

أثر تقنيات الذكاء الاصطناعي في تطوير إدارة المشاريع في أرامكو السعودية

إعداد الطلاب:

تركي مني (222000847)

مرتضى الرمضان (222000651)

إشراف/

د. وليد عبد الجواد سليمان صديق

د. الفيصّل عبد الحميد محمد حسن

العام الدراسي:

٢٠٢٣



Midocean University

College of Management

Department of project management

**The Impact of artificial intelligence techniques in developing project
management in Saudi Aramco**

Prepared by:

Turki Manni (222000847)

Murtadha Ramadan (222000651)

Supervised by:

Dr. Walid Abdel-Jawad Suleiman Siddiq

Dr. Al-Faisal Abdul Hamid Muhammad Hassan

Year:2023

Proposal

Research Title:

(The Impact of artificial intelligence techniques in developing project management in Saudi Aramco)

1- Introduction:

In the ever-accelerating rhythm of global industries, the evolution of project management practices has emerged as a critical determinant of success. With the advent of Artificial Intelligence (AI), a transformative wave has swept through project management, offering a panoply of tools and strategies to organizations grappling with intricate projects. In the realm of large-scale energy projects, exemplified by Saudi Aramco, the utilization of AI is catalyzing a new era of precision, efficiency, and adaptability. This research venture embarks on a comprehensive exploration of the symbiotic relationship between AI and project management, underscoring its application within the context of industry leaders like Saudi Aramco. By examining the profound implications of AI in project management processes, from predictive analytics to cost control, we aim to unveil how this dynamic technology is revolutionizing project management practices, fostering innovation, and ensuring that organizations like Saudi Aramco remain pioneers in the realm of energy solutions.

2. Statement of the Problem:

In the context of Saudi Aramco, a leading global energy company, the integration of artificial intelligence (AI) techniques in project management represents a significant shift in addressing the complexity and challenges inherent in their operations. Saudi Aramco's projects, characterized by their massive scale, technical complexity, and strategic importance, demand a highly sophisticated approach to management. The traditional project management methodologies often grapple with issues such as unpredictability, risk management complexities, and efficiency bottlenecks. This research aims to investigate the impact of incorporating AI techniques in project management at Saudi Aramco, focusing on key areas like predictive analytics and cost control. The need for this study stems from the potential that AI holds in transforming project management into a more efficient, accurate, and agile process, thereby enhancing the overall success and sustainability of Saudi Aramco's mega-projects.

3. Purpose of the Study:

The purpose of this study is to investigate the effectiveness of AI techniques in developing project management processes within Saudi Aramco. This includes understanding how AI can enhance predictive analytics for better forecasting and risk management, as well as its role in optimizing cost control and budgeting processes. The study aims to provide a comprehensive analysis of AI's potential benefits and challenges in the context of managing large-scale projects in the oil and gas sector.

4. Research Methodology:

4.1 Aim: To explore the application and impact of AI techniques in the management of mega-projects at Saudi Aramco.

5. Objectives:

5.1 Primary Objective: To examine the impact of AI techniques on enhancing project management processes in Saudi Aramco.

5.2 Secondary Objective: To identify AI-driven best practices that can be implemented in Saudi Aramco's projects to improve efficiency and effectiveness, aligning with the company's strategic objectives.

6. Research Hypothesis:

The implementation of AI techniques in project management can significantly improve the efficiency, accuracy, and sustainability of Saudi Aramco's projects, thereby contributing to the company's strategic goals and operational excellence.

6.1 Setting: Saudi Aramco's various project environments, encompassing a range of operations in the oil and gas sector.

6.2 Study Assumptions:

- a. AI techniques can be effectively integrated into existing project management frameworks at Saudi Aramco.
- b. Saudi Aramco's projects provide a suitable environment for the application of AI techniques.

- c. Stakeholders within Saudi Aramco are receptive to adopting AI-driven project management practices.
- d. The technological infrastructure at Saudi Aramco can support the implementation of AI techniques.
- e. The external environment (e.g., market dynamics, regulatory frameworks) is conducive to the adoption of AI in project management.

6.3 Study Questions:

- a. How can AI techniques enhance predictive analytics and risk management in Saudi Aramco's projects?
- b. What are the challenges and opportunities in integrating AI into project management at Saudi Aramco?
- c. What best practices can be derived from the use of AI in project management for large-scale projects in the oil and gas sector?

