get lower project delays, better efficiency, and higher quality standard compliance. The survey also



observed, nevertheless, that a lack of sufficient training and leadership commitment causes many building companies to struggle with appropriate TQM use. This is consistent with more general industry trends, where the lack of formal training programs and quality consciousness sometimes prevents the effectiveness of TQM acceptance. Likewise, Yahya and Alab Abdullah (2022) looked at how resource management, managerial support, and ongoing development might help define the effectiveness of TQM deployment. The examination of higher and intermediate managers revealed notable discrepancies in follow-up on quality projects and enforcement, despite their partial embrace of TQM ideas. It was clear that construction companies lacking strict quality control systems and standardised monitoring systems struggled with consistent application. The study advised building companies to create stricter rules and policies to guarantee long-term compliance with TQM criteria. The results align with worldwide patterns, implying that effective deployment of TQM depends on management commitment and staff participation.

A study in Pakistan that looked at TQM activities in building projects looked at data from 326 professionals in the field to see how quality management methods affected the projects (Afzal et al., 2022). The most important determinants of TQM practice performance, according to the study, were managerial commitment, operational focus, and staff



involvement. Clear TQM strategies helped companies to better control risk, increase efficiency, and produce projects. Strong managerial support improved the direct impact of employee involvement on project performance, demonstrated by mediation analysis. This study strengthened the theory that businesses that make investments in staff development, quality awareness, and building a culture of ongoing improvement usually have higher operational success and quality control.

Moreover, research on TQM obstacles and advantages in the building sector investigated the challenges companies face when putting quality control systems into use (Salihi & Ghasemlounia, 2021). Among the various challenges the study found were financial restrictions, lack of quality awareness, and change aversion. According to the report, many building companies, especially in underdeveloped areas—have financial constraints that keep them from funding advanced quality control systems. The study also underlined, though, that breaking through these obstacles results in major advantages, including higher customer satisfaction, lower project faults, and more efficiency. The results suggested that effective TQM applications call for a comprehensive strategy encompassing all participants in the construction process, from top management to on-site laborers. Businesses that include supplier relationships, staff engagement, and ongoing process



enhancements into their TQM system usually find long-term gains in project performance and general organizational success.

2.6 Research Gap

Notwithstanding a lot of study on Total Quality Management (TQM) in the building sector, there are still notable gaps, especially in Saudi Arabia. Although previous studies have examined the implementation of Total Quality Management (TQM) in various areas, only a limited number of studies have specifically examined the extent of TQM adoption in Saudi building enterprises and the key factors contributing to their success within the local sector. Furthermore, the body of current research mostly emphasises the overall advantages of TQM, but there is little empirical data on its direct influence on project efficiency, cost control, and customer satisfaction in the Saudi building industry. Moreover, with Saudi Vision 2030 stressing sustainable growth and quality enhancement, it is important to examine how TQM fits national strategic objectives. Many studies also ignore the practical difficulties and constraints building companies have in applying TQM, which makes it difficult to create doable suggestions. This study aims to bridge these gaps by assessing TQM adoption, identifying success factors, evaluating its impact on project performance, and providing targeted recommendations to enhance TQM practices in the Saudi construction sector.

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

ISSN: 3067-1140



RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



Chapter III

Research Methodology

Chapter III

Research Methodology

3.1 Research Design

This study adopts a quantitative research design to examine the impact of Total Quality Management (TQM) on achieving excellence in the Saudi construction industry. A descriptive research approach is employed to assess the extent of TQM implementation and its influence on construction project performance, institutional efficiency, and alignment with Saudi Vision 2030. The study uses a structured questionnaire to collect primary data, enabling the measurement of respondents' perceptions regarding TQM practices and their effects on quality outcomes. This method ensures a systematic investigation of relationships between TQM principles and performance indicators in the industry.

3.2 Population and Sample Size

The target population for this research consists of professionals working in the Saudi construction industry, including project managers, engineers, quality control officers, contractors, and suppliers. Given the scale of the industry, a sample size of 200 respondents

was selected to ensure statistical reliability. The sample size was determined based on previous studies that examined TQM in construction and considered an adequate representation of industry stakeholders. By including diverse job roles, the study captures comprehensive insights into TQM adoption across different organizational levels.

3.3 Sampling Technique

A non-probability purposive sampling technique was used to select participants for the study. This approach was chosen because it allows for the inclusion of respondents who have direct experience with TQM practices in the construction sector. Since the study focuses on industry professionals knowledgeable about quality management processes, purposive sampling ensures that the collected data is relevant and meaningful. Respondents were identified based on their roles in construction firms, project management teams, and quality assurance departments.

3.4 Data Collection Method

Primary data for this study was collected through an online questionnaire distributed via Google Forms. The questionnaire was designed to assess the extent of TQM implementation, the challenges associated with its adoption, and its perceived impact on construction performance. The use of Google Forms facilitated a broad reach, allowing respondents from various locations across Saudi Arabia to participate. The questionnaire



consisted of multiple sections, including demographic information, TQM application, institutional performance, and alignment with Vision 2030.

3.5 Research Instrument

The primary research instrument used in this study was a structured questionnaire, designed based on previous validated studies on TQM in construction. The questionnaire included both closed-ended and Likert-scale questions to ensure standardized responses. The Likert-scale questions ranged from 1 (Not Important) to 5 (Very Important) to capture respondents' perceptions on various TQM factors. The questionnaire was reviewed and refined to ensure clarity and relevance before distribution.

3.6 Data Analysis Techniques

The collected data was analyzed using statistical methods to ensure accuracy and validity. Descriptive statistics, including frequency distributions and mean scores, were used to summarize respondents' perceptions of TQM practices. Additionally, inferential statistical techniques such as correlation and regression analysis were applied to examine the relationship between TQM implementation and key performance indicators in the construction industry. Data analysis was conducted using SPSS software to ensure precision and reliability.



3.7 Ethical Considerations

Ethical considerations were taken into account throughout the research process. Participation in the survey was voluntary, and respondents were assured of their anonymity and confidentiality. The purpose of the study was clearly explained, and informed consent was obtained before data collection. Additionally, data was stored securely and used solely for academic purposes, ensuring compliance with ethical research standards.

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

ISSN: 3067-1140



RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11

Chapter IV

Results and Discussion

ISSN: 3067-1140

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03



RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11

Chapter IV

Results and Discussion

4.1 Introduction

This chapter presents the findings and analysis of the collected data, structured according to the study's objectives. The results include both descriptive statistics, summarizing the responses using means and standard deviations, and inferential statistics, examining relationships between key variables using correlation and regression analysis.

4.2 Demographic Profile of Respondents

This section provides an overview of the demographic characteristics of the respondents, including gender, age, occupation, education level, and current job position. Understanding the demographic distribution helps contextualize the study findings and provides insight into the representation of different professional groups in the construction industry.

4.2.1 Gender Distribution

As shown in Table 1, the majority of respondents were male (92%), while females accounted for 8% (Figure 2). This indicates that the construction industry in Saudi Arabia is predominantly male-dominated. The low percentage of female respondents suggests that

women remain underrepresented in the sector, which is consistent with global trends where construction is traditionally a male-dominated field.

