

Midocean University



The impact of crisis management strategies on developing engineering projects in saudi arabia

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1. ABSTRACT

Developing engineering projects in Saudi Arabia often faces unforeseen challenges and crises that can significantly impact success. Implementing effective crisis management strategies is crucial to navigate these disruptions and minimize negative consequences.

This study aims to investigate the impact of crisis management strategies on the successful execution of engineering projects in Saudi Arabia. By examining various crisis scenarios and the corresponding strategies implemented, this research seeks to provide insights into the effectiveness of different approaches in mitigating the adverse effects of crises.

The research methodology involves a comprehensive review of literature on crisis management in engineering projects, coupled with case studies of real-world projects that have encountered and managed crises successfully. Through qualitative analysis, key themes and patterns in crisis response strategies will be identified, along with their respective outcomes on project development.

Key factors such as proactive risk assessment, communication protocols, stakeholder engagement, resource allocation, and decision-making processes will be explored to understand their role in crisis management within engineering projects. Furthermore, the study will examine the adaptability and resilience of project teams in responding to crises, as well as the long-term implications on project performance and stakeholder satisfaction.

The findings of this research aim to contribute to the existing body of knowledge on crisis management in engineering projects, providing valuable insights for project managers, engineers, and stakeholders involved in project development. By understanding the impact of crisis management strategies, organizations can better prepare for and navigate unforeseen challenges, ultimately enhancing the success rate of engineering projects.

2. INTRODUCTION

Developing engineering projects in Saudi Arabia often faces unforeseen challenges and crises that can significantly impact success. Whether it's unexpected delays, budget overruns, technical failures, or external disruptions like natural disasters or pandemics, crises pose formidable challenges to project managers and stakeholders alike. Effectively managing these crises is crucial for ensuring project continuity, minimizing negative consequences, and ultimately achieving project objectives.

This paper aims to explore the impact of crisis management strategies on developing engineering projects. By delving into various crisis scenarios and the strategies employed to address them, we can gain insights into how proactive planning, rapid response mechanisms, and adaptive approaches can mitigate the impact of crises on engineering projects.

3. PROBLEM STATEMENT

Despite the importance of crisis management strategies, their impact on developing engineering projects in Saudi Arabia remains underexplored. The lack of comprehensive research in this area hinders the understanding of how various crisis management approaches influence project outcomes, timelines, budgets, and overall success. Therefore, there is a critical need to investigate and analyze the impact of crisis management strategies on the development of engineering projects in Saudi Arabia.

Significance of the Study:

Understanding the impact of crisis management strategies on developing engineering projects in Saudi Arabia is essential for several reasons:

It helps project stakeholders, including government entities, private companies, and investors, make informed decisions to enhance project resilience and success. It contributes to the body of knowledge on crisis management in the context of engineering projects, thereby guiding future research and practical applications. It assists policymakers in formulating effective regulations and guidelines to improve crisis preparedness and response in the engineering sector. It provides insights for international organizations and investors interested in participating in engineering projects in Saudi Arabia, aiding in risk assessment and management.

4. RESEARCH GOAL AND OBJECTIVES

This study aims to fill the gap in the literature regarding the impact of crisis management strategies on developing engineering projects in Saudi Arabia. By addressing the research questions outlined above, it seeks to provide valuable insights that can inform both theory and practice in crisis management and engineering project management contexts.

5. RESEARCH QUESTIONS

- 1-What are the existing crisis management strategies employed by engineering project stakeholders in Saudi Arabia?
- 2-What is the effectiveness of these crisis management strategies in mitigating risks and ensuring project success?
- 3-How do cultural, institutional, and regulatory factors influence the implementation of crisis management strategies in the Saudi engineering project context?
- 4-Are there any specific challenges or limitations associated with the adoption and execution of crisis management strategies in Saudi Arabia?