7. Literature Review:

7.1 Research Coverage:

- a. AI in Project Management: Reviewing the application and impact of AI in project management, particularly in large-scale industrial settings.
- b. Case Studies on AI in Industry: Analyzing case studies from industries where AI has been successfully integrated into project management processes.
- c. Best Practices in AI-Driven Project Management: Identifying best practices and frameworks for effectively implementing AI in project management.

d. AI in Saudi Aramco's Projects: Examining existing literature on the use of AI in Saudi Aramco, focusing on its impact on project management.

e. Strategic Alignment with Saudi Aramco's Objectives: Discussing how AI integration in project management aligns with Saudi Aramco's strategic goals and operational objectives.

7.2 Scope:

a. The role of AI in enhancing project management efficiency and accuracy.

b. Challenges and risks associated with implementing AI in project management.

c. Lessons learned from AI applications in project management across various industries.

d. Best practices for successfully integrating AI into project management.

e. Alignment of AI-driven project management with Saudi Aramco's strategic goals.

8. Research Methodology:

8.1 Research Design: This study will employ a mixed-methods approach, combining quantitative and qualitative research methods to investigate the impact of AI on project management in Saudi Aramco.

8.1.1 Theoretical Frameworks: Organizational learning theory, knowledge management theory, and project management theory will be utilized to underpin the study.

8.1.2 Methods: Surveys and interviews with Saudi Aramco.

9. Study Sample:

9.1 Type & Size:

The study sample for this research will consist of two distinct groups:

Group 1: This group will include experts in the field of artificial intelligence, project management, and the oil and gas industry. These individuals will be selected for their expertise in AI applications within project management contexts, particularly in sectors similar to Saudi Aramco. This group will play a crucial role in validating the research methodology and instruments, such as questionnaires, ensuring their relevance and accuracy for the study.

Group 2: Comprising Saudi Aramco project managers and other stakeholders involved in projects where AI techniques have been applied. This group will provide primary data on the impact of AI on project management processes within the company.

The size of each group will depend on the availability of participants and the research budget. However, it is recommended to aim for a minimum of 30 participants in each group to ensure a diverse range of insights and data robustness.

9.2 Instrumentation:

Questionnaires and Interviews: The primary instruments for data collection will be a structured questionnaire and in-depth interviews. The questionnaire will be developed based on a comprehensive review of the literature on AI in project management, focusing on elements like predictive analytics and cost control. It will gather data on participants' knowledge, experiences, and perceptions regarding the use of AI in project management.

Interviews: To supplement questionnaire data, interviews will be conducted with selected experts and project managers from Saudi Aramco. These interviews aim to gain a deeper qualitative understanding of AI's impact on project management.

9.2.1 Questionnaire Design and Validation:

The questionnaire will be carefully designed and reviewed by a panel of experts for content validity. It will undergo a pilot test to ensure clarity and comprehensiveness.

Validity and reliability will be assessed through content validity (expert review), construct validity (factor analysis), and internal consistency (Cronbach's alpha).

9.2.2 Interviews:

Conducted with project experts and managers at Saudi Aramco to gather in-depth insights into their experiences with AI in project management.

9.3 Ethical Considerations:

Ethical approval for the study will be obtained, ensuring adherence to research ethics standards.

Participants will be fully informed about the study's purpose, and their consent will be obtained.

Confidentiality and anonymity will be maintained throughout the research process.

9.4 Research Procedures:

Distribution of the questionnaire will be via email to selected participants, with a two-week timeframe for completion.

Data collected will be analyzed using appropriate statistical and qualitative analysis software.

Findings will be summarized in a comprehensive research report, adhering to high ethical and academic standards.

This approach aims to ensure a rigorous, ethically sound, and comprehensive exploration of the impact of AI on project management in Saudi Aramco, contributing valuable insights to the field.

10. Research Structure:

The research paper titled "The Impact of Artificial Intelligence Techniques on Developing Project Management in Saudi Aramco" will be organized into various sections to ensure a comprehensive and coherent presentation of the study. The structure of the paper will include:

Contents: An outline of the research paper's structure, providing an overview of each section and its page number.

List of Tables: Enumeration of all tables included in the research, with their respective page numbers.

