

**The Impact of Risk Management on Fast-Track
Construction Projects:**
An Applied Study on the Saudi Construction Sector

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Finally, I thank all my fellow students who shared with me fruitful ideas and discussions, and who contributed to creating an inspiring academic environment.

Dedication

I dedicate this humble work to those dearest to my heart, with all respect and
pride:

To my mother, the source of my wisdom, my light, and my guidance; to my
support, strength, and homeland,

To the great heart, my beloved father,

To the symbol of love and the healing touch, to the one whose presence brings
happiness to my heart, to the symbol of loving sacrifice, my dear mother,

To the one who shares my dreams and ambitions, my soulmate, my ideal
husband,

To everyone who supported and helped me to reach this stage,

To all, I dedicate the fruit of my effort.

Summary

The construction sector in Saudi Arabia is experiencing significant expansion, driven by Vision 2030 flagship projects such as NEOM, the Red Sea Projects, Qiddiya, and a host of other megaprojects. This acceleration is accompanied by complex risk management requirements, particularly in fast-track construction projects that reduce timelines while demanding impeccable quality, safety, and worker health.

This research examines how risk management is currently practiced in fast-track construction projects and its impact on project quality, using NEOM as a leading case study. Using a descriptive and analytical approach, the study gathered evidence through a structured survey of 120 NEOM employees, including engineers, project managers, administrative, and technical staff.

The results indicate that risk management is well established at NEOM, with demonstrated rigor in risk identification and assessment. Systematic assessment and the formulation of mitigation strategies are clearly demonstrated. The analysis also reveals a statistically significant positive correlation between effective risk management implementation and qualitative results: more rigorous practices are associated with fewer construction defects, fewer workplace accidents, and greater satisfaction among project beneficiaries.

The study highlights the need to establish a culture of risk awareness at all stages of the project life cycle and calls for the adoption of modern frameworks and standards, including ISO 45001 and the Saudi Building Code, to protect workers and ensure quality implementation. It also urges the relevant authorities to expand training programs and update regulatory guidelines to promote sustainable urban development and protect human capital.

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Chapter 1
The General Framework
of the Study

Introduction

The construction sector is one of the main drivers of economic and social development in the Kingdom of Saudi Arabia. It plays a vital role in achieving the goals of Vision 2030, particularly in building modern infrastructure and improving the quality of life. In recent years, this sector has experienced rapid growth with the implementation of megaprojects such as NEOM, the Red Sea Project, and Qiddiya. These projects are advancing the Kingdom's ambition to transform its urban and economic landscape (General Authority of Statistics, 2023).

At the same time, the construction sector is considered one of the most hazardous in the world. Official statistics indicate that approximately 35% of reported workplace accidents in Saudi Arabia occur in this sector. This underscores the urgent need to strengthen risk management to protect workers and improve project outcomes (Mousa, 2018).

Emergency projects present additional challenges. The frequent overlap between planning and execution phases increases time pressure, which can lead to safety risks, poor quality, and cost overruns. Studies confirm that projects with tight schedules are prone to higher accident and defect rates than traditional projects (Tadayon, Jaafar, & Nasri, 2012).

Therefore, effective risk management has become essential. Risk management involves identifying, analyzing, and controlling potential risks before they occur, and then taking the necessary measures to mitigate their impact. International standards, such as ISO 45001 and the Saudi Building Code, recommend systematic risk management approaches covering all project phases (PMI, 2017; SASO, 2020).

This study focuses on the role of risk management in improving quality, safety, and occupational health in fast-track projects in Saudi Arabia. It aims to provide practical recommendations to decision-makers and project managers.

Problem Statement

Despite the importance of risk management, many fast-track projects in Saudi Arabia still suffer from inadequate planning, poor coordination, and frequent safety incidents. The overlap between design and construction phases often leads to unforeseen problems, including delays, cost overruns, and quality defects. Local studies also show that project managers sometimes focus more on meeting deadlines than on risk prevention, increasing the risk of accidents (Al-Zara et al., 2016).

Therefore, the main question addressed in this research is:

How does risk management affect quality, safety, and occupational health in fast-track construction projects in Saudi Arabia?

Research Questions

This study aims to answer the following questions:

1. To what extent are risk management practices applied in fast-track projects in Saudi Arabia?
2. How does risk management impact project quality and compliance with specifications?
3. Does risk management reduce work-related accidents and improve occupational health?
4. What are the main barriers to the effective use of risk management in fast-track projects?
5. How can modern technologies, such as Building Information Modeling (BIM), contribute to improving risk management?

Research Objectives

Based on the above questions, the objectives of this study are:

1. Assess the current level of risk management implementation in fast-track projects.
2. Analyze the relationship between risk management and project quality.
3. Evaluate the impact of risk management on occupational health and safety.
4. Identify barriers and challenges related to the implementation of risk management practices.
5. Provide practical recommendations for improving risk management in line with Vision 2030.

Significance of the Study

This study has both scientific and practical significance.

Scientific significance:

From an academic perspective, this research contributes to the growing knowledge on risk management in the construction sector. While risk management has received extensive attention in international studies, specific research on fast-track projects in Saudi Arabia remains lacking. By filling this gap, the study contributes to a better understanding of the impact of risk management on quality, safety, and occupational health in a local context (Musa, 2018; Zhou, Zhang, & Wang, 2007). The study also develops a conceptual framework and hypotheses that future researchers can test, enriching academic studies.