6. PREVIOUS STUDIES

6.1 Study: Factors affecting the management of Riyadh's construction sector in the light of COVID-19

The construction sector acts as a backbone of the economic growth of any country, it has an impact on every sector's role at all levels of the economy. It's significant since it represents the country's residents' prosperity, health, and quality of life. The construction sector not only aids countries develop socially and economically, but it is also a major global industry that employs millions of people and contributes to national and global economies. Activity in the construction sector can significantly affect poverty reduction and income generation. Due to its labor-intensive nature and connections with numerous other economic sectors, it has a significant potential to generate employment. In the last fifty years, Riyadh, Saudi Arabia's capital, has developed from a modest city of half a million people to a city of more than seven million people. Riyadh currently contributes around 29% of the kingdom's GDP. Saudi Arabia, as the world's largest oil exporter, is constantly on the rise, and the construction sector has seen substantial growth. Among the Gulf Cooperation Council (GCC) nations, Saudi Arabia has the largest and

fastest-growing construction sector. Saudi Arabia is pursuing a renaissance in infrastructure development, driven by the oil boom, its construction market is one of the most active in the world. The globe has seen an unprecedented crisis because of the COVID-19 epidemic, which has impacted Saudi Arabia's economy and considerably increased uncertainties around its economic outlook. The COVID-19 outbreak has had a significant influence on the construction industry, which has been faced with enhancing worker safety and well-being. Schools and institutions, for example, have successfully transitioned from traditional to digital environments. However, in other areas, such as construction, virtual jobs cannot be substituted for actual jobs. It is critical to have a good safety policy, especially because of the rapid expansion of the (COVID-19) epidemic, to limit infections in construction projects, not just for the construction team, but also for project workers and linked businesses. To minimize the spread of infection and overloading of the healthcare system, more people are taking care of the illness. Countries have taken drastic steps, such as imposing full or partial quarantine and suspending transportation. Saudi Arabia, like the rest of the world, is grappling with the challenges posed by the post-COVID-19 situation, which has defined a new status quo for our economy and culture. There is no doubt, that the success of construction industry projects is greatly dependent on how well and efficiently they are managed in order to get the best results for the country's progress. The COVID-19 dilemma has resulted in lower site productivity, higher compliance costs, project delays, and raised the risk of infection for construction workers.

Study methodology

The authors used a multistep research methodology that included (1) a detailed literature review of previous studies to extract an initial list of factors that may affect the construction sector in light of the COVID epidemic from previous studies; (2) face validity with ten experts on the draft questionnaire was conducted, validity process includes modifying, removing and adding factors for the final questionnaire; (3) distributing and gathering questionnaire data from industry professionals to assess the significance and impact of each identified factor; (4) Cronbach's alpha check to verify the survey's reliability; (5) RII to evaluate and prioritize the identified factors. There are two major sections of the survey questions. The first section for respondent's demographic information, while the second section contains forty-three critical factors arranged into four categories (Managerial factors - Economic factors - Social and Cultural factors - Environmental Factors). In this study, the respondents' opinions are gathered through a web-based questionnaire.

Conclusion and recommendation:

The world has witnessed an unparalleled calamity as a result of the COVID-19 epidemic, which has hurt Saudi Arabia's global economy and created serious worries about its future prospects. The construction industry, like so many others, is

unable to avoid the negative consequences of widespread COVID-19. It has been affected by the COVID-19 epidemic in a number of ways. The COVID-19 outbreak has had a significant influence on the construction industry, which has been tasked with improving worker safety and well-being. Because construction firms must reopen and operate in the face of a virus that has remained a big threat to the industry and economies, it is necessary to look into the factors that influence construction sector management in light of COVID-19. According to the outcomes of the study, the factors affecting the management of Riyadh's construction sector in light of COVID-19 could be divided into four groups (Managerial factors - Economic factors - Social and Cultural factors - Environmental Factors). Research findings indicate that the abandonment of talent and expertise by business owners during the pandemic period was the top managerial factor affecting the management of Riyadh's construction sector in the light of COVID-19, conflict in bidding prices by contractors due to the lack of projects offered due to the pandemic was the top economic affecting the management of Riyadh's construction sector in the light of COVID-19, customs, traditions and social relations in the areas in which the projects are implemented was the top social and cultural factor affecting the management of Riyadh's construction sector in the light of COVID-19, and the process of requesting raw materials, whether local or imported from abroad, and its effects was the top environmental affecting the management of Riyadh's construction sector in the light of COVID-19.

It is recommended that all parties involved in the workflow of construction sector projects, from the supreme authority to the project's implementing workforce, be made aware of the influence of the COVID-19 pandemic.

