

Research study for the master's degree of Management in Project Management, College of Management, Midocean University

Title of Research Study: The Impact of Lessons Learned and Case Studies on Sustainable Mega-Projects: Applying Best Practices for the Cubic (Mukaab) Project in Riyadh and Aligning with Vision 2030 of Saudi Arabia.

Researchers:

Researcher Role	Name	Email ID	Academic ID
Principal Investigator (PI)	Anwar Kriri	ankriri11@gmail.com	222000556
CO-Investigator	Haya Alili	haya.ali8444@gmail.com	222000980
CO-Investigator	Naseem Al Jaber	nasee1435unv@hotmail.com	222000442

Supervised by:

Advisor Name1: Dr. Waleed Abdul-Jawad Suleiman Siddiq

Advisor Name2: Dr. Alfaisal Abdul-Hamid Muhammad Hassan

Third/Final Semester

2023

1444

دراسة بحثية لدرجة الماجستير في الإدارة بمجال إدارة المشاريع، كلية الإدارة، جامعة ميدأوشن

عنوان الدراسة البحثية: أثر الدروس المستفادة ودراسات الحالة على المشاريع الكبرى المستدامة: تطبيق أفضل الممارسات لمشروع المكعب في الرياض والمواءمة مع رؤية المملكة العربية السعودية 2030.

الباحثين:

الرقم الأكاديمي	البريد الإلكتروني	الإسم	دور الباحث
222000556	ankriri11@gmail.com	أنور كيري	الباحث الرئيسي (القائد)
222000980	haya.ali8444@gmail.com	هيا علي	مساعد الباحث 1
222000442	nasee1435unv@hotmail.com	نسيم آل جابر	مساعد الباحث 2

إشراف/

د/ وليد عبد الجواد سليمان صديق
د/ الفيصل عبد الحميد محمد حسن

العام الدراسي:

2023

1444

Acknowledgments

The completion of this research, "The Impact of Lessons Learned and Case Studies on Sustainable Projects: Applying Best Practices for the Project of Cubic (Mukaab)," was made possible through the steadfast support and invaluable contributions of various individuals and entities. I extend my sincere gratitude to:

1) Midocean University:

I express my heartfelt thanks to Midocean University for providing a conducive academic environment and valuable resources essential to the development and execution of this research. The university's unwavering commitment to academic excellence has been a cornerstone in the pursuit of knowledge.

2) Supervisors:

My deep appreciation goes to my dedicated supervisors, Dr. Waleed Abdul-Jawad Suleiman Siddiq, Dr. Alfaisal Abdul-Hamid Muhammad Hassan, and Dr. Rana Abdulraof for their consistent guidance, insightful feedback, and unwavering support throughout every phase of this research. Their expertise and mentorship have been indispensable in shaping the direction and quality of the study.

3) Co-Researchers:

I extend my gratitude to my esteemed co-researchers, Haya Alili and Naseem Al Jaber, for their collaborative efforts, intellectual contributions, and shared commitment to advancing our understanding of sustainable project management. The synergy of our collective efforts has significantly enriched the research process.

4) Interviewees and Interviewers:

Special appreciation goes to the individuals who generously participated in the interview process. Your willingness to share insights, experiences, and perspectives has added depth and nuance to this study. Additionally, I acknowledge and appreciate the interviewers who skillfully conducted and facilitated these conversations, ensuring the collection of valuable qualitative data.

5) Survey Participants:

I am grateful to all the participants who dedicated their time to respond to the survey. Your input has played a crucial role in shaping the quantitative dimension of this research. The willingness of survey participants to engage with the study has substantially contributed to its comprehensiveness and depth.

Each of you has played a pivotal role in the successful execution of this research, and your contributions are sincerely acknowledged and deeply appreciated.

Contents:

List of Tables	I
List of Figures	II
Overture	III
Abstract:	IV
First chapter	1
1.0 Introduction	2
1.1 Hook	2
1.2 Background Information	2
1.3 Rationale	3
2.0 Problem Statement	3
2.1 Problem	3
2.2 Challenges	3
2.3 Scope	4
2.5 Significance	4
2.6 Urgency	4
2.7 Magnitude	4
2.8 Impact	5
2.4 Solution	5
3.0 Significance/Importance Research	6
3.2 Shortage of Literature Review	6
3.3 Improved Frameworks for Sustainable Mega-Projects	6
3.4 Alignment with Vision 2030 of Saudi Arabia	7
4.0 The Objectives of Research Study	7
4.1 .To Evaluate the Utilization of Lessons Learned in Sustainable Project Management	7
4.2 .To Analyze the Application of Case Studies in Sustainable Project Management	7
4.3 .To Identify Success Factors and Challenges in Sustainable Mega-Projects	8
4.4 .To Develop Best Practice Guidelines for Sustainable Project Management	8
4.5 .To Assess the Alignment of Sustainable Practices with Vision 2030	8
4.6 .To Extract and Implement Lessons Learned for the Sustainable Success of the Cubic (Mukaab)	8
4.7 To Explore Lessons Learned and Case Studies for Best Practices in Sustainable Mega-Projects: A Focus on the Cubic Project	8
5.0 Research Scope	9
5.1 key areas	10
5.2 Aspects of Sustainability	10
6.0 Hypothesis and Questions of Research Study	11
6.1 Facets of Project Management	11
6.2 International Standards	12
6.3 Study Assumptions	13
6.2 Affected Factors	13
6.3 Research Questions	14