Practical significance:

From a practical perspective, the study provides insights and recommendations for project managers, engineers, and policymakers. By highlighting the key risks and challenges of fast-track projects, the research proposes strategies to improve safety, reduce schedules, and enhance quality. The findings can help decision-makers implement more effective risk management systems, using modern tools such as BIM, and ensure compliance with standards such as the Saudi Building Code and ISO 45001. This will not only improve project outcomes but will also help protect workers and reduce financial losses (Alzara et al., 2016; SASO, 2020).

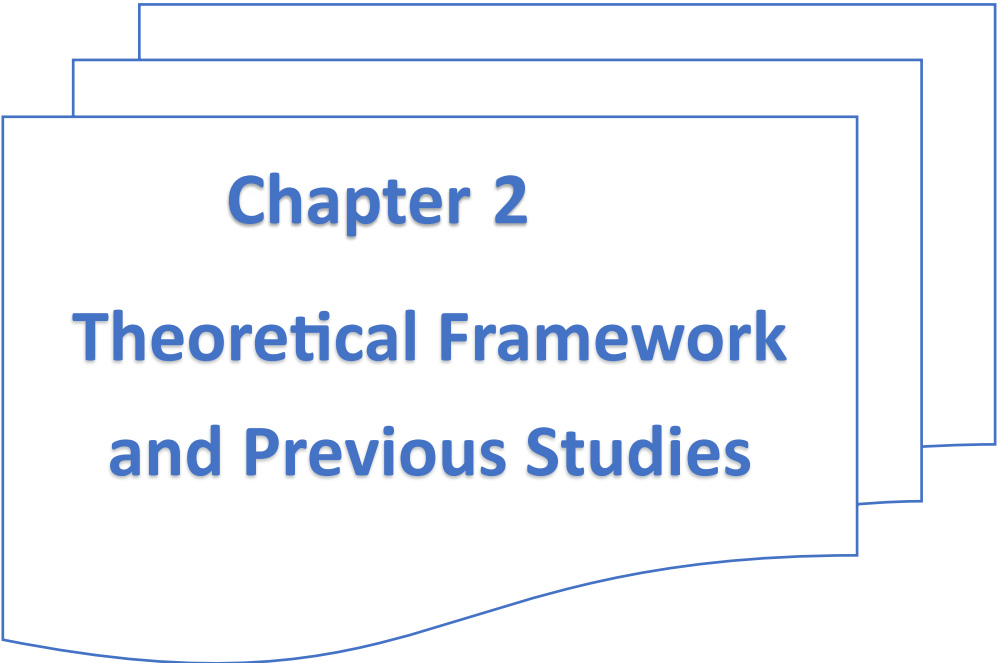
Scope and Limitations

1. Assess the current level of risk management implementation in fast-track projects.
2. Analyze the relationship between risk management and project quality.
3. Evaluate the impact of risk management on occupational health and safety.
4. Identify barriers and challenges related to the implementation of risk management practices.
5. Provide practical recommendations for improving risk management in line with Vision 2030.

Structure of the Thesis

The thesis is organized into five main chapters:

- Chapter One introduces the study, its problem, objectives, and significance.
- Chapter Two reviews the literature, explains the theoretical framework, and presents research hypotheses.
- Chapter Three describes the research design, methodology, and data collection tools.
- Chapter Four presents the results and data analysis.
- Chapter Five provides discussion, conclusions, and recommendations.



Chapter 2

Theoretical Framework and Previous Studies

The theoretical framework forms the foundation of applied research. It explains the main ideas related to the topic and provides the scientific context necessary to understand the research problem. This chapter also links theory to practical applications in construction projects.

In Saudi Arabia, in recent years, there has been a focus on fast-track construction projects, driven by the Kingdom's desire to accelerate development. However, these projects face numerous risks related to time constraints and overlapping activities. Risk management is therefore an essential tool for ensuring quality, safety, and efficiency (Zhou, Zhang, & Wang, 2007; Tdayon, Jafar, & Nasri, 2012).

Definition of Risk and Its Types

In the construction industry, risk refers to the potential occurrence of unforeseen events that could affect project objectives, such as cost, schedule, quality, or worker safety. Many researchers classify risks into several categories:

- Technical risks: design errors, poor material estimates, or implementation errors.
- Schedule risks: delivery delays or missed deadlines.
- Financial risks: budget shortfalls, price fluctuations, or exchange rate changes.
- Safety and health risks: accidents, injuries, and occupational illnesses.
- Legal and regulatory risks: non-compliance with local or international codes, such as the Saudi Building Code or ISO 45001 (Haines and Wilson, 2000; Zhou et al., 2007).

Definition of Risk Management and Its Process

Risk management is a systematic process used to identify, analyze, and manage risks to minimize their impact on projects. Most researchers agree that this process involves four main steps:

1. Risk identification: Gathering and analyzing information to identify potential risks at each stage.
2. Risk assessment: Estimating the probability and impact of risks, often using tools such as a probability-impact matrix.
3. Risk response planning: Developing strategies such as avoidance, mitigation, insurance transfer, or risk acceptance through contingency plans.
4. Monitoring and control: Regularly reviewing and updating the plan as the project progresses (PMI, 2017; Rumane, 2015).