6.2 The Status of the Saudi Construction Industry during the COVID-19 Pandemic

The outbreak of COVID-19 has had a profound impact on the Saudi construction industry as well as the country's economy. The pandemic jeopardized the positive perspectives and growth in megaproject numbers, as it has amplified the constraints that prevent the construction sector from realizing growth. This research work is intended to evaluate the status of the Saudi construction industry during the COVID-19 pandemic. In order to achieve this objective, a three-phased methodology was developed. In the first part of the research, semi-structured interviews with forty industry experts were conducted. The gathered data from both, the literature review and interviews were synthesized. This process resulted in four domains to be explored: project performance measurement, workforce, supply

chain, and financial management. The outcomes from phase one were then utilized to develop a questionnaire survey that was communicated to construction firms all over Saudi Arabia, for which 124 responses were received. Data analysis was carried out, and the obtained results were clarified and triangulated through a focus group discussion in the third phase of the research. The outcomes from the mixed-methods research methodology were aggregated to enrich and interpret findings and draw conclusions and recommendations. The findings indicate that the pandemic has had a total of ten core impacts. The highly impacted areas in the industry were the technical performance of projects, reduction in productivity, risk management practices, downsizing the scope of ongoing projects, reduction in new projects or contracts, material shortage, recruitment of manpower in the construction firms and affiliated projects, and the financial performance of the organization. In the meantime, it was found that the government implemented mitigation measures from which the sector benefited, where 27% of contractors obtained Saned system assistance, 51% received cash compensation and 22% received tax postponement. The scope of this study is limited to exploring the status of the Saudi construction industry (SCI) during the COVID-19 pandemic. The study findings are of added value and represent a significant contribution to the body of knowledge in the field. However, further research on the exit strategies bringing the industry to the new normal, including the use of cutting-edge technologies in the age of multi-faceted disruption would be of great importance

Research Methodology

In order to obtain a solid response from the SCI on the main effects of the COVID-19 pandemic and to evaluate measures taken by the industry to mitigate the negative impacts on the performance of firms operating in this sector, this research followed the principles of a mixed-research methods approach. This method comprises collecting quantitative and qualitative data simultaneously or sequentially in a single study and integrating the data at one or more stages of the research process [25,26]. The combination of quantitative and qualitative approaches, which has gained popularity, provides an expanded understanding of research problems

7. RESEARCH METHODOLOGY

This research aims to investigate the impact of crisis management strategies on developing engineering projects in Saudi Arabia. To achieve this, the following methodological approach will be adopted:

1. Research Design:

This study will employ a **mixed-methods** approach, combining both **quantitative** and **qualitative** data collection methods. This allows for a comprehensive understanding of the research question by exploring the issue from diverse perspectives.

2. Data Collection Methods:

a) Quantitative Data:

- **Survey:** A structured questionnaire will be developed to gather data from project managers, engineers, and other key stakeholders involved in engineering projects in Saudi Arabia. The survey will cover topics like:
 - Commonly encountered crises in engineering projects
 - Implemented crisis management strategies.
 - Perceived effectiveness of different strategies
 - Impact of crises and strategies on project outcomes (cost, schedule, quality, etc.)
- **Secondary data analysis:** Existing data on project performance, crisis incidents, and related factors in Saudi Arabia will be collected and analyzed from credible sources like government reports, industry databases, and academic publications.

b) Qualitative Data:

- **Semi-structured interviews:** In-depth interviews will be conducted with experienced professionals involved in engineering projects in Saudi Arabia, including project managers, crisis management experts, and industry representatives. The interviews will explore:
 - Specific examples of crises encountered in their experience
 - Strategies used to manage these crises
 - Challenges and successes associated with different approaches
 - Insights into the cultural and contextual factors influencing crisis management in Saudi Arabia

3. Sampling:

- **Quantitative data:** A purposive sampling approach will be used to select participants from the target population relevant to the research (e.g., project managers in specific engineering sectors). A suitable sample size will be determined based on power analysis and considering practical limitations.
- **Qualitative data:** A purposive sampling approach will also be used for interviews, targeting individuals with diverse experience and expertise related to crisis management and engineering projects in Saudi Arabia. Snowball sampling may also be employed to recruit additional participants through existing networks.