Table 1: Gender of Respondents

Gender	Frequency (n=200)	Percentage (%)
Male	184	92.0
Female	16	8.0
Total	200	100

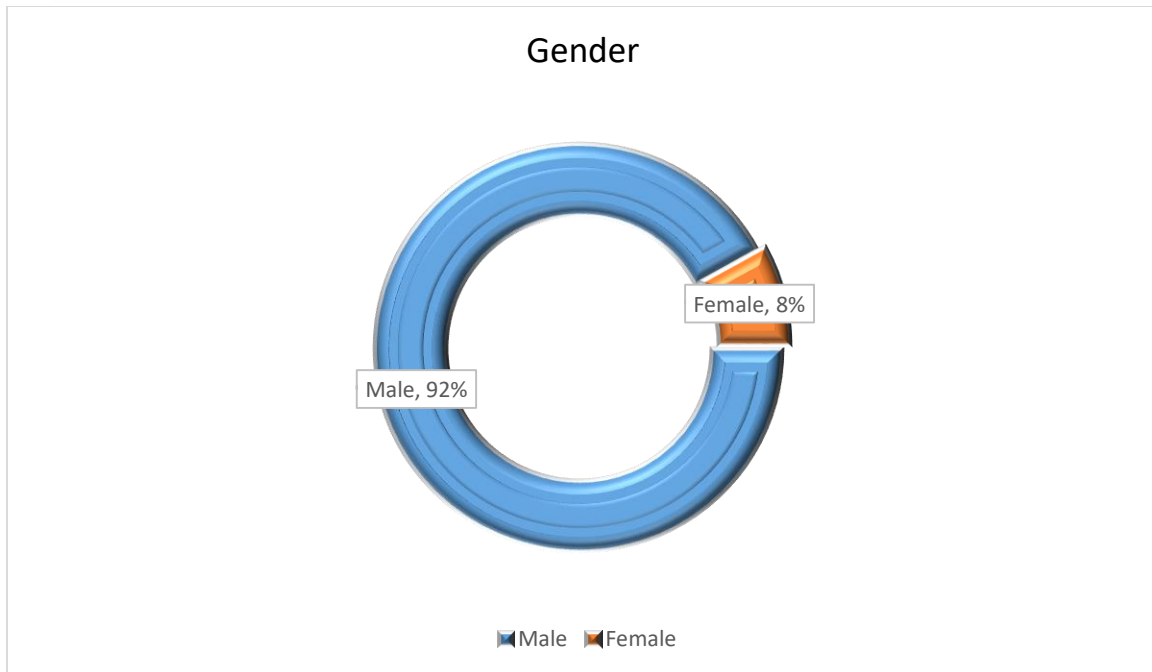


Figure 1: Gender

4.2.2 Age Distribution

The age distribution of respondents, as presented in Table 2, shows that the majority of participants (45%) fall within the 25-35 years age group, followed by 27.5% in the 36-45 years category. Meanwhile, only 1% of respondents were aged above 60 years (Figure 2).

Table 2: Age of Respondents

Age Group	Frequency (n=200)	Percentage (%)
Less than 25 years	18	9.0
25-35 years	90	45.0
36-45 years	55	27.5
46-55 years	35	17.5
Above 60 years	2	1.0
Total	200	100

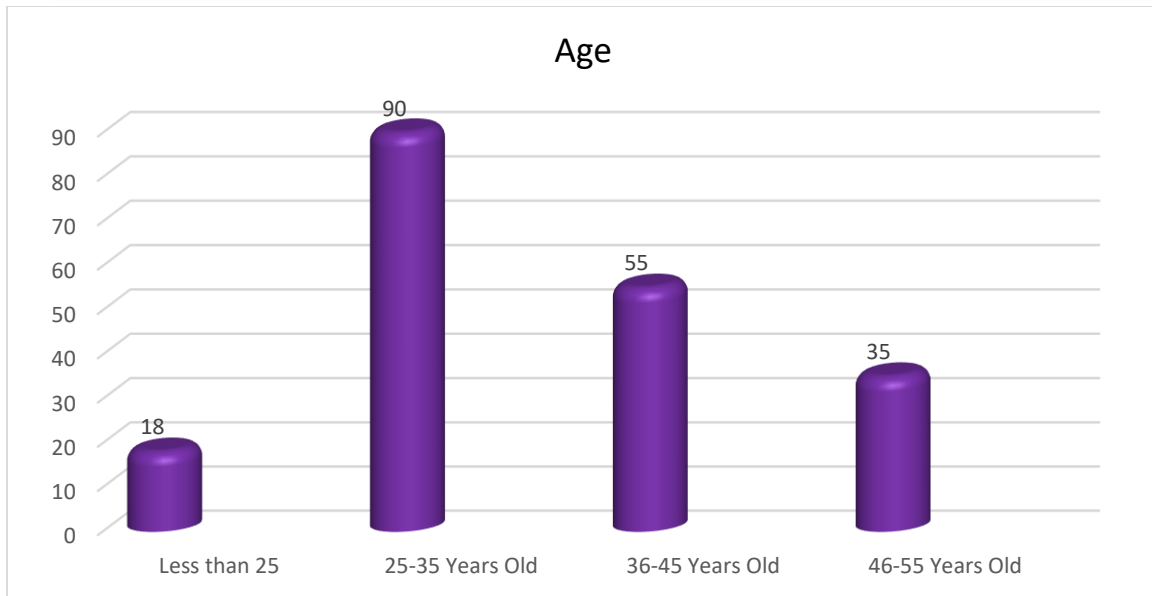


Figure 2: Age Distribution

4.2.3 Occupation Distribution

As presented in Table 3, the majority of respondents (58%) are employed in the private sector, followed by 34% working in the government sector. Only 1% of respondents identified as self-employed, while 7% were students (Figure 3).

Table 3: Occupation of Respondents

Occupation	Frequency (n=200)	Percentage (%)
Self-Employed	2	1.0

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11

ISSN: 3067-1140



Student	14	7.0
Private Sector	116	58.0
Government	68	34.0
Total	200	100

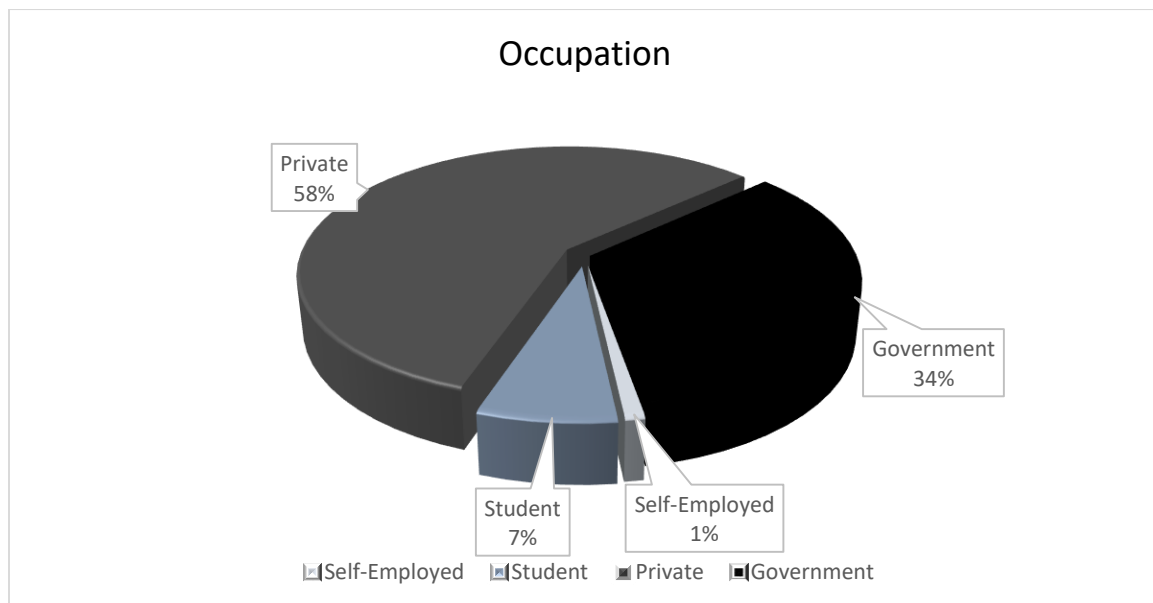


Figure 3: Occupation

4.2.4 Education Level Distribution

The respondents' education levels, shown in Table 4, reveal that the majority (61.5%) hold a bachelor's degree, followed by 15.5% with a master's degree and 14% with a diploma (Figure 4).