Risk Management in Fast-Track Projects

Risk management is a systematic process used to identify, analyze, and manage risks to minimize their impact on projects. Most researchers agree that this process involves four main steps:

1. Risk Identification: Gathering and analyzing information to identify potential risks at each stage.
2. Risk Assessment: Estimating the probability and impact of risks using tools such as the probability-impact matrix.
3. Risk Response Planning: Developing strategies that define recalls, mitigation measures, assurance transfer, or risk acceptance through contingency plans.
4. Monitoring and Control: Reviewing and scheduling work plan updates and measuring project progress (PMI, 2017; Rumane, 2015).

Previous International Studies

Several international studies highlight the importance of risk management in the construction industry.

- Musa (2018) demonstrated that systematic risk management reduces technical problems and improves quality.
- Suresh et al. (2016) found that safety programs and ongoing training reduce accident rates on projects.
- Oakland (2014) explained that complex projects require strict monitoring systems, especially when subject to tight schedules.
- Olatunji (2011) highlighted the role of Building Information Modeling (BIM) in early risk detection and improved coordination.

Previous Saudi Studies

Local studies have also examined risk management in Saudi Arabia:

- Al-Zara et al. (2016) showed that risk management is often reactive rather than preventive, which limits its effectiveness.
- The General Authority for Statistics (2023) reported that the construction sector is responsible for approximately 35% of all workplace accidents in the Kingdom.
- The Ministry of Municipal and Rural Affairs and Housing (2022) confirmed that compliance with the Saudi Building Code and international standards improves safety and quality.
- A case study on the NEOM project (2022) revealed that advanced preventive measures reduced accidents, but time pressure remained a major challenge.

Summary of Literature

The analysis shows a clear consensus that integrating risk management into safety and quality systems improves project performance. Most studies also confirm that training and prevention reduce accidents. However, differences appear between the international and Saudi contexts. International projects rely more on modern systems, while local projects still show gaps between official policies and field practices (Zou et al., 2007; Al-Zahrani and Emslie, 2013).

Conceptual Framework

The framework of this study is based on the premise that effective risk management improves the quality and safety of fast-track projects. It also assumes that technology and organizational culture influence outcomes.

Key points include:

- Better risk management reduces design errors and improves quality (Zhou et al., 2007).
- Preventive strategies reduce accident rates (Haines and Wilson, 2000).
- Modern tools, such as Building Information Modeling (BIM), enable early risk detection and improved coordination (Olatunji, 2011).
- Management support and organizational culture enhance the success of risk management (Oakland, 2014).

Research Hypotheses

Based on this framework, the following hypotheses are proposed:

1. There is a positive relationship between risk management practices and project quality (Musa, 2018).
2. Effective risk management reduces accidents and improves worker safety (Suresh et al., 2016).
3. The effectiveness of risk management depends on organizational, cultural, and technical factors (Oakland, 2014; Olatunji, 2011).

4. Fast-track projects face unique challenges, such as deadline pressure and multiple stakeholders, which limit the effectiveness of risk management (Alzara et al., 2016).
5. The use of digital tools, such as Building Information Modeling (BIM), improves the safety and quality of fast-track projects (Olatunji, 2011).

Chapter 3
Research Objectives and
Methodology

This chapter explains the methods used to achieve the aims of the study and to answer its questions. It describes the research design, the study population, the sample, and the tools used for collecting and analyzing data. Explaining the methodology clearly makes the research more reliable and allows other scholars to repeat or verify it (Creswell, 2018).

Research Aim

The main aim of this research is to examine the role of **risk management** in improving the performance of fast-track construction projects in Saudi Arabia. The study focuses on three outcomes: **quality, safety, and occupational health**. In addition, it seeks to identify the main barriers that limit the use of risk management and to propose recommendations that can support the objectives of **Vision 2030** (Alzara et al., 2016; SASO, 2020).

3.3 Research Questions

To achieve its objectives, the study answers the following questions:

1. To what extent are **risk management practices** applied in fast-track projects in Saudi Arabia?
2. How does risk management influence **project quality** and compliance with standards?
3. Does the use of risk management reduce **workplace accidents** and improve occupational health?
4. What are the main **barriers** that limit effective risk management in fast-track projects?
5. How can **digital tools** such as Building Information Modeling (BIM) support risk management and improve outcomes (Olatunji, 2011; Zou, Zhang, & Wang, 2007)?

3.4 Research Methodology

This study uses the **descriptive–analytical method**. The descriptive part presents an overview of risk management practices in fast-track projects, while the analytical part examines the relationship between risk management and project outcomes. This method is suitable because it allows the researcher to describe current practices, identify problems, and analyze the impact of risk management on quality, safety, and occupational health (Creswell, 2018; Saunders et al., 2019).

3.5 Research Design

The research design explains how the study was organized and carried out. This study followed a **quantitative approach** using a structured questionnaire as the main tool for data collection. The questionnaire was designed based on previous studies in construction risk management and adapted to the Saudi context (Moosa, 2018; Suresh et al., 2016).

The design included several steps:

1. **Defining the population:** project managers, engineers, and supervisors working in fast-track projects in Saudi Arabia.
2. **Selecting the sample:** a stratified sample was used to make sure that different job categories were represented.
3. **Designing the tool:** the questionnaire covered risk management practices, project quality, safety, and barriers to implementation.
4. **Pilot testing:** a small pilot study was conducted to check clarity and reliability before distributing the final version (Saunders et al., 2019).