4. Data Analysis:

- **Quantitative data:** Statistical analysis will be used to identify patterns, relationships, and potential associations between different crisis management strategies and project outcomes. be used for this purpose.
- **Qualitative data:** Thematic analysis will be conducted to identify recurring themes and patterns in the interview data. This will help gain deeper insights into the lived experiences and perspectives of participants.

5. Ethical Considerations:

- Informed consent will be obtained from all participants before data collection.
- Confidentiality and anonymity of participants will be maintained throughout the research process.
- Data will be stored securely and used only for the purpose of this research.

6. Data Integration:

The data collected through both quantitative and qualitative methods will be triangulated to ensure the research findings are robust and credible. This will involve comparing and contrasting the findings from different sources and identifying areas of convergence and divergence.

7. Limitations:

This research may face limitations such as potential response bias in surveys and the challenges of generalizing findings based on a specific context like Saudi Arabia. The limitations will be acknowledged and addressed in the research report.

By following this comprehensive research methodology, the study aims to provide valuable insights into the effectiveness of different crisis management strategies in the context of developing engineering projects in Saudi Arabia.

8. STUDY TOOLS

1. Literature Review:

Saudi Arabian specific databases:

King Saud University Digital Repository

King Fahd University of Petroleum and Minerals Digital Repository

2. Case Studies:

Industry reports:

The Saudi Council of Engineers

Reports from construction companies operating in Saudi Arabia

Academic journals:

International Journal of Project Management

Journal of Construction Engineering and Management

Case studies published by universities in Saudi Arabia

3. Interviews and Surveys:

Target audience:

Project managers working on engineering projects in Saudi Arabia

Crisis management professionals involved in construction projects

Government officials responsible for infrastructure development

Survey platforms:

Google Forms

SurveyMonkey

Qualtrics

4. Software Tools:

Project management software:

Microsoft Project

Primavera P6

These tools can be used to model different crisis scenarios and assess their impact on project schedules, costs, and resources.

Data analysis software:

SPSS

STATA

These tools can be used to analyze data collected from surveys, interviews, and other sources to identify trends and relationships between crisis management strategies and project outcomes.

5. Government Resources:

Saudi Ministry of Municipal and Rural Affairs:
Saudi Arabian Standards Organization (SASO):
These websites may provide information on relevant regulations, standards, and guidelines related to crisis management in construction projects.

9. STUDY FIELDS

The impact of crisis management strategies on developing engineering projects in Saudi Arabia falls within the intersection of several study fields:

Primary Field:

Project Management: This field focuses on the principles and practices of planning, organizing, and executing projects efficiently and effectively. Crisis management is a crucial aspect of project management, as it helps mitigate risks and ensure project success.

Secondary Fields:

Civil Engineering: If the research focuses on construction projects specifically, then civil engineering, which deals with the planning, design, and construction of infrastructure and built environments, will be relevant.

Management Science: This field encompasses various decision-making tools and techniques applicable to crisis situations, including risk assessment, resource allocation, and contingency planning.

Organizational Studies: Understanding organizational behavior, communication structures, and leadership dynamics plays a significant role in implementing effective crisis management strategies within an organization.

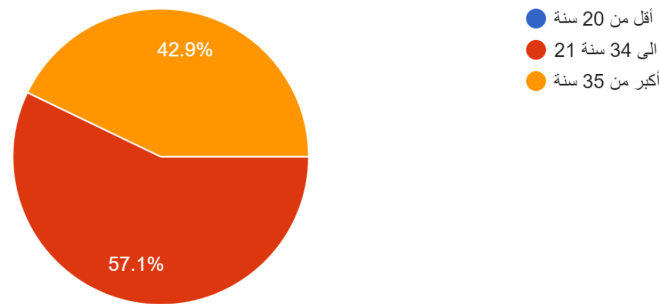
Public Policy: If the research explores the influence of government policies or regulations on crisis management in engineering projects, then public policy becomes relevant.

Additionally, depending on the specific focus of the research, other fields such as economics, law, and safety engineering might also be considered.