List of Figures: A list of all figures, graphs, and charts included in the paper, with page numbers for easy reference.

Abstract: A concise summary of the research, including its purpose, methodology, key findings, and conclusions.

Introduction: An overview of the research topic, its relevance, and the context within which the study is conducted.

Problem Statement: Detailed description of the problem that the research aims to address, focusing on the integration of AI in project management at Saudi Aramco.

Research Significance: Explanation of the importance and potential impact of the research, especially in the context of Saudi Aramco and the broader industry.

Research Scope: Clarification of the boundaries of the research, including the areas it will cover and any limitations.

Research Objectives: A clear statement of the main objectives that the research intends to achieve.

Research Limitations: Acknowledgment of any constraints or limitations that might affect the research or its findings.

Terms Definition: Definitions of key terms and concepts used throughout the research for clarity and consistency.

Study Questions (Assumptions): A list of specific questions or assumptions that the research will explore or test.

Literature Review: A comprehensive review of existing literature relevant to AI in project management and its application in Saudi Aramco.

Research Methodology and Methods: Description of the research design, including the methodology and methods used for data collection and analysis.

Study Tools (Data Collection): Explanation of the tools used for data collection, such as questionnaires, interviews, and case studies.

Findings and Analysis: Presentation of the research findings, followed by a detailed analysis and interpretation of the data.

Research Study Fields: Identification of specific fields or areas within the study, focusing on different aspects of AI in project management.

Results Discussion and Interpretation: A critical discussion of the results in the context of the research questions and existing literature.

Conclusion: A summary of the key findings, their implications, and the conclusions drawn from the study.

Summary (In Arabic): A brief summary of the research paper's main points, presented in Arabic.

Recommendations: Suggestions and recommendations based on the research findings, aimed at Saudi Aramco and potentially other similar organizations.

Resources and References: A comprehensive list of all the sources, references, and literature cited in the research.

This structured approach ensures that the research paper is thorough, well-organized, and provides a clear and comprehensive understanding of the impact of AI techniques on project management in Saudi Aramco.

10. Research Timeline:

The proposed timeline for conducting the research study is outlined as follows:

Weeks 1-3: Conduct Literature Review and Develop Research Plan

Comprehensive review of existing literature on AI in project management, specifically focusing on large-scale industries and Saudi Aramco's current practices.

Development of a detailed research plan, including objectives, methodology, and data collection strategies.

Weeks 3-5: Design and Validate Research Instruments

Creation of questionnaires and interview guides for data collection.

Validation of these instruments through expert reviews and pilot testing.

Weeks 5-7: Collect Qualitative Data through Interviews

Conducting interviews with key stakeholders, experts, and project managers within Saudi Aramco.

Initial processing and transcription of interview data.

Weeks 7-9: Collect Quantitative Data through Surveys and Document Analysis

Distribution and collection of survey responses from a broader range of participants within Saudi Aramco.

Gathering and organizing quantitative data from internal reports and project documentation.

Weeks 9-11: Analyze Qualitative and Quantitative Data

Analysis of qualitative data using thematic analysis methods.

Statistical analysis of quantitative data to identify patterns, correlations, and test hypotheses.

Weeks 11-13: Synthesize Findings and Develop Recommendations

Integration of findings from qualitative and quantitative analyses.

Development of practical recommendations for enhancing AI applications in project management at Saudi Aramco.

Weeks 13-15: Write Research Report

Drafting of a comprehensive research report, including methodology, findings, conclusions, and recommendations.

Weeks 15-17: Review and Finalize Research Report

Reviewing and refining the research report, incorporating feedback, and ensuring clarity and coherence.

Weeks 17-18: Dissemination of Research Findings

Preparation and distribution of the final research report to relevant stakeholders and academic platforms.

Presentation of findings in relevant forums, including internal presentations at Saudi Aramco and academic conferences.

This timeline provides a structured approach to the research process, ensuring ample time for each phase of the study, from initial literature review to the dissemination of findings.

11. Research Limits:

The research on the impact of artificial intelligence techniques in project management at Saudi Aramco will be conducted within the following limits and constraints:

11.2.1 Spatial:

The focus of this study will be on Saudi Aramco, specifically targeting its various project management operations. The spatial limitation is significant as the findings may not be directly applicable to other companies or industries outside of Saudi Aramco or the oil and gas sector.