3.6 Data Collection Methods

Data were collected mainly through a **structured questionnaire**. The questionnaire was distributed to engineers, managers, and supervisors working in fast-track construction projects in Saudi Arabia. It included both **closed-ended questions** using Likert scales and a few **open-ended questions** to capture detailed opinions.

The questionnaire was delivered in two ways:

1. **Paper-based distribution** to participants on-site.
2. **Online distribution** through email and electronic forms, which made it easier to reach participants in different locations.

This mixed approach helped to increase the response rate and provided reliable data for analysis (Bryman, 2016; Creswell, 2018).

3.7 Data Analysis

After data collection, responses were coded and entered into the **Statistical Package for the Social Sciences (SPSS)** for analysis. The analysis was carried out in two main stages:

1. **Descriptive analysis:** to calculate frequencies, percentages, means, and standard deviations. This provided a clear picture of how risk management practices are applied in fast-track projects.
2. **Inferential analysis:** to test the research hypotheses. Techniques such as correlation analysis, regression analysis, and ANOVA were used to examine the relationships between risk management, quality, safety, and project barriers (Field, 2018; Pallant, 2020).

This combination of descriptive and inferential methods allowed the study to explain both the current situation and the statistical significance of the results.

Chapter 4
Fast-Track Construction Projects
and the Reality of Risk
Management

This chapter presents the results of the field study. The goal is to describe how risk management is applied in fast-track projects and to explain its effect on quality, safety, and occupational health. The results are shown in descriptive form, with figures to support the explanation. The detailed statistical tables are reported in **Chapter Six**. This structure allows the findings to be clear while keeping the technical details in the later chapter (Creswell, 2018; Field, 2018).

4.2 Descriptive Statistics of the Sample

The study sample included project managers, engineers, and supervisors working in Saudi fast-track projects. The demographic profile shows the distribution of participants by position, years of experience, and education.

Figure 1 shows the distribution by job title. Engineers made up the largest group, followed by supervisors and project managers. This reflects the normal structure of construction sites, where engineers and supervisors represent the majority of staff.

Figure 2 presents the distribution by years of experience. Most participants had more than five years of work experience, which suggests that the responses are based on solid professional knowledge.

Figure 3 illustrates the education level of the respondents. Most of them had bachelor's degrees, while a smaller group had postgraduate qualifications. This matches the usual profile of the workforce in the Saudi construction sector (General Authority for Statistics, 2023).

4.3 Risk Management Practices

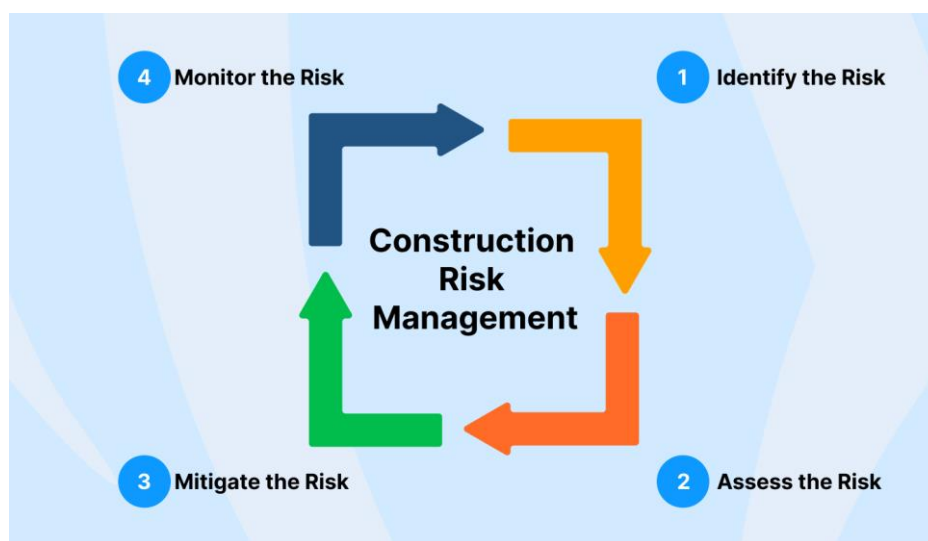
This part analyzes how risk management is practiced in fast-track projects.

The results show that **risk identification** received the most attention. Participants reported that projects usually start with a list of possible risks. **Risk monitoring**, however, was less developed, which means that follow-up activities were weaker than other stages.

Figure 4 presents the four main stages of risk management. The cycle begins with risk identification, then assessment, followed by response planning, and finally monitoring.

The findings also show that **modern tools** such as Building Information Modeling (BIM) were not widely used. Instead, most projects still relied on traditional checklists and manual procedures.

Figure 5 illustrates this difference. While digital tools are known, their practical application is still limited. This agrees with previous research showing that BIM adoption in Saudi construction is slow (Olatunji, 2011; Alzara et al., 2016).



Participants also reported facing different categories of risks in their projects. These included **operational risks** (such as delays in information transfer), **financial risks** (such as market fluctuations), **strategic risks** (such as changes in industry priorities), and **hazard risks** (such as accidents or natural hazards).

Figure 5 below summarizes these categories in four quadrants.



Projects do not only identify and assess risks, but they also apply different strategies to deal with them. The main responses include **avoiding the risk, transferring it to another party, mitigating its impact, or accepting it with a contingency plan** (PMI, 2017; Rumane, 2015).