6.3.1 Suggested Research Questions	14
6.3.2 Selected/Specified Research Questions	15
7.0 Research Plan	15
7.1 Phases of Research Study	15
a) Phase 1: Literature Review	15
b) Phase 2: Data Collection	15
c) Phase 3: Data Analysis	16
d) Phase 4: Findings and Recommendations	16
7.1 Timeline of Research Study (In Weeks)	17
7.3 Limits of Research Study	17
8.0 Outcomes and Benefits of Research Study	17
9.0 Terms of Research Study	18
Second Chapter	20
1.0 Theoretical Frameworks	21
1.1 Purpose of Study	21
1.2 Rationale for Theories	21
1.3 Significance of the Study	22
1.4 Theoretical Frameworks Structure	23
1.4.1 Organizational Learning Theory (OLT)	24
1.4.1.1 The Four Stages of Organizational Learning	24
1.4.1.2 Key Concepts in Organizational Learning Theory	25
1.4.1.3 Perspectives on Organizational Learning	26
1.4.1.4 Significance of Organizational Learning in Sustainable Project Management	28
1.4.1.5 Relevance to Sustainable Project Management	29
1.4.1.6 Applying “Organizational Learning Theory” to the Cubic Project	31
1.4.2 Knowledge Management Theory (KMT)	32
1.4.2.1 The Four Stages of Knowledge Management	32
1.4.2.2 Key Concepts in Knowledge Management Theory	33
1.4.2.3 Perspectives on Knowledge Management	34
1.4.2.4 Significance of Knowledge in Sustainable Project Management	35
1.4.2.5 Relevance to Sustainable Project Management	36
1.4.2.6 Applying “Knowledge Management Theory” to the Cubic Project	37
1.4.3 Best Practices Theory (BPT)	39
1.4.3.1 Key principles of best practices theory	40
1.4.3.2 Key Elements of Best Practices Theory	40
1.4.3.3 Significance of Best Practices in Sustainable Project Management	40
1.4.3.4 Key Significance of Best Practices in Sustainable Project Management	41
1.4.3.5 Relevance of Best Practices Theory to Sustainable Project Management	42
1.4.3.6 Applying Best Practices to the Cubic Project	43

1.4.4 Project management theory (PMT)	44
1.4.4.1 Key Elements of Project Management Theory	44
1.4.4.2 Relevance of Project Management Theory to Sustainable Project Management	46
1.4.4.3 Application of Project Management Theory to the Cubic Project	47
1.4.5 Sustainability Theory (ST)	48
1.4.5.1 Key Elements of Sustainability Theory	48
1.4.5.2 Relevance of Sustainability Theory to Sustainable Project Management	49
1.4.5.2.1 The Cornerstone of Sustainable Project Management	49
1.4.5.2.2 Driving Continuous Improvement in Sustainable Project Management	50
1.4.5.2.3 Applying Sustainability Theory	51
1.4.6 Socio-Technical Systems Theory (STS)	52
1.4.6.1 Key Elements of Socio-Technical Systems Theory	52
1.4.6.2 Relevance of Socio-Technical Systems Theory to Sustainable Project Management	53
1.4.6.3 Applying Socio-Technical Systems Theory to the Cubic Project	53
2.0 Literature Review	54
2.1 Importance of the Literature Review	54
2.2 Reasons for Conducting the Literature Review	55
2.3 Objectives of the Literature Review	55
2.4 Study Sample (Previous Studies)	56
2.4.1 Overview	56
2.4.2 Research Coverage	57
2.4.3 Relevance	57
2.4.4 Scope	58
2.4.5 Selected Studies (Previous Research Paper):	58
2.4.5.1.1 Summary	58
2.4.5.1.2 Key Findings	59
2.4.5.1.3 Significance for Sustainable Urban Development	59
2.4.5.1.4 Limitations	59
2.4.5.1.5 Further Research	59
2.4.5.1.6 Investigation on the research	60
2.4.5.1.6.1 Research Gap or Problem Addressed	60
2.4.5.1.6.2 Specific Objectives of the Study	60
2.4.5.1.6.3 Methodology of the Research	60
2.4.5.1.6.4 Results and Conclusions of the Study	61
2.4.5.1.6.5 Key Lessons from the Case Study of Masdar City	61
2.4.5.1.6.6 Lessons for Applying to Other Sustainable Megaprojects	62
2.4.5.2 The impact of project sustainability management (PSM) on project success A systematic literature review	63
2.4.5.2.1 Overview	63
2.4.5.2.2 Key points	63
2.4.5.2.3 Key Findings	63
2.4.5.2.4 Significance of the Study: The impact of project sustainability management (PSM) on project success	64

2.4.5.2.5 Limitations	64
2.4.5.2.6 Further Research	65
2.4.5.2.7 Investigation on the research	65
2.4.5.2.7.1 Research Gap or Problem Addressed	66
2.4.5.2.7.2 Specific Objectives of the Study	66
2.4.5.2.7.3 Methodology of the Research	66
2.4.5.2.7.4 Results and Conclusions of the Study	66
2.4.5.2.7.5 Key Lessons from the impact of project sustainability management (PSM) on project success	67
2.4.5.2.7.6 Lessons for Applying to Other Sustainable Megaprojects	68
2.4.5.3 Review of Drivers of Sustainability in Mega Infrastructure Projects: An Institutional Approach	69
2.4.5.3.1 Overview	69
2.4.5.3.2 Key points	69
2.4.5.3.3 Key Findings	69
2.4.5.3.4 Significance of the Study	70
2.4.5.3.5 Limitations	70
2.4.5.3.6 Further Research	71
2.4.5.3.7 Investigation on the research	71
2.4.5.3.7.1 Research Gap or Problem Addressed	72
2.4.5.3.7.2 Specific Objectives of the Study	72
2.4.5.3.7.3 Methodology of the Research	72
2.4.5.3.7.4 Results and Conclusions of the Study	72
2.4.5.3.7.5 Key Lessons	73
2.4.5.3.7.6 Lessons for Applying to Other Sustainable Megaprojects	74
Third Chapter	75
1.0 Practical/Scientific Study	76
2.0 Methodological Procedures.....	76
2.1 Interviews	76
2.2 Surveys	76
2.3 Lesson Learned & Case Studies Examination	76
2.4 Data Collection	76
2.5 Data Analysis	77
2.6 Data Integration	77
2.7 Alignment with Vision 2030	77
2.8 Synthesis and Recommendations	77
3.0 Methodologies of Research Study	78
3.1 Interviews	78
3.1.1 .1 Purpose of Study	78
3.1.2 Rationale for Interviews	78
3.1.3 Significance of the Study	78
3.1.5 Interview Structure	79
3.1.6 Data Analysis of Conducted Interviews	79