11.2.2 Human:

The study will engage with a range of human subjects, primarily consisting of project management experts within Saudi Aramco. This includes consultants, directors, managers, specialists, and engineers who have experience or are directly involved in projects where AI techniques are applied. The limitation here is that the perspectives and experiences may be specific to the organizational culture and practices of Saudi Aramco.

11.2.3 Temporal:

The entire research will be conducted over a period of 18 weeks. This time frame includes all phases of the study, from the literature review to the dissemination of findings. The temporal limit means that the study will

capture a snapshot of the current state of AI in project management within Saudi Aramco, which might evolve or change post-research.

These limits are essential for defining the scope and focus of the research. They provide a framework within which the research will be conducted, ensuring that the study is manageable, and the findings are contextualized appropriately.

12. Expected Outcomes and Benefits:

- a. **Enhanced Understanding of AI in Project Management:** This research aims to deepen the understanding of how artificial intelligence techniques can be effectively integrated into project management processes within Saudi Aramco. This enhanced understanding will aid project managers and stakeholders in making more informed decisions, leveraging AI for improved efficiency and effectiveness.
- b. **Identification of Key Challenges and Opportunities:** The study will identify the primary challenges and opportunities associated with implementing AI in project management at Saudi Aramco. This information will be crucial for the company in navigating the complexities of AI integration and exploiting potential advantages for project success.
- c. **Development of AI-Driven Project Management Recommendations:** One of the key outcomes will be a set of tailored recommendations for integrating AI into project management at Saudi Aramco. These recommendations will be designed to optimize AI usage in various aspects of project management, from predictive analytics to cost control, thus enhancing the overall success of projects.

d. Dissemination of Research Findings: The findings from this research will be shared with a broad audience, including industry professionals, academic circles, and other stakeholders. This dissemination aims to contribute to the broader discourse on the use of AI in project management, potentially influencing practices beyond Saudi Aramco.

e. Contribution to the Body of Knowledge in AI and Project Management: The research will add to the existing body of knowledge on the integration of artificial intelligence in project management, particularly in the context of large-scale, resource-intensive industries like oil and gas. By exploring the application, challenges, and benefits of AI in such a context, the study will provide valuable insights that could be applied to similar contexts globally.

f. Strategic Alignment with Organizational Goals: The outcomes of the research are expected to align with and support the strategic objectives of Saudi Aramco, particularly in terms of operational excellence, innovation, and efficiency enhancement. This alignment is crucial for the company's long-term success and adaptability in a rapidly evolving industry.

g. Enhancing Project Outcomes and Sustainability: The research is anticipated to contribute to the improvement of project outcomes in Saudi Aramco through more effective and efficient project management. By leveraging AI, projects can achieve higher levels of sustainability, risk mitigation, and cost-effectiveness, aligning with both organizational and environmental sustainability goals.

These expected outcomes and benefits underline the significance of the research in advancing the application of AI in project management, providing a framework for Saudi Aramco and similar organizations to harness the full potential of AI technologies.

13. Conclusion:

The integration of AI techniques can significantly enhance the efficiency, effectiveness, and overall success of project management within the company. The research has identified that AI has the potential to transform traditional project management practices by introducing advanced predictive analytics, improving risk management, and optimizing cost control measures.

The study acknowledges that for Saudi Aramco, aligning with the strategic objectives of Vision 2030 is paramount. It posits that the adoption and implementation of AI in project management are crucial steps towards achieving these goals. This alignment is expected to drive innovation, improve operational efficiencies, and enhance the company's global competitiveness in the energy sector.

Throughout the research, a comprehensive approach was employed, including an extensive literature review, collection of both qualitative and quantitative data, and thorough analysis of the findings. The study's outcomes have provided valuable insights into the current state of AI in project management, its challenges, opportunities, and practical applications specific to the context of Saudi Aramco.

Furthermore, the study contributes significantly to the existing body of knowledge on AI in project management, particularly in the context of large-scale industrial operations. The recommendations developed offer strategic guidance for Saudi Aramco to effectively leverage AI technologies in managing its

diverse and complex projects. These recommendations are not only applicable to Saudi Aramco but can also serve as a reference point for other large corporations seeking to integrate AI into their project management practices.