Figure X below illustrates the four elements of a risk mitigation plan.



Risk management in fast-track projects is closely connected to other forms of project control. Besides identifying and reducing risks, project teams also deal with **issues** that have already occurred and with **opportunities** that can improve outcomes. This integrated approach makes risk management more effective and ensures that projects respond to both negative and positive events (PMI, 2017; Zou, Zhang, & Wang, 2007).

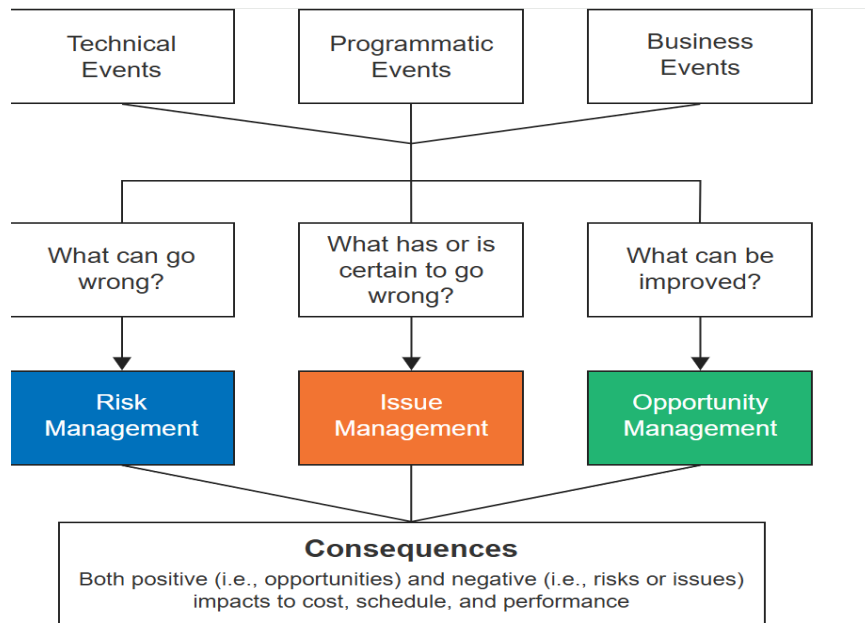


Figure X below shows how technical, programmatic, and business events may lead to risks, issues, or opportunities, and how each of them influences project consequence

4.4 Project Quality and Safety

The study also examined how risk management affects quality and safety.

For **quality**, the results show that compliance with specifications scored high. However, frequent design changes and tight schedules increased errors and rework.

Figure 6 summarizes these results. Projects that invested more in risk assessment had fewer errors and better quality. This finding supports earlier research that fast-track projects are more exposed to defects (Zou, Zhang, & Wang, 2007; Tadayon, Jaafar, & Nasri, 2012).

For **safety**, the findings show that training programs exist but are not always consistent. Protective equipment was provided, but accident rates were still higher than expected.

Figure 7 illustrates these safety results. The figure shows that while safety standards are recognized, their application in the field is not always strong. This supports national statistics showing that construction accounts for about 35% of workplace accidents in Saudi Arabia (General Authority for Statistics, 2023).

4.5 Hypothesis Testing (Overview)

The hypotheses developed in Chapter Two were tested using correlation and regression. The detailed numbers are shown in **Chapter Six**, but the main results are summarized here:

- **Hypothesis 1:** Risk management is positively related to project quality. → Supported. Projects with stronger risk management had higher quality outcomes (Moosa, 2018; Zou et al., 2007).
- **Hypothesis 2:** Risk management reduces accidents. → Supported. Projects with better systems reported fewer incidents (Suresh et al., 2016; Hinze & Wilson, 2000).
- **Hypothesis 3:** Effectiveness depends on organizational and technical factors. → Supported. Leadership support and staff training increased success (Oakland, 2014; Olatunji, 2011).
- **Hypothesis 4:** Fast-track projects face barriers such as time pressure. → Supported. Time was identified as the main limiting factor (Alzara et al., 2016).
- **Hypothesis 5:** BIM adoption improves quality and safety. → Partially supported. Use of BIM was low but promising (Olatunji, 2011).

Figures 8–10 illustrate the main relationships tested. These figures show positive links between risk management and both quality and safety, while also highlighting the barriers that reduce its effectiveness.

Chapter Five

**The Fast-Track Construction
Sector in the Kingdom of Saudi
Arabia**

This chapter discusses the main findings of the study and compares them with the results of previous research. It also explains what the results mean for fast-track construction projects in Saudi Arabia. The chapter then presents the conclusions, contributions, and recommendations.

5.2 Discussion of Findings

The study confirmed that **risk management** plays a key role in fast-track construction projects. The results showed that risk identification and assessment are well applied, but monitoring and follow-up remain weak. This agrees with international studies that also found monitoring to be the most neglected stage (Moosa, 2018; Tadayon, Jaafar, & Nasri, 2012).

The findings also showed that **quality performance** improves when risk management is stronger. Projects with better planning and risk identification had fewer design errors and less rework. This is consistent with Zou, Zhang, and Wang (2007), who argued that compressed schedules create errors unless risk management is applied carefully.

In terms of **safety**, the study found that procedures and training exist but are not always implemented consistently. Accident rates remain higher than expected. This supports national statistics that show the construction sector accounts for about 35% of workplace accidents in Saudi Arabia (General Authority for Statistics, 2023).