Table 4: Education Level of Respondents

Education Level	Frequency (n=200)	Percentage (%)
High School	16	8.0
Diploma	28	14.0
Bachelor's Degree	123	61.5
Master's Degree	31	15.5
PhD	2	1.0
Total	200	100

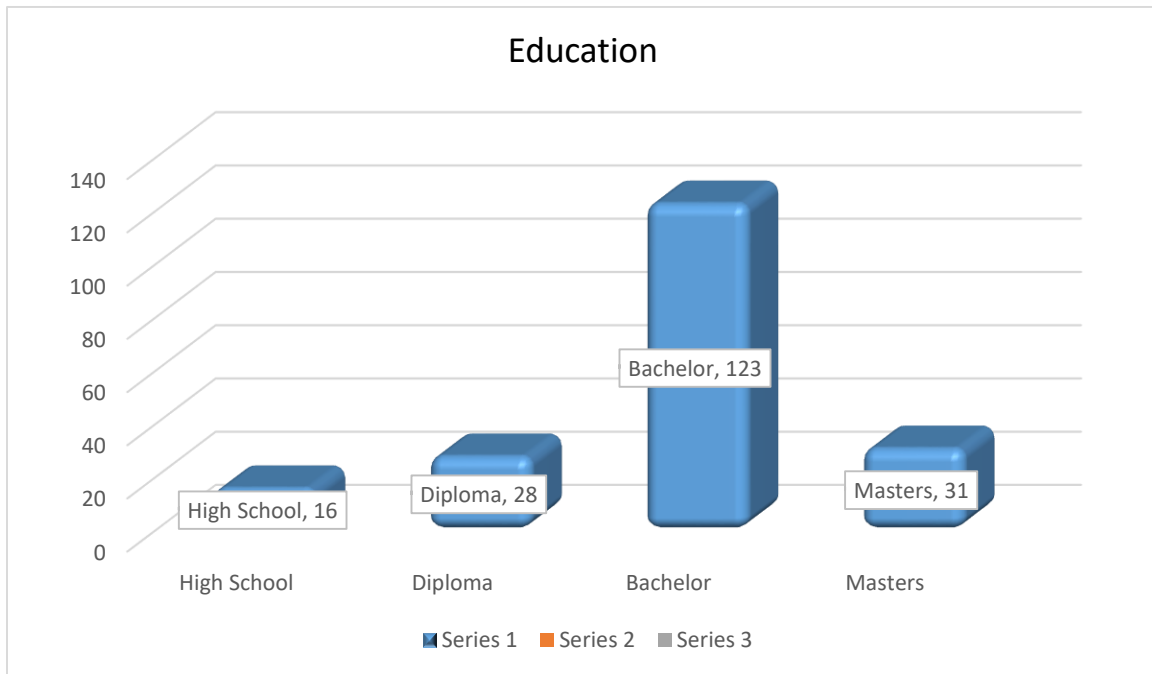


Figure 4: Education level

4.2.5 Current Job Position

The distribution of respondents' job positions, as outlined in Table 5, shows that 42% of respondents are engineers, followed by 16% working as quality control officers and 13% as project control officers (Figure 5).

Table 5: Current Position of Respondents

Job Position	Frequency (n=200)	Percentage (%)
Engineer	84	42.0

Quality Control Officer	32	16.0
Project Control Officer	26	13.0
Others	58	29.0
Total	200	100

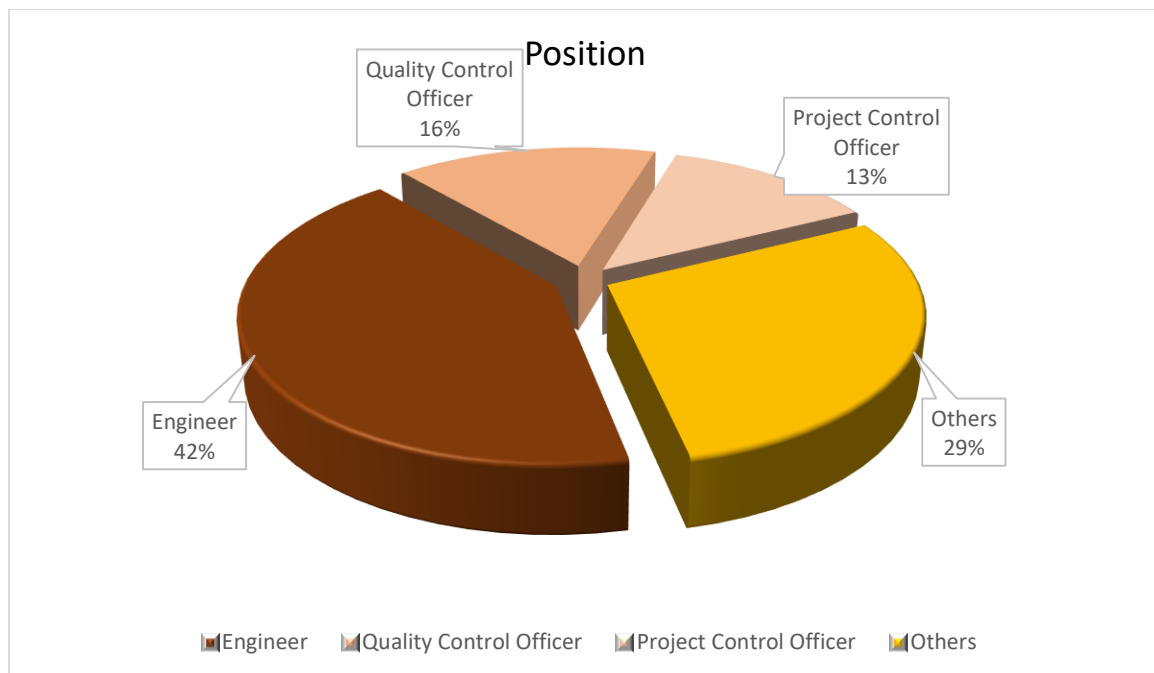


Figure 5: Position

4.3 Assessing the Level of TQM Adoption in Construction Companies

Table 6: Level of TQM Adoption

Statements	Mean	SD
Top management commitment to TQM	4.10	0.997
Adoption of TQM principles	3.96	1.086
Frequency of performance and quality evaluation	3.84	1.083
Regular employee training on TQM	3.66	1.222

The extent to which TQM is adopted in construction companies was assessed based on several indicators. Senior management commitment to TQM had the highest mean score (4.10, SD = 0.997), indicating that leadership in most companies strongly supports TQM initiatives (Table 6). However, the adoption of TQM principles (Mean = 3.96, SD = 1.086) and the frequency of performance and quality evaluation (Mean = 3.84, SD = 1.083) were slightly lower, suggesting that while TQM is a strategic priority, its full integration into daily operations is still developing.

Notably, employee training on TQM had the lowest mean score (Mean = 3.66, SD = 1.222), highlighting a key challenge in the effective implementation of TQM. This suggests that

while management may support TQM, there is a lack of structured training programs to enhance employee awareness and application of TQM principles.

Figure 6 reveals a high level of perceived implementation, especially in areas like leadership and quality impact. Employee training emerges as a relative weakness.