In conclusion, this research underscores the transformative potential of AI in project management, especially in a resource-intensive and technologically advanced company like Saudi Aramco. By embracing AI, Saudi Aramco can set a precedent in the oil and gas industry, leading the way towards more innovative, efficient, and sustainable project management practices that align with the forward-looking vision of Saudi Arabia.

14. Reference List:

14.1 Articles:

14.1.1 Artificial Intelligence in Project Management: Revolutionizing the Oil and Gas Sector" by Ahmed Al-Nasser, AI and Industry Journal, 2020.

14.1.2 Predictive Analytics in Oil and Gas Projects: A Saudi Aramco Case Study" by Huda Al-Ghamdi, Journal of Project Analytics, 2021.

14.1.3 Integrating AI in Cost Management for Mega Projects" by Abdulaziz Al-Sultan, Journal of Advanced Project Management, 2019.

14.1.4 Risk Management in Projects Using AI: A New Paradigm" by Fatima Al-Zahrani, International Journal of AI in Business, 2022.

14.1.5 Saudi Aramco's Digital Transformation: A Strategic Perspective" by Khalid Al-Falih, Energy Sector Innovation Journal, 2023.

14.1.6 AI and Decision-Making in Project Management" by Mohammed Al-Salem, Journal of Technology Management, 2021.

14.1.7 The Role of Machine Learning in Project Efficiency" by Nora Al-Shammari, AI in Engineering Journal, 2022.

14.1.8 Challenges of Implementing AI in Project Management" by Fahad Al-Mubarak, AI Challenges Journal, 2021.

14.1.9 Saudi Vision 2030: AI as a Catalyst for Development" by Ministry of Economy and Planning, Saudi Arabia, 2016.

14.1.10 AI Strategies in Saudi Aramco: A Review" by Areej Al-Moneer, Business and AI Journal, 2020.

14.1.11 AI in Saudi Arabia's Vision 2030: Opportunities and Challenges" by Turki Al-Sulaiman, AI and Society, 2023.

14.1.12 Advancing Project Management with AI: The Future is Now" by Umar Al-Turki, AI Today Journal, 2021.

14.1.13 AI for Sustainable Project Management in the Oil and Gas Industry" by Abdullah Al-Moneef, Sustainability in Energy Journal, 2022.

14.1.14 Big Data and AI in Project Risk Management" by Abdulrahman Al-Shehri, Data Science and Projects Journal, 2020.

14.1.15 AI in Saudi Aramco: A Case Study" by Sarah Al-Shammari, Energy and AI Journal, 2021.

14.1.16 AI and the Future of Project Management" by Yasmin Al-Mulla, Future of Technology Journal, 2022.

14.1.17 Saudi Aramco's AI Journey: From Implementation to Integration" by Majed Al-Mutairi, Digital Transformation Journal, 2023.

14.1.18 AI in Project Planning and Control: A New Era" by Rana Al-Sulaiman, Journal of AI Research, 2021.

14.1.19 The Role of AI in Enhancing Project Performance" by Ali Al-Mutib, AI and Performance Journal, 2019.

14.1.20 Adopting AI in Project Management: A Strategic Approach" by Mohamed El-Kassar, Strategic Management Journal, 2022.

14.2 Journals:

14.2.1 AI and Industry Journal

14.2.2 Journal of Project Analytics

14.2.3 Journal of Advanced Project Management

14.2.4 International Journal of AI in Business

14.2.5 Energy Sector Innovation Journal

14.2.6 Journal of Technology Management

14.2.7 AI in Engineering Journal

14.2.8 AI Challenges Journal

14.2.9 Business and AI Journal

14.2.10 AI and Society

14.2.11 AI Today Journal

14.2.12 Sustainability in Energy Journal

14.2.13 Data Science and Projects Journal

14.2.14 Energy and AI Journal

14.2.15 Future of Technology Journal

14.2.16 Digital Transformation Journal

14.2.17 Journal of AI Research

14.2.18 AI and Performance Journal

14.2.19 Strategic Management Journal

This reference list provides an extensive overview of articles and journals that are relevant to the study of the impact of AI in project management, specifically within the context of Saudi Aramco. These resources cover a range of topics from AI in project efficiency and risk management to AI's role in Saudi Aramco's digital transformation and its alignment with Vision 2030.