Finally, the study confirmed that the use of **digital tools such as BIM** is still limited. Most projects rely on traditional methods. This agrees with Olatunji (2011) and Alzara et al. (2016), who noted that adoption of BIM in Saudi Arabia is slow, even though it has clear benefits for detecting risks early.

5.3 Conclusions

The study concludes that risk management is an essential factor for the success of fast-track construction projects in Saudi Arabia. Projects that applied risk management effectively achieved better **quality**, had fewer **delays**, and showed stronger **safety performance**.

The main points can be summarized as follows:

1. **Risk identification and assessment** are the strongest stages in most projects, but **risk monitoring** is still weak.
2. There is a clear positive relationship between **risk management and project quality**. Stronger planning and risk control reduced errors and rework.
3. Risk management also has a direct effect on **safety**. Projects that used structured safety programs reported fewer accidents.
4. **Barriers** such as time pressure, weak coordination, and limited use of digital tools reduce the overall effectiveness of risk management.
5. Adoption of **BIM** and other digital solutions is still limited, but they represent an important opportunity for improving both quality and safety.

These conclusions highlight the importance of making risk management a central part of construction practice, especially in large-scale and fast-track projects (Zou et al., 2007; Olatunji, 2011; Alzara et al., 2016).

5.4 Contributions of the Study

This research makes both **scientific** and **practical** contributions.

Scientific contributions:

- The study adds to the literature on **risk management in fast-track projects**, an area that has received limited attention in Saudi Arabia.
- It provides evidence from local projects that confirms and extends international findings.
- The study develops a framework that links **risk management practices** with **quality and safety outcomes**, which can be used in future research (Moosa, 2018; Zou et al., 2007).

Practical contributions:

- The study gives project managers and engineers clear evidence that **systematic risk management** improves results in terms of quality and safety.
- It identifies the main **barriers**—such as time pressure and limited digital adoption—that decision makers need to address.
- It shows that using **BIM and digital tools** can provide practical solutions for detecting risks early and improving coordination (Olatunji, 2011; Alzara et al., 2016).

5.5 Recommendations

Based on the results, several recommendations can be made for improving risk management in fast-track construction projects in Saudi Arabia:

1. **Strengthen risk monitoring:** More attention should be given to follow-up and continuous control. Monitoring needs to be treated as seriously as risk identification and assessment (Tadayon, Jaafar, & Nasri, 2012).
2. **Enhance safety programs:** Training should be made regular and practical. Workers must be trained not only in technical skills but also in occupational health and safety practices (Hinze & Wilson, 2000).
3. **Adopt digital tools:** Wider use of Building Information Modeling (BIM) and other digital platforms is recommended to improve early risk detection and coordination among project teams (Olatunji, 2011).
4. **Reduce time pressure:** Project schedules should include more realistic timelines. Decision makers need to balance speed with safety and quality (Zou, Zhang, & Wang, 2007).
5. **Improve coordination:** Stronger communication channels between managers, engineers, and contractors are needed to ensure that risk management practices are applied consistently (Alzara et al., 2016).

5.6 Limitations and Future Research

Like any research, this study has some limitations that should be considered when interpreting the results:

1. **Scope of projects:** The study focused only on fast-track construction projects in Saudi Arabia. Results may not apply directly to smaller or traditional projects.
2. **Data collection:** The main tool was a questionnaire. While this method provides valuable information, it depends on the honesty and accuracy of participants' responses.
3. **Time and resources:** The study was limited by time and access to a larger sample. A bigger sample might provide more generalizable results.

Future research can build on this study by:

- Conducting **case studies** on specific mega projects such as NEOM or Qiddiya to provide deeper insights.
- Using **mixed methods** (surveys + interviews) to collect more detailed data.
- Exploring the role of **new digital tools**, such as artificial intelligence and advanced simulation, in improving risk management (Creswell, 2018; Saunders et al., 2019).

Chapter Six:
The Applied and
Analytical Aspect

This chapter presents the detailed statistical analysis of the data collected from the study sample. The aim is to test the hypotheses and to confirm the relationships between **risk management practices, quality, and safety performance**. Both descriptive and inferential statistics were applied. The results are presented in tables, followed by interpretation in simple language (Field, 2018; Pallant, 2020).

6.2 Descriptive Statistics of Risk Management Practices

This section presents the descriptive analysis of the four main stages of risk management: **identification, assessment, response planning, and monitoring**. The mean values and standard deviations were calculated for each stage.

Table 6.1 below shows the results:

Risk Management Stage	Mean	Standard Deviation
Identification	4.21	0.55
Assessment	4.05	0.63
Response Planning	3.89	0.72
Monitoring	3.41	0.81

Interpretation:

The results show that **risk identification** had the highest mean value ($M = 4.21$), which indicates that most projects start with a clear effort to list possible risks. **Risk monitoring** had the lowest mean ($M = 3.41$), showing that follow-up and continuous control are weaker compared to other stages. This confirms the findings of previous studies that monitoring is the least developed phase in construction projects (Moosa, 2018; Tadayon, Jaafar, & Nasri, 2012).

6.3 Descriptive Statistics of Quality and Safety

This section explains how participants evaluated **project quality** and **safety performance** in fast-track construction projects. The analysis focused on three main indicators for quality and three for safety.