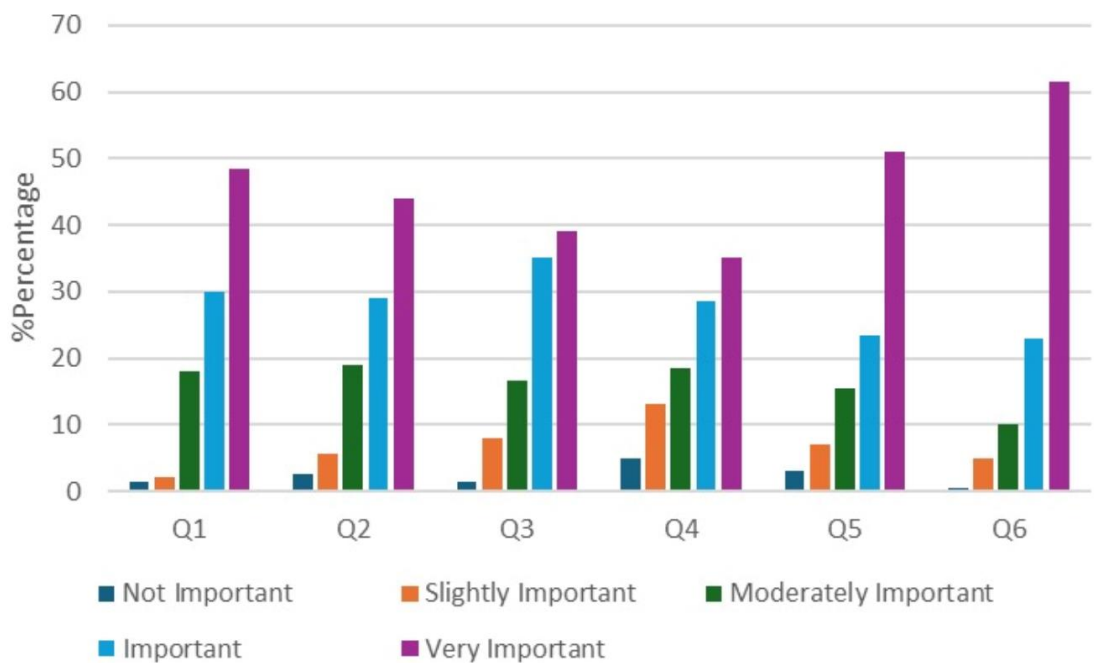


Figure 6: Level of TQM Adoption

4.4 Identifying Key Factors Influencing TQM Implementation

Table 7: Key Factors Affecting TQM Implementation

Statements	Mean	SD
Documentation and analysis of errors from previous projects	4.05	1.140
Improvement of worker safety due to quality standards	4.20	0.976
Quality management's role in fostering innovation	4.10	0.964
Effectiveness of quality management in interdepartmental cooperation	4.01	1.007
Impact of TQM on reducing internal conflicts	4.04	1.044

Several factors affecting the implementation of TQM were analyzed. The highest-rated factor was the improvement of worker safety due to quality standards (Mean = 4.20, SD = 0.976), indicating that organizations recognize TQM as a key driver of safety improvements on construction sites (Table 7).

Additionally, quality management's role in fostering innovation (Mean = 4.10, SD = 0.964) was rated highly, showing that TQM is perceived as beneficial for continuous improvement. However, the effectiveness of quality management in interdepartmental cooperation (Mean = 4.01, SD = 1.007) received the lowest rating, suggesting that cross-functional collaboration remains a challenge.

Moreover, the impact of TQM on reducing internal conflicts (Mean = 4.04, SD = 1.044) indicates that while TQM can improve teamwork, its full potential in conflict resolution has not been fully realized.

Figure 7 shows that TQM positively affects key institutional metrics, especially customer satisfaction, safety, and continuous improvement. Innovation and collaboration, while rated positively, could benefit from targeted strategies.

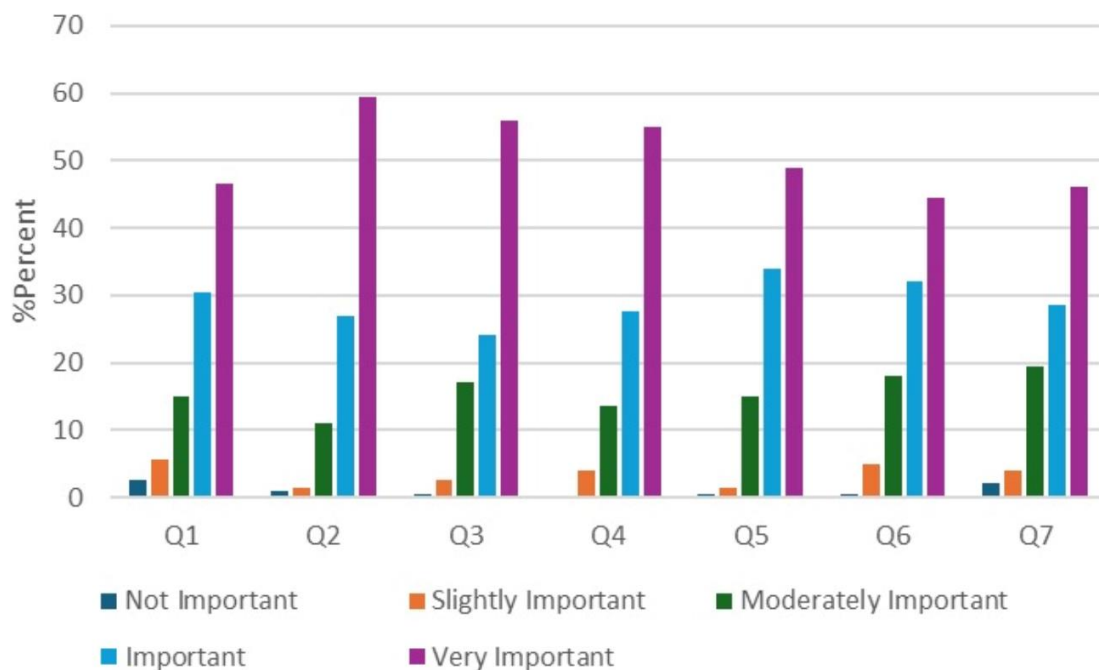


Figure 7: Key Factors Affecting TQM Implementation

4.5 Evaluating the Impact of TQM on Project Efficiency, Cost Reduction, and Customer Satisfaction

Table 8: Impact of TQM on Project Performance

Statements	Mean	SD
Quality standards reduce rework and adjustments	4.27	1.011
TQM contributes to efficiency and waste reduction	3.98	1.105
Application of quality standards increases customer satisfaction	4.26	0.974
Quality management strategies reduce time delays	4.25	0.928
High-quality construction reduces maintenance and repair costs	4.44	0.878

TQM's impact on project performance was examined based on its influence on efficiency, cost reduction, and customer satisfaction. The highest-rated impact was TQM's ability to reduce maintenance and repair costs (Mean = 4.44, SD = 0.878), suggesting that quality

management significantly enhances long-term cost savings in construction projects (Table 8).

The findings also reveal that quality standards help reduce rework and modifications during project execution (Mean = 4.27, SD = 1.011), further supporting the financial benefits of TQM. Customer satisfaction also showed strong improvement, with TQM's contribution to customer satisfaction rated at 4.26 (SD = 0.974).

However, TQM's effect on operational efficiency and waste reduction (Mean = 3.98, SD = 1.105) was the lowest among the indicators, indicating that while efficiency improvements are recognized, there may still be inefficiencies in implementing quality measures effectively.