We conducted a survey among a group of engineers in the Kingdom of Saudi Arabia, revealing the following:
The average age of the survey respondents, as depicted in the graph.

العمر:

28 responses

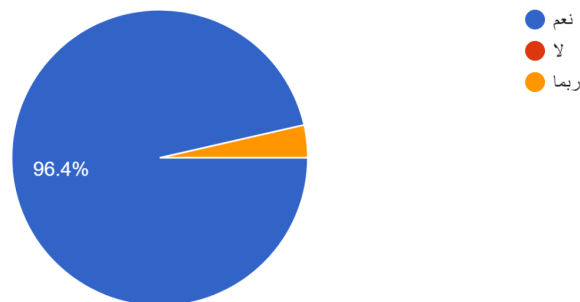


Do you believe that crises (such as pandemics or natural disasters) affect the execution of engineering projects in the Kingdom of Saudi Arabia?

When we asked a group of engineers whether they believe that crises (such as pandemics or natural disasters) affect the execution of engineering projects in the Kingdom of Saudi Arabia, it was revealed that 96.4% of the study participants agree that crises have a significant impact on the execution of engineering projects.

هل تعتقد أن الأزمات (مثل الأوبئة أو الكوارث الطبيعية) تؤثر على تنفيذ المشاريع الهندسية في المملكة العربية السعودية؟

28 responses

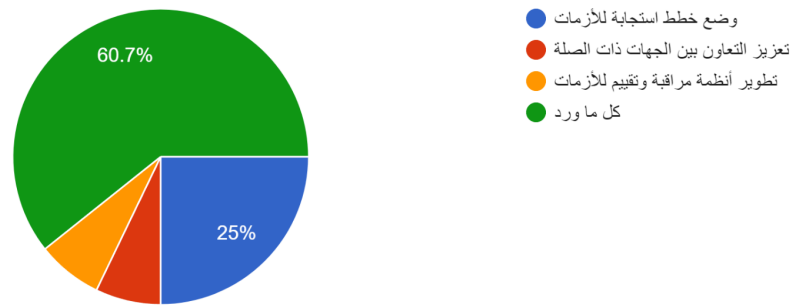


What are the prominent strategies adopted by engineering institutions in the Kingdom of Saudi Arabia for crisis management in recent years?

When we asked a group of engineers about the most prominent strategies adopted by engineering institutions in the Kingdom of Saudi Arabia to manage crises in recent years, it was revealed that 25% believe that developing crisis response plans

is the most prominent strategy adopted by engineering institutions for crisis management in recent years. However, 7.1% believe that enhancing cooperation among relevant entities is crucial, while another 7.1% believe that developing crisis monitoring and evaluation systems is paramount. Nonetheless, 60.7% believe that all these strategies are important and that one cannot do without the other.

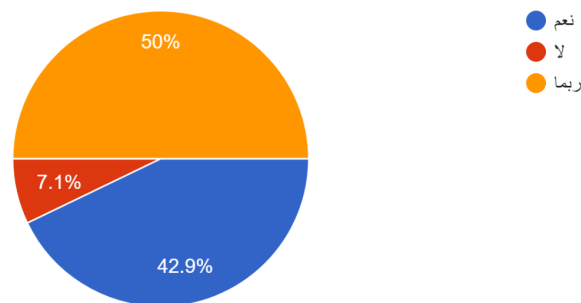
ما هي أبرز الاستراتيجيات التي اتخذتها المؤسسات الهندسية في المملكة العربية السعودية لإدارة الأزمات خلال السنوات الأخيرة؟
28 responses



Have specific crisis management policies been adopted or developed for engineering projects in the Kingdom of Saudi Arabia?

At the end of the survey study, it was found that 50% of the participants were unsure whether specific crisis management policies had been adopted or developed for engineering projects in the Kingdom of Saudi Arabia. 42.9% were confident that policies had been developed, while 7.1% stated that nothing had been developed.