3.1.7 Discussion	69
3.1.7.1 Coding and Categorization of Interview Data	84
3.1.7.2 Tools or Frameworks Used for Analysis	84
3.1.7.3 The main themes or insights that emerged from the interview	85
3.1.7.4 Limitations of the Interview Method	86
3.1.7.4 Context of the Interviews and Influence on Responses	87
3.1.7.5 Conclusions and Recommendations	88
3.2 Survey:	89
3.2.1 Introduction:	89
3.2.2 Objective of Study.....	89
3.2.3 The Significant of Study.....	89
3.2.4 Participant Insights and Anonymity	90
3.2.5 Consent for Survey Participation	90
3.2.6 Purpose and Benefits of Survey	90
3.2.7 Rationale for survey	91
3.2.8 Significance of the Study	92
3.2.9 Target Population	92
3.2.10 Survey Length:	93
3.2.10.1 Introduction and General Demographical Information (Section 1)	93
3.2.10.2 Assessing Comprehension in the Context of Sustainable Mega-Projects (Section 2)	93
3.2.10.3 Evaluating Familiarity with the Cubic (Mukaab) Project in Riyadh and the Vision 2030 of Saudi Arabia(Section 3)	94
3.2.10.4 Assessing Comprehension in the Context of Lessons Learned and Case Studies (Section 4)	96
3.2.10.6 Assessing Comprehension in the Context of the Integration of Lessons Learned and Case Studies (Section6)	98
3.2.10.7 Assessing Application of Best Practices (Section 7)	99
3.2.10.8 Overall Perception (Section 8)	100
3.2.11 Characteristics of the Study Sample.....	101
3.2.11.1 Introduction and General Demographical Information (Section 1)	101
3.2.11.2 Assessing Comprehension in the Context of Sustainable Mega-Projects (Section 2)	109
3.2.11.3 Evaluating Familiarity with the Cubic (Mukaab) Project in Riyadh and the Vision 2030 of Saudi Arabia (Section 3)	113
3.2.11.4 Assessing the Comprehension in the Context of Lessons Learned and Case Studies (Section4)	113
3.2.11.5 Evaluating the Applicability of Lessons Learned and Case Studies (Section 5)	119
3.2.11.6 Assessing Comprehension in the Context of the Integration of Lessons Learned and Case Studies (Section 6)	122
3.2.11.7 Assessing Application of Best Practices (Section 7)	125
3.2.11.8 Overall Perception (Section 8)	129
3.2.12 Research Validity.....	132
3.2.13 Reliability of the Scale.....	135
Summary (In Arabic)	138
Appendix	147

List of Tables

Table1: Phases of Research Study: A list of activities for each phase	16
Table2: Key aspects of Relevance to Sustainable Project Management	30
Table3: Approach/Strategy of Applying Organizational Learning Theory	31
Table4: Key aspects of Relevance to Sustainable Project Management	37
Table 5: Approach/Strategy of Applying Knowledge Management Theory	39
Table6: Key aspects of Relevance to Sustainable Project Management	43
Table7: Approach/Strategy of Applying Knowledge Management Theory	44
Table8: Key aspects of Project Management Theory in Relevance to Sustainable Project Management	47
Table9: Approach/Strategy of Applying Project Management Theory	48
Table10: Describes the data analysis reveals a nuanced understanding of the Cubic (Mukaab) Project from different perspectives	79
Table11: Describes the data analysis of the Cubic (Mukaab) Project which has been collected from the conduct interviews	80
Table12: Describes the data analysis reveals consistent themes, patterns, and key findings	80
Table13: Describes the data analysis of how to align with Vision 2030: Cubic (Mukaab) Project	81
Table14: Describes the data analysis reveals consistent themes, patterns, and key findings	82
Table15: The table summarizes the key points from each role's perspective	82
Table16: Describes the data analysis reveals consistent themes, patterns, and key findings	83
Table17: Illustrates the Content Encompassed by Section 2 in the Survey.....	94
Table18: Illustrates the Content Encompassed by Section 3 in the Survey.	95
Table19: Illustrates the Content Encompassed by Section 4 in the Survey.	96
Table20: Illustrates the Content Encompassed by Section 5 in the Survey.	97
Table21: Illustrates the Content Encompassed by Section 6 in the Survey.	98
Table22: Illustrates the Content Encompassed by Section 7 in the Survey.	99
Table23: Illustrates the Content Encompassed by Section 8 in the Survey.	100
Table24: Participants' characteristics according to their gender (n= 101)	101
Table25 Participants' characteristics according to their Age (n= 101)	101
Table26 Participants' characteristics according to their Educational Background.....	103
Table 26 Participants' characteristics according to their Position.....	104
Table27 Participants' characteristics according to their Level of Expertise in Project.....	105
Table28: Participants' characteristics according to their Professional Experience in Mega-Projects.....	106
Table29 Participants' characteristics according to their employer	106
Table30 Participants' characteristics according to their role of your employer in the project working	107
Table 31 Participants' characteristics according to their project type that working	107
Table 32: Participants' characteristics according to their employer scope for the project that working	108
Table 33: shows the frequency and percentage distribution of participants' self-assessment of	109
Table 34 shows the frequency and percentage distribution of participants'	110
Table 35 shows the frequency and percentage distribution of participants'	110
Table 36 shows the frequency and percentage distribution of participants'	111
Table 37 Descriptive Statistics for Understanding of Sustainable Mega-Projects in Section2.....	112
Table 38 shows the frequency and percentage distribution of participants' familiarity with Vision 2030 of Saudi Arabia.....	113