4.6 Analyzing the Role of TQM in Supporting Saudi Vision 2030

Table 9: TQM and Saudi Vision 2030

Statements	Mean	SD
Continuous improvement methodologies impact project progress	4.25	0.940
TQM contributes to Vision 2030 by improving construction quality	4.29	0.981

Construction quality improves quality of life in Saudi Arabia	4.42	0.887
TQM enhances foreign investment attractiveness	4.32	0.944
TQM improves tourism infrastructure in line with Vision 2030	4.37	0.979

TQM's contribution to Saudi Vision 2030 was analyzed through various strategic indicators. The highest-rated aspect was the role of TQM in improving construction quality (Mean = 4.42, SD = 0.887) (Table 9), demonstrating that participants see quality management as essential to achieving national development goals.

Additionally, TQM's ability to enhance the attractiveness of foreign investment (Mean = 4.32, SD = 0.944) and improve tourism infrastructure in alignment with Vision 2030 (Mean = 4.37, SD = 0.979) were also highly rated. These findings suggest that TQM is viewed as a tool for economic growth and global competitiveness.

Respondents see TQM as a strategic enabler of Vision 2030, especially in reducing lifecycle costs, improving public well-being, and strengthening Saudi Arabia's global and regional status (Figure 8).

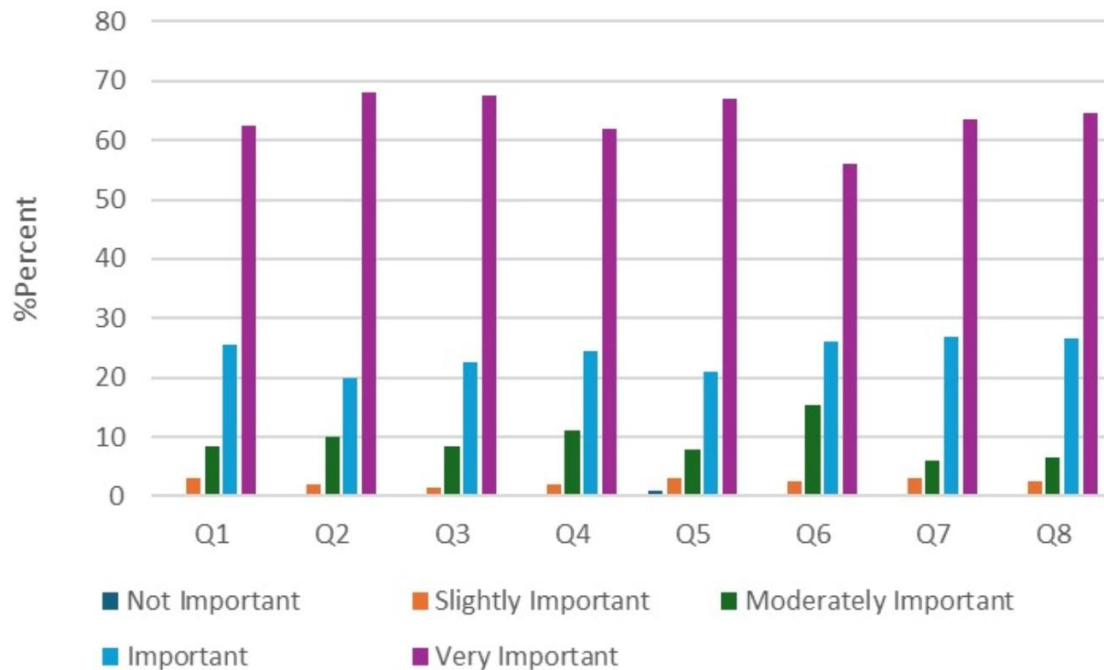


Figure 8: TQM's Role in Vision 2030

4.7 Correlation Analysis

Table 10: Pearson Correlation Coefficients

Variables	TQM Adoption	Project Efficiency	Cost Reduction	Customer Satisfaction
TQM Adoption	1.000	0.405**	0.365**	0.248**
Project Efficiency	0.405**	1.000	0.510**	0.348**
Cost Reduction	0.365**	0.510**	1.000	0.386**
Customer Satisfaction	0.248**	0.348**	0.386**	1.000

(Significance at $p < 0.01$)

A Pearson correlation analysis was conducted to examine relationships between TQM adoption, project efficiency, cost reduction, and customer satisfaction. The results (Table 10) show strong positive correlations between TQM adoption and project efficiency ($r = 0.405$, $p < 0.01$), cost reduction ($r = 0.365$, $p < 0.01$), and customer satisfaction ($r = 0.248$, $p < 0.01$). This confirms that greater TQM adoption leads to improved performance outcomes.

4.8 Discussion of Research Findings

The study findings indicate that TQM adoption in Saudi construction companies is relatively high, with strong commitment from senior management. This suggests that leaders in these organizations recognize the value of quality management in improving construction processes and outcomes. However, despite this commitment, gaps exist in the full implementation of TQM, particularly in terms of employee training and awareness. Without adequate training, employees may lack the necessary skills to apply quality management principles effectively, leading to inconsistencies in implementation. Addressing this gap through structured training programs could enhance the overall effectiveness of TQM initiatives in the construction industry.

In addition to leadership commitment, several factors influence the successful implementation of TQM. One of the most significant factors identified in the study is the improvement of worker safety. This finding suggests that quality management practices are not only beneficial for efficiency and cost reduction but also play a critical role in creating safer working environments. Another key factor is the role of TQM in fostering innovation within construction companies. By emphasizing continuous improvement, TQM encourages organizations to adopt new methods, technologies, and best practices that enhance construction quality and efficiency. However, despite these advantages,



challenges remain, particularly in the area of interdepartmental collaboration. The study reveals that organizations struggle with integrating quality management across different departments, which can limit the overall effectiveness of TQM. Improving cross-functional collaboration through better communication strategies and teamwork initiatives could enhance the effectiveness of TQM across all levels of an organization.

The study also confirms that TQM has a significant impact on project performance, particularly in terms of efficiency, cost reduction, and customer satisfaction. One of the most notable benefits is the reduction of maintenance and repair costs, indicating that implementing quality management practices leads to fewer defects and less rework. This finding aligns with prior studies that suggest organizations with strong quality control measures experience lower costs due to improved project planning and execution. Furthermore, the study establishes a positive relationship between TQM and project efficiency, demonstrating that companies that adopt quality management principles tend to complete projects more efficiently and with fewer delays. However, while the study highlights the positive effects of TQM on efficiency, it also reveals that some inefficiencies persist. This suggests that although TQM contributes to process improvements, companies may still face challenges in fully integrating these practices into their daily operations. One possible explanation is that while companies may adopt TQM policies at a strategic level,



their implementation at the operational level may be inconsistent. Ensuring that quality management is embedded into every stage of the construction process, from planning to execution, could help address these inefficiencies.

In addition to improving project performance, TQM plays a crucial role in supporting Saudi Vision 2030 objectives. The study findings indicate that quality management is widely recognized as a key factor in enhancing infrastructure quality, attracting foreign investment, and improving tourism facilities. By promoting higher construction standards, TQM contributes to the development of a more competitive and sustainable construction industry. This aligns with Saudi Arabia's long-term vision of creating world-class infrastructure that supports economic diversification and growth. Moreover, the study highlights the importance of continuous improvement methodologies in driving progress within the construction sector. However, despite these benefits, the study also identifies challenges in organizational alignment. While TQM is perceived as essential for achieving national development goals, companies may struggle with integrating quality management practices across different teams and departments. Strengthening organizational collaboration, streamlining communication, and fostering a culture of shared responsibility could help maximize the impact of TQM in achieving Vision 2030 objectives.