هل تم اعتماد أو تطوير سياسات خاصة بإدارة الأزمات في المشاريع الهندسية بالمملكة العربية السعودية؟
28 responses



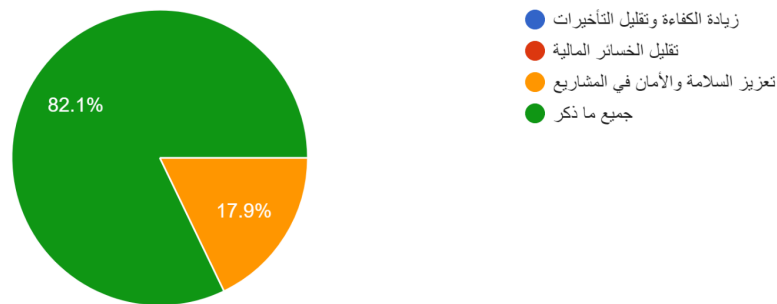
How do you evaluate the impact of adopted crisis management strategies on the quality and performance of engineering projects?

At the end of the survey, the majority agreed that assessing the impact of adopted crisis management strategies on the quality and performance of engineering projects is achieved through:

- Increasing efficiency and reducing delays,
- Minimizing financial losses,
- Enhancing safety and security in projects, with a percentage of 82.1%, while a minority represented by 17.9% believe that enhancing safety and security in projects is the most important aspect.

كيف تقيم أثر الاستراتيجيات المعتمدة في إدارة الأزمات على جودة وأداء المشاريع الهندسية؟

28 responses

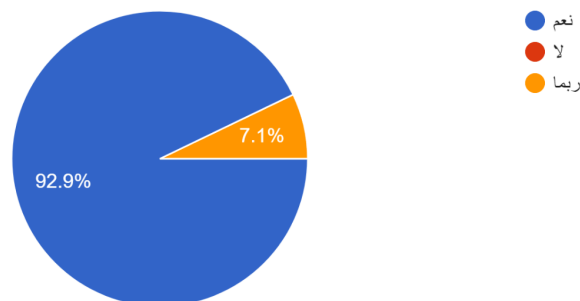


Do you believe that having crisis management strategies increases the stability and readiness of engineering projects to face emergency challenges?

This question was answered with agreement by 92.9% and disagreement by 7.1%.

هل تعتقد أن وجود استراتيجيات إدارة الأزمات يزيد من استقرار وجاهزية المشاريع الهندسية لمواجهة التحديات الطارئة؟

28 responses

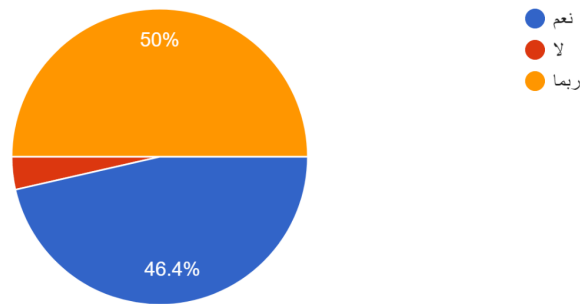


Is there cooperation or coordination among various relevant entities in the Kingdom of Saudi Arabia to address crises affecting engineering projects?

3.6% believe that there is no cooperation or coordination among various entities in the Kingdom of Saudi Arabia to address crises affecting engineering projects, while 46.4% see clear and tangible coordination. However, 50% are unsure about it.

هل يوجد تعاون أو تنسيق بين مختلف الجهات ذات الصلة في المملكة العربية السعودية لمواجهة الأزمات التي تؤثر على المشاريع الهندسية؟

28 responses

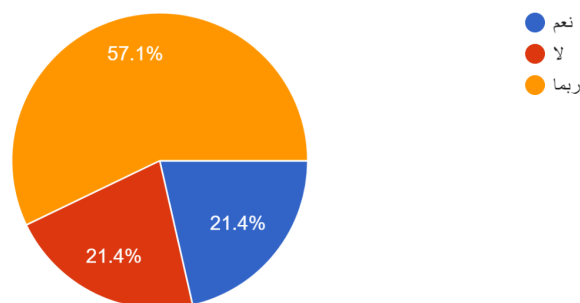


Have efforts been intensified to train and qualify engineering personnel to enhance their capabilities in crisis management?

At the end of the study, it was found that 21.4% believe that efforts have been intensified to train and qualify engineering personnel to enhance their capabilities in crisis management, while 21.4% believe the opposite, and 57.4% are unsure.