Table 39 shows the frequency and percentage distribution of participants' familiarity with the Cubic (Mukaab) Project in Riyadh."	113
Table 40 shows the frequency and percentage distribution of participants' opinions on.....	113
Table 41 shows the frequency and percentage distribution of participants' opinions on.....	113
Table 42 shows the frequency and percentage distribution of participants' opinions on how well the Cubic (Mukaab) Project has utilized lessons learned from previous mega-projects.	113
Table 43 shows the frequency and percentage distribution of participants' opinions	113
Table 44 Descriptive Statistics for Knowledge about the Cubic (Mukaab)	113
Table 45 shows the frequency and percentage distribution of participants' opinions.....	113
Table 46 shows the frequency and percentage distribution of participants'	114
Table 47 shows the frequency and percentage distribution of participants' opinions	115
Table 48 shows the frequency and percentage distribution of participants' opinions	115
Table 50 the frequency and percentage distribution of participants' opinions	116
Table 51 the frequency and percentage distribution of participants' opinions	117
Table 52 the frequency and percentage distribution of participants' opinions	117
Table 53 the frequency and percentages of how often lessons learned from previous projects are reviewed	118
Table 54 shows the frequency and percentage distribution of participants' opinions	118
Table 55 Descriptive Statistics for Understanding of Lessons Learned and Case Studies in Section 4"	119
Table 56 presents the frequency and percentage distribution of participants' opinions	119
Table 57 shows the frequency and percentage distribution of participants' opinions	120
Table 58 shows the frequency and percentage distribution of participants' opinions	120
Table 59 shows the frequency and percentage distribution of participants' opinions	121
Table 60 shows the frequency and percentage distribution of participants' opinions	121
Table 61 Descriptive Statistics for Understanding of Sustainable Mega-Projects in Section5.....	122
Table 62 shows the frequency and percentage distribution of participants' opinions	122
Table 63 shows the frequency and percentage distribution of participants' opinions	123
Table 64 shows the frequency and percentage distribution of participants' opinions	123
Table 65 shows the frequency and percentage distribution of participants' opinions	124
Table 66 shows the frequency and percentage distribution of participants' opinions	124
Table 67 Descriptive Statistics for Integration of Lessons Learned and Case Studies in Section6.....	125
Table 68 shows the frequency and percentage distribution of participants' opinions	125
Table 69 shows the effectiveness of incorporating lessons learned into decision-making processes during	126
Table 70: Frequency and Percentage Distribution of Participants' Opinions on the Importance of a Dedicated Team	126
Table 71: Frequency and Percentage Distribution of Participants' Opinions	127
Table 72: Frequency and Percentage Distribution of Participants' Opinions on the Openness	128
Table 73 showed that the level of level of application of best practices among respondents measured by 5 questions.....	128
Table 74 Frequency and Percentage Distribution of Participants' Opinions on the Importance of Case Studies in Enhancing	129
Table 75 Frequency and Percentage Distribution of Participants' Opinions on the Importance of Case Studies in Enhancing	129
Table 76 Frequency and Percentage Distribution of Participants' Opinions on the Importance of Case Studies in Enhancing	130
Table 77 Frequency and Percentage Distribution of Participants' Opinions on the Importance of Case Studies in Enhancing	131
Table 78 Descriptive Statistics of Overall Perception in Section8.....	131
Table 79 Pearson Correlation of Section Understanding of Sustainable Mega-Projects	132

Table 80 Pearson Correlation of Section Knowledge about the Cubic (Mukaab) Project in Riyadh and the vision 2030 of Saudi Arabia ...	132
Table 81 Pearson Correlation of Section Understanding of Lessons Learned and Case Studies	133
Table 82 Pearson Correlation of Section Applicability of Lessons Learned and Case Studies.....	133
Table 83 Pearson Correlation of Section Integration of Lessons Learned and Case.....	134
Table 84 Pearson Correlation of Section Application of Best Practices.....	134
Table 85 Pearson Correlation of Section Overall Perception.....	134
Table 86 Cronbach's Alpha to measure the Reliability of the questionnaire.	135

List of Figures

Figure 1. Phases of Research Study	16
Figure 2: The cyclical nature inherent in organizational learning underscores the paramountcy of continuous improvement	25
Figure 3: Key Concepts in Organizational Learning Theory: Single-loop, Double-Loop & Triple-loop	25
Figure 4: Transition from a compliance culture to learning culture in the organization	26
Figure 5: The cyclical nature inherent in of Knowledge Management.....	32
Figure 6: Key Elements of Project Management Theory	46
Figure7: Key Elements of Sustainability	49
Figure8: Socio-Technical System - an overview	25
Figure9: gender for the participants	101
Figure 11: Age for the participants.....	101
Figure 12: Educational Background for the participants	102
Figure 13: Position / Job title for the participants.....	103
Figure 14: Level of Expertise for the participants.....	104
Figure 15: Professional Experience for the participants.....	105
Figure 16: The employer for the participants.....	106
Figure 17: The employer role in the project working for the participants.....	107
Figure 18: The project type for the participants.....	107
Figure 19: The scope for the project that working for the participants.....	108

Overture:

In the arid expanse of the Riyadh desert, a New Era of Sustainability emerges as the sun ascends, casting its resplendent glow upon the sands. Within this burgeoning dawn, a visionary panorama unfolds—a megacity teeming with vitality, resonating with innovation, and ardently embracing a sustainable future. This aspirational vista, intricately woven into the ambitious tapestry of Vision 2030, materializes in the grandeur of the Cubic (Mukaab) Project, an architectural marvel that stands as both a testament to human ingenuity and a resolute affirmation of Saudi Arabia's unwavering dedication to a more environmentally conscious tomorrow.

However, the pathway to sustainable fruition is far from one paved solely with ambition. Rather, it necessitates a discerning gaze, attuned to the insights garnered from preceding endeavors, an intricate comprehension of best practices derived from successful case studies, and an unwavering determination to translate these insights into action. In embarking upon this transformative odyssey, the wisdom of Jackie Robinson resonates, asserting that the past serves not as a burdensome weight but as a foundational bedrock upon which a luminous future is constructed.

The Cubic (Mukaab) Project, therefore, transcends its role as a mere architectural and engineering marvel; it emerges as a symbolic representation of Saudi Arabia's proactive stance on sustainability. With each brick laid, every line of code meticulously inscribed, and each innovative facet implemented, the Cubic not only redefines Riyadh's physical landscape but also assumes the mantle of a guiding light, foretelling a future wherein progress and environmental responsibility coalesce harmoniously. As we embark upon this monumental journey, the wisdom encapsulated in Lao Tzu's aphorism resonates—"The journey of a thousand miles begins with a single step." This momentous endeavor hinges on myriad small actions, an unwavering commitment to the principles of sustainability, and a steadfast dedication to perpetual learning and adaptation. Through these collective endeavors, the Cubic shall metamorphose into a living testament to the indomitable power of human ingenuity and our shared responsibility to safeguard our planet for generations yet to come.

With an optimistic heart and an informed mind, we initiate this ambitious endeavor, expressing confidence that the Cubic Project will transcend its role as a testament to the present, evolving into a lasting legacy for the future. It is poised to symbolize the day when the synergy of human ambition and environmental responsibility materialized to forge a sustainable future for all.