Chapter V

Conclusions and Recommendations

Chapter V

Conclusion and Recommendations

5.1 Conclusion

- The study found a moderate to high level of TQM adoption across construction firms in Saudi Arabia.
- There is strong support from senior management, but inconsistencies remain in implementation, especially in employee training and interdepartmental collaboration.
- Worker safety and innovation were identified as the most significant enablers of TQM success.
- Resistance to change and poor interdepartmental coordination were found to be key barriers to effective implementation.
- Effective TQM practices led to notable improvements in cost efficiency, construction quality, and customer satisfaction.

- Companies with higher TQM integration experienced fewer reworks, reduced maintenance costs, and better project delivery performance.
- However, the incomplete integration of TQM into all operational processes limited its full benefits.
- TQM supports key objectives of Saudi Vision 2030 by enhancing infrastructure quality, efficiency, and global competitiveness.
- Its adoption contributes to economic diversification, foreign investment attraction, and sustainable development in the construction sector.
- Gaps remain in employee training, leadership engagement, and organizational culture regarding continuous quality improvement.
- Addressing these issues will maximize TQM's impact on both project success and broader national goals.

5.2 Recommendations

Enhance Employee Training in TQM

- Develop structured training programs covering TQM principles, Six Sigma, Lean Construction, and quality control tools.



- Conduct regular workshops and hands-on sessions to ensure all employees understand and apply TQM consistently.

Strengthen Leadership Engagement

- Encourage leaders to be actively involved in daily quality initiatives, not just in strategic support.
- Set clear quality objectives and establish dedicated quality management teams to sustain leadership focus.

Improve Interdepartmental Collaboration

- Create structured communication channels between departments to enhance teamwork on quality goals.
- Form cross-functional quality teams to foster collaboration and joint problem-solving across project phases.

Foster a Culture of Continuous Improvement

- Promote a work environment that values innovation and quality enhancement.



- Use performance rewards and employee recognition systems to motivate proactive quality contributions.

Invest in Advanced Quality Control Measures

- Implement real-time monitoring systems and preventive maintenance programs to catch issues early.
- Leverage emerging technologies like BIM, automation, and digital tracking tools to enhance accuracy and reduce rework.

Align TQM with Saudi Vision 2030

- Ensure TQM practices support international construction standards and align with national development goals.
- Collaborate with regulatory bodies to adopt sustainable, high-quality construction practices that attract foreign investment.

Overcome Resistance to Change

- Introduce effective change management strategies, including awareness campaigns and mentoring programs.



- Involve employees in decision-making and communicate the long-term benefits of TQM to gain buy-in.

Create a Comprehensive TQM Framework

- Combine the above strategies into an integrated TQM framework tailored to the Saudi construction context.
- Regularly evaluate and refine the framework to ensure continuous alignment with industry challenges and opportunities.

REFERENCES

1. Abdulkadir, K. (2023). Total Quality as an Effective Tool for Achieving Customer Satisfaction, Patronage, Productivity Gains and Sustainability in Organizations. *Studies in Economics and Business Relations*, 4(2), Article 2. <https://doi.org/10.48185/sebr.v4i2.893>
2. Kolla, S. K. (2025). Next-Generation Precision Healthcare: AI-Driven Clinical Intelligence, Predictive Analytics, and Adaptive Decision Support Systems. *International Journal of Research Publications in Engineering, Technology and Management (IJRPETM)*, 8(4), 12539-12552.
3. Afzal, N., Hanif, A., & Rafique, M. (2022). Exploring the impact of total quality management initiatives on construction industry projects in Pakistan. *PLoS ONE*, 17(9), e0274827. <https://doi.org/10.1371/journal.pone.0274827>
4. Ahmed, M. A., & Sajid, N. M. (2023). Leadership and Its Impact on Total Quality Management. *Journal of Advanced Research in Economics and Administrative Sciences*, 4(3), Article 3. <https://doi.org/10.47631/jareas.v4i3.709>
5. Mangalampalli, B. M., Kolla, S. K., Bandi, V. D. V. K., Yandamuri, U. S., & Rani, P. S. (2025). Designing Intelligent Healthcare Ecosystems through Adaptive Data

Integration and Autonomous Learning Systems. Vascular and Endovascular Review, 8(20s), 330-347.

6. Aichouni, A. B. E., Silva, C., & Ferreira, L. M. D. F. (2024). A Systematic Literature Review of the Integration of Total Quality Management and Industry 4.0: Enhancing Sustainability Performance Through Dynamic Capabilities. Sustainability, 16(20), Article 20. <https://doi.org/10.3390/su16209108>
7. Alawag, A. M., Alaloul, W. S., Liew, M. S., Baarimah, A. O., Musarat, M. A., & Al-Mekhlafi, A.-B. A. (2023). The Role of the Total-Quality-Management (TQM) Drivers in Overcoming the Challenges of Implementing TQM in Industrialized-Building-System (IBS) Projects in Malaysia: Experts' Perspectives. Sustainability, 15(8), Article 8. <https://doi.org/10.3390/su15086607>
8. Siva Hemanth Kolla, Narendra Mangala. (2025). DESIGNING AUTONOMOUS LLM AGENT FRAMEWORKS USING GEN AI PIPELINES TO ENHANCE CUSTOMER SERVICE MANAGEMENT AND KNOWLEDGE WORKFLOWS. Lex Localis - Journal of Local Self-Government, 23(S6), 9719–9733. <https://doi.org/10.52152/rhxpbz87>
9. Alawag, A. M., Alqahtani, F. K., Alaloul, W. S., Liew, M. S., Baarimah, A. O., Al-Mekhlafi, A.-B. A., & Sherif, M. A. (2024). Developing Framework for Implementing Total Quality Management (TQM) in Sustainable Industrialized Building System (IBS)



in Construction Projects. Sustainability, 16(23), Article 23.

<https://doi.org/10.3390/su162310399>

10. Mattaparthi, R. (2025). GenAI-Augmented Diagnostic Reasoning for Diesel Engine Fault Triage: A Large Language Model Framework for Technician Decision Support at Scale. *Journal of Material Sciences & Manufacturing Research*, 6(12), 1. [https://doi.org/10.47363/jmsmr/2025\(6\)226](https://doi.org/10.47363/jmsmr/2025(6)226)

11. Alghuried, A. (2025). Assessing the critical success factors for the sustainable construction project management of Saudi Arabia. *Journal of Asian Architecture and Building Engineering*. <https://www.tandfonline.com/doi/abs/10.1080/13467581.2025.2454616>

12. Raghunath Loganathan. (2025). AGENTIC AI FRAMEWORKS FOR AUTONOMOUS RISK DETECTION AND COMPLIANCE REMEDIATION IN ENTERPRISE DATA CENTER OPERATIONS. *Lex Localis - Journal of Local Self-Government*, 23(S6), 9672–9697. <https://doi.org/10.52152/3f90ak91>

13. Ali Ibrahim Bisho, A. H., & Bin Mohd Sam, M. F. (2022). TOTAL QUALITY MANAGEMENT INTEGRATED STRATEGY: ITS IMPLICATION TO ORGANIZATIONAL SUCCESS. *Proceedings on Engineering Sciences*, 4(3), 371–378. <https://doi.org/10.24874/PES04.03.014>