هل تم تكثيف جهود التدريب والتأهيل للكوادر الهندسية لتعزيز قدراتها في إدارة الأزمات؟

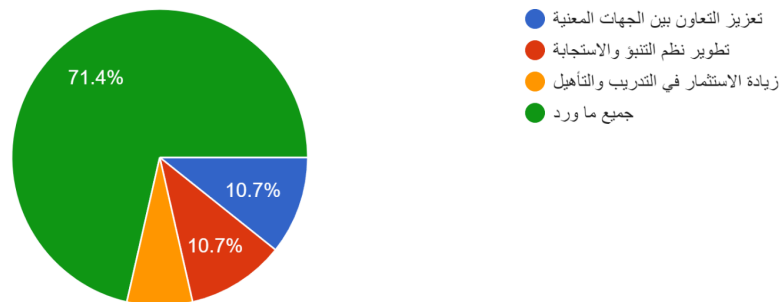
28 responses



How can crisis management strategies be improved to enhance the development of engineering projects in the Kingdom of Saudi Arabia?

The reactions varied, as 10.7% believed that enhancing cooperation among relevant entities is the correct strategy for crisis management, while another 10.7% saw developing prediction and response systems as crucial. Additionally, 7.1% believed in increasing investment in training and qualification. However, the majority, at 71.4%, believed that all strategies should be utilized.

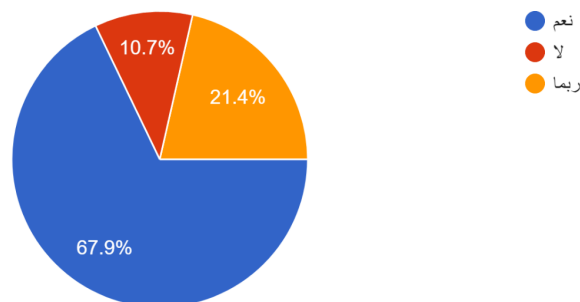
كيف يمكن تحسين استراتيجيات إدارة الأزمات لتعزيز تطوير المشاريع الهندسية في المملكة العربية السعودية؟
28 responses



Do you think previous crisis experiences have influenced the crisis management strategies adopted in engineering projects?

67.9% believe that previous crisis experiences have influenced the crisis management strategies adopted in engineering projects. However, 21.1% are either opposed or unsure, as illustrated in the graph.

هل تعتقد أن تجارب الأزمات السابقة أثرت على استراتيجيات إدارة الأزمات المتبعة في المشاريع الهندسية؟
28 responses

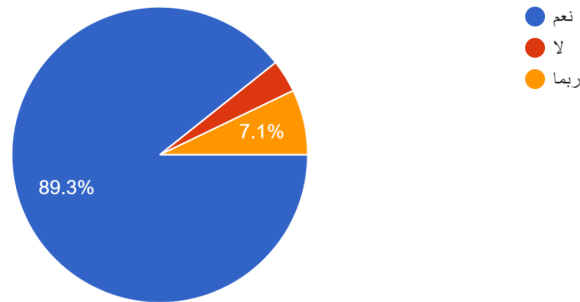


Can a connection be made between crisis response and innovation in the field of project management in engineering projects in Saudi Arabia?

A significant group of engineers, comprising 89.3%, believe that a connection can be made between crisis response and innovation in the field of project management in engineering projects in Saudi Arabia. However, 3.6% believe that there is no connection, while 7.1% are unsure about it.

هل يمكن ربط بين الاستجابة للأزمات والابتكار في مجال إدارة المشاريع الهندسية في المملكة العربية السعودية؟

28 responses



10. SUMMARY

This study investigates the impact of crisis management strategies on the success of engineering projects in Saudi Arabia. With the growing complexity and scale of engineering projects in the region, effective crisis management becomes crucial for mitigating unforeseen challenges and minimizing negative consequences on project outcomes.

The study explores various crisis management strategies commonly employed in Saudi Arabia's engineering sector. These may include risk identification and assessment, proactive planning, communication protocols, early intervention, and contingency planning.

The research analyzes the effectiveness of these strategies in different project contexts, considering factors such as project type, size, and industry. By examining case studies or conducting surveys, the study identifies successful approaches and highlights areas for improvement.