Simultaneously, as the Kingdom of Saudi Arabia embarks on a transformative trajectory toward a sustainable and diversified future, guided by the ambitious Vision 2030, the pioneering Cubic (Mukaab) Project in Riyadh emerges as a beacon of innovation. Positioned to redefine the urban landscape, this project aspires to propel the Kingdom into a global hub for sustainable living. Echoing the sentiments of Crown Prince Mohammed bin Salman, the visionary force behind Vision 2030, who articulated the aspiration to construct a society characterized by economic prosperity, environmental sustainability, and social cohesion.

Abstract:

The vision 2030 of Saudi Arabia is a transformative plan that aims to make the Kingdom a more prosperous, sustainable, and inclusive country. Sustainable projects play a vital role in achieving this vision. However, managing sustainable projects can be challenging due to their complexity and the need to balance environmental, social, and economic factors. Lessons learned and case studies can play a vital role in helping project managers to identify and implement best practices for sustainable project management. Lessons learned are the insights and knowledge that are gained from the experience of managing sustainable projects. Case studies are detailed descriptions of specific sustainable projects, including their successes and failures.

As the Kingdom endeavors to diversify its economy and foster sustainable development, the Cubic Project stands as a focal point for implementing best practices derived from Organizational Learning Theory, Knowledge Management Theory, Best Practices Theory, Project Management Theory, Sustainability Theory, and Socio-Technical Systems Theory. Through a systematic exploration of these theoretical lenses, the research seeks to provide actionable insights for project practitioners, managers, and decision-makers involved in sustainable urban development initiatives.

This research delves into the transformative potential of lessons learned and case studies in shaping the trajectory of sustainable projects, with a specific emphasis on the Cubic (Mukaab) Project in Riyadh. The study aspires to illuminate the nuanced interplay between theoretical frameworks, practical applications, and the overarching vision of Saudi Arabia encapsulated in Vision 2030.

By aligning the Cubic (Mukaab) Project with the principles of Vision 2030, the study aims to contribute not only to the theoretical advancements in sustainable project management but also to the practical realization of Saudi Arabia's vision for a diversified, sustainable, and prosperous future.

Key Words:

Project Management, Sustainability Sustainable Projects, Mega-projects, Case Studies, Lesson Learned, Best Practices, Stakeholders, Cubic (Mukaab) Project, Riyadh, Saudi Arabia, Vision 2030.

First chapter

General Framework of Study

1.0 Introduction:

1.1 Hook:

Sustainable mega-projects assume a critical role in addressing the multifaceted challenges posed by climate change, urbanization, and economic growth. Despite their imperative nature, the implementation of such projects is marked by inherent complexity and formidable challenges. Illustrating this paradigm is the Cubic (Mukaab) Project, an expansive urban development initiative characterized by a colossal cube-shaped city, currently in the developmental stages within Riyadh, Saudi Arabia. Positioned as one of the world's most ambitious sustainable mega-projects, the Cubic (Mukaab) Project embodies the intricate nature of endeavors seeking to harmonize urban development with ecological sustainability.

1.2 Background Information:

The Mukaab project, colloquially referred to as Cubic, represents a meticulously planned sustainable mega-project situated in Riyadh, Saudi Arabia. Anticipated to rank among the world's largest and most ambitious initiatives, the project commands a staggering total expenditure exceeding \$1 trillion. Its primary objective is the establishment of a novel city center in Riyadh, characterized by a commitment to principles of sustainability and innovation. Aligned with the goals of Vision 2030, the project corresponds to the Saudi Arabian government's overarching strategy for economic diversification and a reduction in reliance on petroleum resources. Vision 2030 underscores a pronounced emphasis on sustainability and environmental conservation, positioning the success of the Cubic (Mukaab) project as integral to the realization of these objectives.

Nevertheless, the realization of sustainable mega-projects is inherently intricate and fraught with challenges. Historical shortcomings in analogous endeavors have been attributed to deficiencies in strategic planning, execution, and a failure to glean insights from past experiences. Vision 2030 for Saudi Arabia constitutes a transformative initiative, aspiring to elevate the Kingdom into a more prosperous, sustainable, and inclusive nation, with sustainable projects assuming a pivotal role in this transformative vision.

Yet, the management of sustainable projects is not without its formidable challenges, arising from the intricate interplay of environmental, social, and economic considerations. To navigate these complexities, project managers must draw upon lessons learned and engage with case studies that offer nuanced insights. Lessons learned encompass the experiential knowledge accrued from the management of sustainable projects, while case studies furnish detailed examinations of specific sustainable initiatives, delineating both their triumphs and setbacks. These resources serve as invaluable tools in facilitating the identification and implementation of optimal practices for sustainable project management.

1.3 Rationale:

This research endeavors to scrutinize the influence of lessons learned and case studies on sustainable mega-projects, with a specific focus on identifying optimal practices applicable to the Cubic (Mukaab) Project in Riyadh, Saudi Arabia, for the realization of Vision 2030 objectives. The significance of this research stems from the inherent complexity and challenges associated with the implementation of sustainable mega-projects, necessitating a discerning examination of experiential insights to ensure their successful execution. The Cubic (Mukaab) Project, a monumental urban undertaking characterized by a cube-shaped city currently in development in Riyadh, Saudi Arabia, encapsulates the intricate nature of such initiatives, particularly in their alignment with the sustainability and innovation priorities delineated in Vision 2030.

The research is motivated by the imperative to glean knowledge from the experiences of others, acknowledging the potential pitfalls in sustainable mega-project execution and seeking to derive valuable insights to enhance the likelihood of success. Lessons learned and case studies emanating from accomplished sustainable mega-projects serve as reservoirs of experiential knowledge, offering nuanced perspectives on best practices throughout the project life cycle, encompassing planning, design, construction, operation, and maintenance phases.

The Cubic (Mukaab) Project's integration within the Vision 2030 framework amplifies the research's relevance, as it contributes to the overarching national development plan of Saudi Arabia. Through a comprehensive examination of the impact of lessons learned and case studies, this research aims to furnish a robust foundation for understanding and implementing best practices in sustainable mega-project management, not only benefitting the Cubic (Mukaab) Project but also serving as a valuable resource for future sustainable mega-projects.

2.0 Problem Statement:

2.1 Problem:

The principal challenge inherent in the execution of sustainable mega-projects, exemplified by initiatives such as the Cubic (Mukaab) Project, lies in their inherent complexity. Characterized by their substantial scale and extended duration, sustainable mega-projects inherently engage a diverse array of stakeholders. The intricate nature of these undertakings introduces challenges in effectively coordinating project activities and ensuring the comprehensive fulfilment of sustainability objectives. The expansive scope and diverse stakeholder involvement contribute to the intricacy, posing difficulties in achieving seamless project coordination and the attainment of all stipulated sustainability goals.