14. Srikanth, T., Segireddy, A. R., & Elavarasi, S. A. (2025, October). STaSFormer-SGAD: Semantic Triplet-Aware Spatial Flow-Guided Spatio-Temporal Graph for Anomaly Detection in Surveillance Videos. In 2025 International Conference on Communication, Computer, and Information Technology (IC3IT) (pp. 1-7). IEEE.
15. Alsharef, A., Ovid, A., Jamil Uddin, S. M., & Albert, A. (2024). Biggest Challenges Facing the Construction Industry. 652–660. <https://doi.org/10.1061/9780784485286.065>
16. Dara, H. M., Raut, A., Adamu, M., Ibrahim, Y. E., & Ingle, P. V. (2024). Reducing non-value added (NVA) activities through lean tools for the precast industry. Heliyon, 10(7), e29148. <https://doi.org/10.1016/j.heliyon.2024.e29148>
17. Egbebi, A. O. (2024). Quality Management in Construction Projects. International Journal of Research Publication and Reviews. https://www.academia.edu/126617326/Quality_Management_in_Construction_Projects
18. Hathiwala, A. M., & Pitroda, D. J. R. (2021). Implementation of Total Quality Management in Construction Company: A Review. Turkish Online Journal of Qualitative Inquiry, 12(7), Article 7. <https://doi.org/10.53555/tojq.v12i7.3827>



19. Ibrahim, A., Zayed, T., & Lafhaj, Z. (2024). Enhancing Construction Performance: A Critical Review of Performance Measurement Practices at the Project Level. *Buildings*, 14(7), Article 7. <https://doi.org/10.3390/buildings14071988>
20. Mattaparthi, R. (2025). GenAI-Augmented Diagnostic Reasoning for Diesel Engine Fault Triage: A Large Language Model Framework for Technician Decision Support at Scale. *Journal of Material Sciences & Manufacturing Research*, 6(12), 1. [https://doi.org/10.47363/jmsmr/2025\(6\)226](https://doi.org/10.47363/jmsmr/2025(6)226)
21. Jimoh, R., Oyewobi, L., Isa, R., & Waziri, I. (2019). Total quality management practices and organizational performance: The mediating roles of strategies for continuous improvement. *International Journal of Construction Management*. <https://www.tandfonline.com/doi/abs/10.1080/15623599.2017.1411456>
22. Ladewski, B. J., & Al-Bayati, A. J. (2019). Quality and safety management practices: The theory of quality management approach. *Journal of Safety Research*, 69, 193–200. <https://doi.org/10.1016/j.jsr.2019.03.004>
23. Kolla, T. (2025). Anomaly Detection Models for Outlier Provider Behavior in Cost and Treatment Patterns. *Journal of Computational Analysis & Applications*, 34(12), 1204.
24. Nasereddin, M. Y. (2015). An investigation of the importance of Total Quality Management in construction field projects: Quality control. <https://doi.org/10.13140/RG.2.1.2261.1609>



25. Okonta, E. D., Okeke, F. O., Ojelabi, E. T., & Akinola, A. V. (2024). Exploring the Role of quality management practices (QMS) in mitigating Construction Failures and building collapse. Discover Civil Engineering, 1(1), 111. <https://doi.org/10.1007/s44290-024-00115-6>
26. Reddy, V. A. R., & Kolla, S. K. (1984). Infrastructure-As-Code Practices For Regulated Healthcare Cloud Environments. Metallurgical and Materials Engineering, 30 (4), 1028–1042.
27. Riaz, H., Iqbal Ahmad Khan, K., Ullah, F., Bilal Tahir, M., Alqurashi, M., & Alsulami, B. T. (2023). Key factors for implementation of total quality management in construction Sector: A system dynamics approach. Ain Shams Engineering Journal, 14(3), 101903. <https://doi.org/10.1016/j.asej.2022.101903>
28. Sheoran, V., & Thakur, D. J. (2023). A STUDY ON EVALUATION OF QUALITY MANAGEMENT SYSTEMS IN CONSTRUCTION PROJECTS. International Journal of Membrane Science and Technology, 10(4), Article 4. <https://doi.org/10.15379/ijmst.v10i4.2357>
29. Singh, J., & Singh, H. (2015). Continuous improvement philosophy – literature review and directions. Benchmarking: An International Journal, 22(1), 75–119. <https://doi.org/10.1108/BIJ-06-2012-0038>



30. Snongtaweeporn, T., Siribensanont, C., Kongsong, W., & Channuwong, S. (2020). Total Quality Management in Modern Organizations by Using Participation and Teamwork.
31. Xie, W., Deng, B., Yin, Y., Lv, X., & Deng, Z. (2022). Critical Factors Influencing Cost Overrun in Construction Projects: A Fuzzy Synthetic Evaluation. *Buildings*, 12(11), Article 11. <https://doi.org/10.3390/buildings12112028>
32. Yu, H., Shang, Z., & Wang, F. (2024). Analysis of the Current Situation of the Construction Industry in Saudi Arabia and the Factors Affecting It: An Empirical Study. *Sustainability*, 16(16), Article 16. <https://doi.org/10.3390/su16166756>
33. Zehir, S., & Zehir, C. (2023). Effects of Total Quality Management Practices on Financial and Operational Performance of Hospitals. *Sustainability*, 15(21), Article 21. <https://doi.org/10.3390/su152115430>



APPENDIX

QUESTIONNAIRE

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



إستبيان حول "بناء التميز: تسخير قوة إدارة الجودة الشاملة لتحقيق تفوق لامثيل له في صناعة البناء السعودية" Questionnaire on "Building Excellence: Harnessing the power of Total quality management for Unmatched Excellence in the Saudi construction industry

عززي المشاركون،

أنا باحث، أواصل دراساتي للحصول على درجة الماجستير في إدارة المشاريع الإنشائية في جامعة الملك خالد حول "بناء التميز: تسخير قوة إدارة الجودة الشاملة لتحقيق تفوق لامثيل له في صناعة البناء السعودية" سنكون شاكرين لو خصصتم وقتكم للتميز لاستكمال الاستبيان المرفق. قد يستغرق استكمال الاستبيان من 5 إلى 10 دقيقة. ستضيف ملاحظتكم القيمة أهمية لأبحاثنا وكذلك لجسم المعرفة. سيتم استخدام الردود الإجمالية للأغراض الأكاديمية فقط.

في حالة وجود أي غموض أثناء ملء هذا الاستبيان، يرجى عدم التردد في التواصل معي على الإيميل 445816768@kku.edu.sa

أو يمكنك التواصل مع مشرفي الرئيسي، د. جميل محمد سرادك jamoali@kku.edu.sa

شكرا لك،

مع خالص التقدير،

Dear Participant,

I am a researcher, continuing my studies to obtain a master's degree in construction
" project management at King Khalid University on

Building Excellence: Harnessing the power of Total quality management for Unmatched Excellence in the Saudi construction industry" We would be grateful if you would dedicate your valuable time to completing the attached questionnaire. It may take 5-10 minutes to complete the questionnaire. Your valuable feedback will add importance to our research as well as to the body of knowledge. Aggregate responses will be used for academic purposes only.

In case of any ambiguity while filling out this questionnaire, please do not hesitate to contact me at 445816768@kku.edu.sa

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



التعليمات Instructions

يرجى قراءة التعليمات التالية بعناية ومراعاة ذلك أثناء الإجابة على عناصر هذا الاستبيان

يرجى إكمال جميع العناصر في الاستبيان

في كل من الجزء الأول والجزء الثاني، يرجى استخدام علامة (✓) للإجابة

يتكون الجزء الثاني من مقياس ليكرت من 5 نقاط يتراوح من غير مهم إلى مهم جدًا؛ يرجى وضع علامة (✓) على الرقم المقابل كإجابة

حاول الإجابة في أقل وقت ممكن، حيث تعتبر ردود الفعل السريعة دقيقة وأفضل

Kindly read the following instructions carefully and consider them while responding the items of this questionnaire:

Please complete all items in the questionnaire.

In both Part I and Part II, please use tick (✓) to respond.

Part II comprises of 5 point likert scale ranging from Not Important to Very Important; please tick (✓) the corresponding number as your respond.