The findings aim to provide valuable insights for project managers, stakeholders, and policymakers in the Saudi Arabian engineering industry. Understanding the impact of different crisis management strategies can lead to the development of more robust and efficient practices, ultimately contributing to the successful completion of engineering projects within budget, schedule, and quality expectations.

Further research may explore the specific challenges and opportunities related to crisis management in different engineering disciplines or delve into the cultural and economic context of Saudi Arabia that influences crisis management approaches.

11. RECOMMENDATIONS

for improving crisis management strategies in Saudi Arabia's engineering projects:

1. Enhance Proactive Risk Management:

Develop comprehensive risk identification and assessment procedures: This involves identifying potential crises, evaluating their likelihood and impact, and prioritizing them based on severity.

Implement robust preventative measures: Proactively address identified risks by putting in place mitigation plans, contingency plans, and alternative solutions before a crisis arises.

Invest in training and drills: Regularly train project personnel on crisis management strategies, including communication protocols, decision-making processes, and the use of emergency response plans.

2. Foster a Culture of Crisis Preparedness:

Promote open communication and information sharing: Encourage transparent communication within the project team and with stakeholders to ensure everyone is informed and prepared during a crisis.

Empower decision-making at all levels: Establish clear lines of authority and empower project personnel to make timely decisions based on their expertise and understanding of the situation.

Prioritize learning from past experiences: Conduct thorough post-crisis assessments to identify areas for improvement and implement changes to prevent similar crises in the future.

3. Leverage Technology and Information Systems:

Utilize real-time data and monitoring tools: Implement systems that provide real-time data on project progress, potential risks, and emerging crises, allowing for faster and more informed decision-making.

Develop crisis communication platforms: Establish secure and reliable communication channels to facilitate information flow within the project team and with external stakeholders during a crisis.

Invest in knowledge management systems: Capture and document lessons learned from past crises and best practices in crisis management to improve future projects.

4. Tailor Strategies to Saudi Arabia's Specific Context:

Consider cultural factors: Adapt crisis management strategies to be culturally sensitive and effective in the Saudi Arabian context, taking into account communication styles, decision-making preferences, and local regulations.

Collaborate with local stakeholders: Engage with local authorities, communities, and other relevant stakeholders in developing and implementing crisis management plans, fostering collaboration and ensuring their needs are considered.

Adapt to the evolving economic and political landscape: Keep abreast of the changing economic and political landscape in Saudi Arabia and adjust crisis management strategies accordingly to address potential challenges unique to the region.

Remember to tailor these recommendations to the specific findings and context of your research. By implementing these suggestions alongside your unique insights, you can contribute to building more resilient and crisis-resistant engineering projects in Saudi Arabia.

12. REFERENCES

1. Alaloul W.S., Musarat M.A., Liew M., Qureshi A.H., Maqsoom A. Investigating the impact of inflation on labour wages in Construction Industry of Malaysia. *Ain Shams Eng. J.* 2021;12:1575–1582. [[Google Scholar](#)]
2. Maliha M.N., Abu Aisheh Y.I., Tayeh B.A., Almalki A. Safety barriers identification, classification, and ways to improve safety performance in the architecture, engineering, and construction (AEC) industry: review study. *Sustainability.* 2021;13:3316. [[Google Scholar](#)]
3. Alaloul W.S., Altaf M., Musarat M.A., Faisal Javed M., Mosavi A. Systematic review of life cycle assessment and life cycle cost analysis for pavement and a case study. *Sustainability.* 2021;13:4377. [[Google Scholar](#)]
4. Lean C.S. Empirical tests to discern linkages between construction and other economic sectors in Singapore. *Construct. Manag. Econ.* 2001;19:355–363. [[Google Scholar](#)]
5. Saudi Contractors Authority COVID-19 Impact on the Contracting Sector in Saudi Arabia Building Resilience in a Turbulent Environment. 2020. Available online: <https://sca.sa/16052020091859.pdf> (accessed on 15 August 2022).
6. Alhammadi, S.A. Factors Affecting the Management of Riyadh's Construction Sector in the Light of COVID-19. *Heliyon* **2022**, 8, e11899. [[Google Scholar](#)] [[CrossRef](#)] [[PubMed](#)]