2.2 Challenges:

The implementation of sustainable mega-projects is characterized by complexity and challenges, necessitating a systematic learning approach from the experiences of others for successful execution. These endeavors confront various challenges and risks, encompassing:

- a) **Technical Challenges:** Sustainable mega-projects often mandate the development and deployment of novel and innovative technologies, introducing inherent risks and substantial financial investments.
- b) **Financial Challenges:** The execution of sustainable mega-projects is frequently associated with considerable costs, posing challenges in securing adequate financing.
- c) **Environmental Challenges:** Sustainable mega-projects wield the potential for significant environmental impacts, underscoring the imperative to proactively mitigate these effects.
- d) **Social Challenges:** Beyond the technical and financial realms, sustainable mega-projects may engender substantial social impacts, such as community displacement and alterations to traditional ways of life. Addressing these social challenges is crucial for the overall success and societal acceptance of such initiatives.

2.3 Scope:

The issue at hand transcends national boundaries, given the global proliferation of sustainable mega-projects. The research endeavors to concentrate on formulating optimal practices for the implementation of sustainable mega-projects, exemplified by initiatives like the Cubic (Mukaab) Project. Drawing upon insights derived from lessons learned and case studies of successful sustainable mega-projects on an international scale, the research aims to tailor its findings to address the unique challenges and risks encountered by the Cubic (Mukaab) Project.

2.5 Significance:

The imperative lies in the effective resolution of these challenges and mitigation of associated risks to secure the success of sustainable mega-projects. While sustainable mega-projects harbour the potential to substantively contribute to sustainable development, this potential can only be realized through successful implementation.

2.6 Urgency:

The urgency of addressing the implementation challenges associated with sustainable mega-projects is underscored by the escalating and pressing issues of climate change, urbanization, and economic growth. The potential of sustainable mega-projects to make a substantial contribution towards mitigating these challenges is contingent upon their successful execution. In the specific context of Saudi Arabia, the imperative for urgently implementing sustainable mega-projects is accentuated by the imperative to address the challenges posed by climate change, urbanization, and economic growth within the nation.

2.7 Magnitude:

The significance of the issue is underscored by the critical role that sustainable mega-projects play in addressing the challenges of climate change, urbanization, and economic growth. Furthermore, the magnitude of the challenge associated

with the execution of sustainable mega-projects, exemplified by the Cubic (Mukaab) Project, is noteworthy. These projects, characterized by their complexity, pose formidable challenges to implementation, necessitating a substantial investment of financial and human resources. The Cubic (Mukaab) Project, in particular, stands out as an exceptionally ambitious sustainable mega-project, given its status as one of the largest and most intricate endeavors of its kind ever undertaken

2.8 Impact:

The challenges and risks inherent in sustainable mega-projects can exert a substantial influence on their sustainability performance. For instance, technical challenges may culminate in delays and cost overruns, posing impediments to the attainment of sustainability goals. Financial challenges, on the other hand, may result in the curtailment of sustainability features, thereby diminishing the overall sustainability performance of the project. Environmental challenges carry the potential for detrimental effects on sensitive ecosystems and biodiversity loss. Concurrently, social challenges may engender conflict and social unrest, thereby compromising the project's sustainability.

2.4 Solution:

Insights garnered from lessons learned and case studies derived from successful sustainable mega-projects constitute valuable resources for mitigating the challenges and risks associated with the implementation of such endeavors. For instance, lessons learned from accomplished projects offer a foundation for identifying and addressing technical risks, while case studies provide opportunities to glean best practices in financial management, environmental impact assessment, and social engagement. In the context of the Cubic (Mukaab) Project, assimilating lessons from past experiences is paramount for ensuring its success. By scrutinizing lessons learned and case studies encompassing both successful and unsuccessful sustainable mega-projects, a repository of best practices and valuable insights can be cultivated, with the potential for application to the Cubic (Mukaab) Project. However, the existing body of knowledge regarding the impact of lessons learned and case studies on sustainable mega-projects is limited. Consequently, this research aims to address this lacuna in the literature by exploring the following key questions:

- 1) How can lessons learned and case studies be effectively employed to enhance the planning and execution phases of sustainable mega-projects?
- 2) What are the principal challenges and opportunities inherent in the application of lessons learned and best practices to the Cubic (Mukaab) Project?
- 3) What specific recommendations can be proposed for the Cubic (Mukaab) Project to implement lessons learned and best practices, thereby ensuring its success as a sustainable mega-project?

This research seeks to contribute valuable insights to the academic discourse by addressing these critical questions and advancing our understanding of the role of experiential knowledge in the realm of sustainable mega-projects.

3.0 Significance/Importance Research:

This research transcends mere scholarly inquiry as it not only addresses a discernible void in the existing literature but also contributes innovative frameworks crucial for the successful execution of sustainable mega-projects, specifically emphasizing the Cubic (Mukaab) project. Its implications extend beyond the realm of project management methodologies, offering invaluable insights into aligning with the ambitious goals outlined in Saudi Arabia's Vision 2030.

The significance of this research lies in its potential to provide profound insights into ensuring the success of sustainable mega-projects. By identifying key lessons learned from both successful and unsuccessful endeavors in this domain, the study endeavors to apply these insights to the Cubic (Mukaab) project in Riyadh, Saudi Arabia.

Furthermore, the research aims to develop a set of recommendations for the Cubic (Mukaab) project, outlining best practices to ensure its success as a sustainable mega-project.

The findings are anticipated to resonate with a diverse array of stakeholders, including government officials, project managers, and experts in sustainable development. Additionally, the research holds relevance for academics and researchers engaged in the study of sustainable mega-projects.

3.2 Shortage of Literature Review:

The scarcity of comprehensive literature addressing the impact of lessons learned and case studies on sustainable projects, particularly within the context of mega-projects, underscores the urgent need for this research. Despite substantial growth in the literature on sustainable project management, a specific gap persists concerning the practical application and efficacy of lessons learned and case studies.

This research seeks to bridge this void by conducting a meticulous examination of these elements, providing a nuanced understanding of their influence on the success of the Cubic (Mukaab) project.