Try to answer in minimum time, prompt reactions are considered accurate and best

Respondent profile القسم الأول: ملف تعريف المشارك

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



1. الجنس Gender : *

- ☐ Male ذكر
- ☐ Female أنثى

2. العمر Age : *

- ☐ >24 سنة
- ☐ 35-25 سنة
- ☐ 45-36 سنة
- ☐ 55- 46 سنة
- ☐ >60 سنة

3. المهنة Occupation : *

- ☐ Government Employee موظف حكومي
- ☐ Private Sector قطاع خاص
- ☐ Self-employed/Business العاملين لحسابهم الخاص / الأعمال التجارية
- ☐ Student طالب

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



4. المستوى التعليمي Education Level : *

- ☐ High School المرحلة الثانوية
- ☐ Diploma دبلوم
- ☐ Bachelor's Degree درجة البكالوريوس
- ☐ Master's Degree درجة الماجستير
- ☐ PhD الدكتوراه

4. المنصب الحالي Current Position : *

- ☐ Project Manager مدير المشروع
- ☐ Engineer مهندس
- ☐ Quality Control Officer مسؤول مراقبة الجودة
- ☐ Contractor/Supplier المقاول / المورد
- ☐ Other آخر

في شركات البناء (TQM) القسم الثاني: مدى تطبيق إدارة الجودة الشاملة

The extent to which Total Quality Management (TQM) is applied in construction companies

بناء على خبرتك، يرجى الإشارة إلى مستوى أهمية العوامل التالية في تنفيذ إدارة الجودة الشاملة

(غير مهم، 2 = مهم قليلاً، 3 = مهم إلى حد ما، 4 = مهم، 5 = مهم جداً = 1)

Based on your experience, please indicate the importance level of the following factors in implementing Total Quality Management (TQM):

(1 = Not Important, 2 = Slightly Important, 3 = Moderately Important, 4 = Important, 5 = Very Important)

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



إلى أي مدى تلتزم الإدارة العليا بتطبيق معايير الجودة وتعزيز التحسين المستمر. 1 *

To what extent is top management committed to applying quality standards and fostering continuous improvement

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

هل تتبنى شركتكم مبادئ إدارة الجودة الشاملة في جميع عملياتها. 2 *

Does your company adopt the principles of total quality management in all its operations

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



3. كم مرة يتم تقييم الأداء والجودة لضمان الامتثال للمعايير المطلوبة. *

How frequently are performance and quality evaluated to ensure compliance with required standards

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

4. هل يتم تدريب الموظفين بانتظام على مفاهيم وممارسات إدارة الجودة الشاملة. *

Are employees regularly trained in TQM concepts and practices

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



5. ما مدى جودة توثيق الأخطاء والعيوب من المشاريع السابقة وتحليلها لتحسين الجودة في المستقبل. *

How well are errors and defects from previous projects documented and analyzed for future quality improvement

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

6. هل تساعد معايير الجودة في تقليل الحاجة إلى إعادة العمل والتعديلات أثناء تنفيذ المشروع. *

Do quality standards help reduce the need for rework and adjustments during project implementation

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

القسم الثالث: تأثير إدارة الجودة الشاملة على الأداء المؤسسي

The impact of total quality management on institutional performance

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



1. إلى أي مدى ساهمت إدارة الجودة الشاملة في تحسين كفاءة العمليات وتقليل الهدر في مؤسستك *

To what extent has Total Quality Management contributed to improving the efficiency of operations and reducing waste in your organization

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

2. إلى أي مدى أدى تطبيق معايير الجودة إلى زيادة رضا العملاء *

To what extent has the application of quality standards resulted in an increase in customer satisfaction

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



3. ما مدى تأثير استخدام منهجيات التحسين المستمر بشكل إيجابي على تقدم المشاريع. *

How positively do you believe the use of continuous improvement methodologies affects the progress of projects

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

4. إلى أي مدى تحسنت سلامة العمال وممارسات السلامة في مواقع البناء نتيجة لتطبيق معايير الجودة. *

To what extent have worker safety and safety practices on construction sites improved due to the application of quality standards

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



5. هل تعتقد أن إدارة الجودة تساهم في تشجيع الابتكار داخل المنظمة من خلال السعي إلى أفضل الممارسات. *

Do you believe that quality management contributes to encouraging innovation within the organization through the pursuit of best practices

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

6. ما مدى فعالية إدارة الجودة التي تعزز التعاون بين الإدارات المختلفة داخل مؤسستك لتحقيق الأهداف المشتركة. *

How effectively does quality management promote cooperation between different departments within your organization to achieve common goals

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



7. إلى أي مدى تساعد إدارة الجودة الشاملة في تقليل النزاعات الداخلية وتحسين بيئة العمل في مؤسستك. *

To what extent does Total Quality Management help reduce internal conflicts and improve the working environment in your organization

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

القسم الرابع: تأثير إدارة الجودة الشاملة على تحقيق رؤية السعودية 2030

The impact of total quality management on achieving Saudi Vision 2030

1. إلى أي مدى تعتقد أن إدارة الجودة الشاملة تساهم في تحقيق أهداف رؤية 2030 من خلال تحسين جودة مشاريع البناء. *

To what extent do you believe that Total Quality Management contributes to achieving the goals of Vision 2030 by improving the quality of construction projects

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



2. * إلى أي مدى تعتقد أن البناء عالي الجودة يقلل من تكاليف الصيانة والإصلاح ، وبالتالي دعم التنمية المستدامة .

To what extent do you think that high-quality construction reduces maintenance and repair costs, thereby supporting sustainable development

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

3. * ما مدى تأثير جودة مشاريع البناء على تحسين نوعية الحياة في المملكة .

How significantly does the quality of construction projects affect the improvement of the quality of life in the Kingdom

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



4. إلى أي مدى تساهم إدارة الجودة الشاملة في تعزيز جاذبية الاستثمار الأجنبي في قطاع البناء السعودي . *

To what extent does Total Quality Management enhance the attractiveness of foreign investment in the Saudi construction sector

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

5. إلى أي مدى يدعم تطبيق إدارة الجودة الشاملة أهداف رؤية 2030 المتعلقة بجذب السياحة من خلال تحسين جودة المرافق والبنية التحتية السياحية . *

To what extent does the implementation of Total Quality Management support the goals of Vision 2030 related to attracting tourism by improving the quality of tourism facilities and infrastructure

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



6. إلى أي مدى تعتقد أن استراتيجيات إدارة الجودة تساهم في تقليل التأخير الزمني للمشاريع الكبرى. *

How much do you believe that quality management strategies contribute to reducing time delays for major projects

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

7. إلى أي مدى تعتقد أن المشاريع البناء عالية الجودة تساعد في تحقيق أهداف رؤية 2030 وتعزيز مكانة المملكة كمركز إقليمي للبناء والتنمية العمرانية. *

To what extent do you think that high-quality construction projects help achieve the goals of Vision 2030 and strengthen the Kingdom's position as a regional hub for construction and urban development

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً

AMERICAN ONLINE JOURNAL OF SCIENCE AND ENGINEERING

VOLUME: 03 ISSUE: 03

RECEIVED: MAY 24

REVISED: JUNE 06

ACCEPTED: JUNE 27

PUBLISHED: JULY 11



8. ما مدى أهمية تأثير جودة البناء على التنمية الشاملة في المملكة. *

How significant is the impact of construction quality on overall development in the Kingdom

- ☐ Not Important غير مهم
- ☐ Slightly Important مهم قليلاً
- ☐ Moderately Important مهم إلى حد ما
- ☐ Important مهم
- ☐ Very Important مهم جداً