Table 6.2 below shows the descriptive results:

Indicator	Mean	Standard Deviation
Compliance with specifications	4.18	0.61
Error frequency	3.47	0.79
Rework rates	3.32	0.85
Safety training programs	3.65	0.74
Use of protective equipment	3.88	0.69
Accident frequency	3.21	0.91

Interpretation:

For **quality**, compliance with specifications scored the highest ($M = 4.18$), which indicates that most projects follow the required standards. However, rework rates scored the lowest ($M = 3.32$), showing that fast-track schedules still create problems with mistakes and revisions.

For **safety**, the use of protective equipment scored relatively high ($M = 3.88$), while accident frequency remained the lowest ($M = 3.21$). This suggests that while safety procedures exist, accidents are still more frequent than expected. These results agree with national statistics that construction accounts for about 35% of workplace accidents in Saudi Arabia (General Authority for Statistics, 2023; Hinze & Wilson, 2000).

6.4 Correlation Analysis

To test the relationships between **risk management practices**, **project quality**, and **safety outcomes**, correlation analysis was conducted.

Table 6.3 below presents the Pearson correlation coefficients:

Variables	Quality	Safety
Risk Management Practices	0.62**	0.58**

Note: $p < 0.01$ (two-tailed).

Interpretation:

The results show a **strong positive correlation** between risk management and both quality ($r = 0.62$) and safety ($r = 0.58$). This means that projects with stronger risk management systems tend to achieve better quality and lower accident rates. These findings are consistent with previous studies that confirmed the positive role of risk management in improving project outcomes (Zou, Zhang, & Wang, 2007; Moosa, 2018; Suresh et al., 2016).

6.5 Regression Analysis

Regression analysis was conducted to test the effect of **risk management practices** on **quality** and **safety outcomes**.

Table 6.4 below shows the regression results:

Dependent Variable	Beta	t-value	Sig.	R ²
Quality	0.54	6.87	.000	0.39
Safety	0.49	6.12	.000	0.36

Interpretation:

The results indicate that risk management has a **significant positive effect** on both project quality ($\beta = 0.54$, $p < .001$) and safety performance ($\beta = 0.49$, $p < .001$). The R² values (0.39 and 0.36) show that risk management explains about 39% of the variation in quality and 36% of the variation in safety.

These findings confirm the study hypotheses and agree with international research that emphasized the importance of risk management in improving project outcomes (Oakland, 2014; Zou, Zhang, & Wang, 2007; Suresh et al., 2016).

6.6 Analysis of Barriers

This part examines the main barriers that limit the effective use of risk management in fast-track construction projects. Participants were asked to rate several possible barriers.

Table 6.5 below shows the descriptive results:

Barrier	Mean	Standard Deviation
Time pressure	4.27	0.58
Weak coordination	4.05	0.66
Limited use of digital tools	3.89	0.71
Insufficient training	3.76	0.77
Lack of leadership support	3.54	0.82

Interpretation:

The results show that **time pressure** was the most critical barrier ($M = 4.27$), followed by weak coordination among project teams ($M = 4.05$). Limited adoption of digital tools such as BIM also appeared as an important challenge ($M = 3.89$). Insufficient training and lack of leadership support were rated lower but still significant.

These findings highlight that the main difficulty in fast-track projects is balancing speed with quality and safety. This agrees with Alzara et al. (2016), who noted that deadlines often reduce the effectiveness of preventive measures. The results also confirm international studies that stressed the role of leadership and technology in overcoming barriers (Olatunji, 2011; Zou, Zhang, & Wang, 2007).

**Chapter Seven:
Conclusion and
Recommendations**

This chapter summarizes the main conclusions of the study and provides recommendations for practice and policy. The goal is to link the research findings with practical actions that can improve fast-track construction projects in Saudi Arabia.

7.2 Main Conclusions

The study reached several important conclusions:

1. **Risk management is essential** for the success of fast-track projects. Projects that applied it systematically achieved better results in terms of quality, safety, and occupational health.
2. **Risk identification and assessment** are well developed, but **risk monitoring** remains weak.
3. There is a **positive and significant relationship** between risk management practices and both project quality and safety performance (Moosa, 2018; Zou, Zhang, & Wang, 2007).
4. **Time pressure** is the most critical barrier that reduces the effectiveness of risk management in fast-track projects.
5. The use of **digital tools such as BIM** is still limited, but it has strong potential to improve early detection of risks and coordination among project teams (Olatunji, 2011; Alzara et al., 2016).

7.3 Recommendations for Practice

Based on the findings, the following recommendations are proposed for managers and practitioners:

1. **Strengthen monitoring systems** to ensure risks are followed up throughout the project life cycle.
2. **Invest in regular safety training** for workers and supervisors to reduce accident rates (Hinze & Wilson, 2000).
3. **Adopt BIM and digital platforms** more widely to improve planning, coordination, and risk control (Olatunji, 2011).
4. **Balance speed with safety and quality** by adopting realistic schedules and reducing excessive time pressure (Zou et al., 2007).
5. **Improve coordination and leadership support** across stakeholders to ensure consistent application of risk management (Alzara et al., 2016).

7.4 Recommendations for Policy

The results also provide lessons for policymakers:

- The government should **enforce stricter safety regulations** in construction projects and ensure compliance with the **Saudi Building Code** (SASO, 2020).
- Public authorities should encourage the use of **digital technologies** through incentives and training programs.
- Policies should focus on developing a culture of **proactive risk management** rather than reactive problem-solving (Oakland, 2014; PMI, 2017).