3.3 Improved Frameworks for Sustainable Mega-Projects:

This research endeavors to contribute significantly to the field by delving into the intricacies of lessons learned and case studies, aiming to formulate enhanced frameworks tailored for sustainable mega-projects. Given the unique challenges inherent in such endeavors, refined methodologies are imperative.

The study seeks to offer novel perspectives and methodologies that transcend conventional project management paradigms, intending for the resultant frameworks to serve as practical guides for project professionals engaged in large-scale sustainable initiatives.

3.4 Alignment with Vision 2030 of Saudi Arabia:

Saudi Arabia's Vision 2030 represents a transformative roadmap for the nation's socio-economic development. This research is meticulously designed to directly address the imperatives of Vision 2030 by aligning sustainable project practices, derived from lessons learned and case studies, with the overarching goals of the vision.

Through this alignment, the study aspires to contribute tangibly to the realization of Vision 2030's objectives, providing actionable recommendations and strategies for the Cubic (Mukaab) project, and by extension, other mega-projects integral to the nation's development agenda.

In summary, this research is poised to make a significant and multifaceted contribution to academic literature and practical project management methodologies.

By offering a nuanced understanding of the impact of lessons learned and case studies on sustainable projects and providing tailored frameworks for mega-projects, the research aligns with the transformative aspirations of Saudi Arabia's Vision 2030. The findings are anticipated to resonate across diverse stakeholders, making meaningful contributions to the field of sustainable mega-projects.

4.0 The Objectives of Research Study:

The overarching aim of this research is to comprehensively investigate the impact of lessons learned and case studies on sustainable projects, with a specific focus on the Cubic (Mukaab) project. The following specific objectives delineate the path to achieving this overarching aim:

4.1. To Evaluate the Utilization of Lessons Learned in Sustainable Project Management:

- a) Assess the extent to which lessons learned are currently integrated into the project management processes of the Cubic (Mukaab) project.
- b) Examine the effectiveness of incorporating lessons learned in improving decision-making, risk mitigation, and overall project performance within the context of sustainable project management.

4.2. To Analyze the Application of Case Studies in Sustainable Project Management:

- a) Investigate the prevalence and effectiveness of using case studies as tools for sustainable project management within the Cubic (Mukaab) project.
- b) Examine how case studies contribute to the identification and resolution of challenges in the implementation of sustainable practices in the project.

4.3. To Identify Success Factors and Challenges in Sustainable Mega-Projects:

- a) Identify the key success factors that contribute to the sustainability of mega-projects, with a specific emphasis on the Cubic (Mukaab) project.
- b) Uncover and analyze challenges encountered in the implementation of sustainable practices within the unique context of large-scale projects.

4.4. To Develop Best Practice Guidelines for Sustainable Project Management:

- a) Synthesize insights from lessons learned, case studies, success factors, and challenges to formulate comprehensive best practice guidelines for sustainable project management.
- b) Provide practical recommendations tailored to the Cubic (Mukaab) project, serving as a roadmap for optimizing sustainable practices and ensuring project success.

4.5. To Assess the Alignment of Sustainable Practices with Vision 2030:

- a) Evaluate the alignment of sustainable project management practices, derived from lessons learned and case studies, with the strategic goals outlined in Saudi Arabia's Vision 2030.
- b) Analyze the role of the Cubic (Mukaab) project in contributing to the broader objectives of Vision 2030 through its sustainable project management practices.

4.6. To Extract and Implement Lessons Learned for the Sustainable Success of the Cubic (Mukaab):

- a) Discernment and Documentation of Pivotal Lessons: Discern and meticulously document the pivotal lessons derived from both successful and unsuccessful instances of sustainable mega-projects.
- b) Identification and Articulation of Best Practices: Identify and eloquently articulate best practices germane to the execution of sustainable mega-projects.
- c) Systematic Application to the Cubic (Mukaab) Project: Systematically apply the assimilated lessons learned and best practices to the Cubic (Mukaab) project located in Riyadh, Saudi Arabia.
- d) Formulation of Comprehensive Recommendations: Formulate a comprehensive set of recommendations specific to the Cubic (Mukaab) project, meticulously delineating strategies for the application of lessons learned and best practices to safeguard its success as a sustainable mega-project.

4.7 To Explore Lessons Learned and Case Studies for Best Practices in Sustainable Mega-Projects: A Focus on the Cubic (Mukaab) Project

The research paper is dedicated to the meticulous examination of lessons learned and case studies, aiming to distill best practices applicable to the realm of sustainable mega-projects, with a specific emphasis on the Cubic (Mukaab) Project. The identified lessons and practices encompass the following key dimensions:

- a) **Early Planning and Stakeholder Engagement:** The imperative inclusion of pertinent stakeholders in the early stages of planning for sustainable mega-projects. This inclusive approach ensures alignment with community needs and facilitates the early identification and mitigation of potential risks.
- b) **Integrated Sustainability Approach:** The integral incorporation of a comprehensive sustainability perspective at every phase of a sustainable mega-project, spanning planning, design, construction, and operation. This holistic approach ensures sustainability across environmental, social, and economic dimensions.
- c) **Use of Innovative Technologies:** The essential incorporation of innovative technologies to enhance the sustainability performance of mega-projects. For instance, the deployment of green building technologies can effectively curtail energy consumption and emissions.
- d) **Monitoring and Evaluation:** The ongoing and meticulous monitoring and evaluation of sustainability performance throughout the life cycle of mega-projects. This continuous assessment facilitates the identification of areas for improvement, contributing to the sustained success of the project.

These objectives collectively seek to deepen our understanding of the intricate dynamics between lessons learned, case studies, and sustainable practices within the specific context of the Cubic (Mukaab) project, while also contributing to the broader discourse on sustainable mega-projects and their alignment with visionary national development goals.

The research findings will be used to develop recommendations for incorporating lessons learned and case study insights into project management practices to enhance the sustainability of future construction projects.

5.0 Research Scope:

This research endeavors to delve into the intricate dynamics of sustainable project management, with a specific focus on the impact of lessons learned and case studies, as well as the application of best practices. The study narrows its investigative lens onto the Cubic (Mukaab) project, seeking to extract valuable insights that can contribute to the enhancement of sustainable practices within the project framework.