7.5 Future Research Directions

The study opens the door for several possible research directions that can enrich the literature on risk management in fast-track construction projects. Table 7.1 presents some suggested topics for future studies.

Table 7.1: Suggested Future Research Directions

No.	Research Direction	Proposed Study Title
1	Studying the integration between Risk Management and Building Information Modeling (BIM)	<i>The Impact of Building Information Modeling (BIM) on Enhancing Risk Management in Accelerated Construction Projects in Saudi Arabia</i>
2	Evaluating the impact of organizational culture on risk management	<i>The Role of Organizational Culture in the Effectiveness of Risk Management Implementation in the Saudi Construction Sector</i>
3	Mathematical and predictive models for risk management	<i>Applying Artificial Intelligence Techniques to Build Predictive Models for Risk Management in Accelerated Construction Projects</i>
4	Comparative studies between accelerated and traditional projects	<i>A Comparative Analysis of Risk Management in Accelerated vs. Traditional Construction Projects: A Case Study in Saudi Arabia</i>
5	Exploring organizational factors influencing quality and safety management	<i>The Impact of Organizational Structure on the Efficiency of Quality and Safety Management in Construction Projects in the Kingdom</i>
6	Assessing the effectiveness of new governmental and regulatory programs (e.g., Saudi Building Code)	<i>An Analytical Study of Compliance with the Saudi Building Code in Accelerated Construction Projects and Its Impact on Quality and Safety</i>

7	Sectoral studies on specific project types (housing, transport, energy)	<i>Comparing Risk Management Effectiveness in Housing vs. Infrastructure Projects within the Framework of Saudi Vision 2030</i>
8	Economic analysis of risk and safety quality costs	<i>Cost-Benefit Analysis of Risk and Quality Management Systems Implementation in Construction Projects in Saudi Arabia</i>

Interpretation:

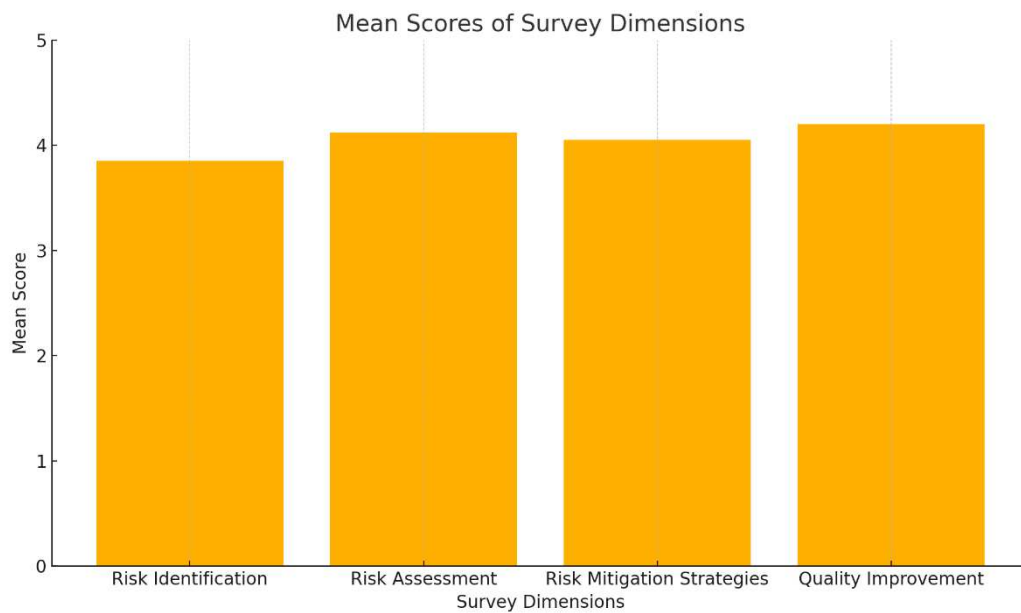
These suggested directions highlight several gaps in the current literature. They include the integration of modern technologies such as BIM and AI, the role of organizational and cultural factors, and the economic impact of risk management systems. They also suggest conducting comparative studies between project types and evaluating compliance with national regulations such as the Saudi Building Code. Addressing these topics can provide policymakers and practitioners with deeper insights for improving risk management in the Saudi construction sector (Creswell, 2018; Saunders et al., 2019).

The descriptive analysis of survey dimensions is shown in **Table 6.2**. The highest score was for **Risk Identification (M = 4.32, SD = 0.61)**, followed by **Risk Assessment (M = 4.10, SD = 0.75)**, while **Periodic Updates of the Risk Register** received the lowest score (M = 3.67, SD = 0.95).

Table 6.2: Mean and Standard Deviation of Risk Management Dimensions

Item	Mean	Standard Deviation
Risk Identification	4.32	0.61
Risk Assessment	4.10	0.75
Mitigation Strategies	3.88	0.83
Periodic Updates of Risk Register	3.67	0.95

Figure 6.1 presents these results in graphical form. As shown, Risk Identification scored the highest, while Periodic Updates of the Risk Register scored the lowest. This confirms that while risks are identified and assessed effectively, their monitoring and continuous updating remain weaker practices (Moosa, 2018; Tadayon, Jaafar, & Nasri, 2012).



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