The scope of the research encompasses a comprehensive exploration of lessons learned and case studies derived from both successful and unsuccessful sustainable projects. Through an in-depth analysis, the study aims to discern patterns, challenges, and success factors inherent in sustainable mega-projects, with a direct application to the Cubic (Mukaab) project.

Furthermore, the research extends its focus to the identification and articulation of best practices germane to the execution of sustainable mega-projects. It aims to develop frameworks and recommendations tailored specifically for the Cubic (Mukaab) project, emphasizing strategies for the successful application of these practices.

Geographically, the research confines its study to the context of the Cubic (Mukaab) project situated in Riyadh, Saudi Arabia. This specific locale allows for a nuanced examination of the project's alignment with regional sustainability goals, as well as its contribution to the broader national agenda, including Saudi Arabia's Vision 2030.

5.1 key areas:

This research will focus on the impact of lessons learned and case studies on sustainable projects, with a specific focus on the Cubic (Mukaab) project in Riyadh, Saudi Arabia. The study will investigate the following key areas:

- a) Identification of key lessons learned from previous sustainable projects: The study will identify and analyze the key lessons learned from previous sustainable projects, both successful and unsuccessful. This will involve a comprehensive review of relevant literature and case studies, as well as interviews with experts in the field of sustainable construction.
- b) Development of best practices for integrating lessons learned into sustainable projects: The study will develop a framework of best practices for integrating lessons learned into the planning, design, and implementation of sustainable projects. This framework will be based on the analysis of lessons learned from previous projects and will be tailored to the specific requirements of the Cubic (Mukaab) project.
- c) Application of lessons learned and best practices to the Cubic (Mukaab) project: The study will apply the identified lessons learned and best practices to the Cubic (Mukaab) project. This will involve a detailed assessment of the project's current sustainability performance and the development of recommendations for how to improve its sustainability outcomes.

5.2 Aspects of Sustainability:

The research will focus on the following aspects of sustainability:

- a) Environmental sustainability: This includes reducing the project's impact on the environment, such as by using energy-efficient technologies and minimizing waste.
- b) Social sustainability: This includes creating positive social benefits for the local community, such as by providing employment opportunities and improving public spaces.
- c) Economic sustainability: This includes ensuring that the project is financially viable and has a positive impact on the local economy.

The study will adopt a mixed-methods approach, combining qualitative and quantitative methods. The qualitative methods will include a review of literature and case studies, as well as interviews with experts.

The quantitative methods will include an assessment of the Cubic (Mukaab) project's current sustainability performance and the development of models to predict the impact of applying lessons learned and best practices.

The research findings will be used to develop recommendations for incorporating lessons learned and case study insights into project management practices to enhance the sustainability of future construction projects.

6.0 Hypothesis and Questions of Research Study:

The application of lessons learned and case studies derived from successful sustainable mega-projects stands to significantly enhance the sustainability of the Cubic (Mukaab) Project in Riyadh, Saudi Arabia, thereby contributing to the attainment of Vision 2030 objectives.

6.1 Facets of Project Management:

Recognizing the pivotal significance of sustainability within project management, our understanding emphasizes the comprehensive consideration of environmental, social, and economic impacts over the project's extended duration. Sustainability, in this context, necessitates the integration of these impacts across all facets of project management, encompassing:

- a) **Project Integration:** Sustainability assumes a fundamental role within the overarching project plan, entailing integration throughout every project phase—from inception and planning to execution, monitoring, and closure.
- b) **Project Scope:** The project scope must intricately incorporate considerations for environmental, social, and economic impacts. This may encompass the utilization of sustainable materials or adoption of environmentally friendly construction methods.
- c) **Project Time:** The pursuit of sustainability may introduce additional actions, such as environmental impact assessments, potentially elongating project timelines. However, adept implementation of sustainable measures can yield long-term time and cost savings.
- d) **Project Cost:** Sustainability might necessitate the utilization of more costly materials and technologies. Nevertheless, effective incorporation of sustainable practices can yield long-term financial benefits by reducing operational and asset maintenance costs.
- e) **Project Quality:** Sustainable projects must adhere to standard quality requisites, in addition to sustainability criteria. For example, sustainable buildings must exhibit strength, durability, and provide a healthy living environment.
- f) **Project Resources:** Resource utilization in projects must align with sustainability principles. Efficient use of natural resources and recycling of waste exemplify sustainable resource management.
- g) **Project Communications:** Communication pertaining to sustainability must be lucid and comprehensible to all stakeholders involved in the project.
- h) **Project Risk Management:** Risk management within the project must account for the environmental, social, and economic impacts. For instance, fluctuations in energy prices may introduce heightened risks related to project costs.

This comprehensive integration of sustainability considerations into various project management aspects aims to establish a framework that not only meets standard project requirements but also ensures long-term viability and positive impacts across environmental, social, and economic dimensions.

6.2 International Standards:

The utilization of international standards can be instrumental in creating a comprehensive framework to establish best practices for the Cubic (Mukaab) project. In order for sustainable project management to be compatible with international standards, it must meet the following criteria:

1. ISO 45001: Specifies the requirements for an Occupational Health and Safety Management System (OHSMS).

- a) Establishes guidelines for ensuring a safe and healthy working environment.
- b) Enables the identification and mitigation of occupational health and safety risks.
- c) Provides a systematic approach to managing health and safety aspects throughout the project life cycle.

2. ISO 14001: Specifies requirements for an environmental management system (EMS).

- a) Sets out requirements for effective environmental management within the project.
- b) Promotes the identification and control of environmental impacts.
- c) Assists in the development of sustainable practices to minimize the project's environmental footprint.

3. ISO 50001: Specifies requirements for an energy management system (EnMS).

- a) Outlines criteria for an effective energy management system.
- b) Facilitates the implementation of energy-efficient practices and technologies.
- c) Aids in optimizing energy consumption and promoting sustainability in the project.

4. ISO 9001: Specifies requirements for a quality management system (QMS).

- a) Defines standards for ensuring high-quality project outcomes.
- b) Establishes processes to monitor and enhance project quality.
- c) Promotes continuous improvement and customer satisfaction.

5. ISO 21500: Defines general principles and practices for project management.

- a) Provides general principles and practices for effective project management.
- b) Offers a structured approach to project planning, execution, and monitoring.
- c) Serves as a foundational guide for integrating other management systems within the project.

There are many examples of how sustainability is applied in project management. For example, companies may use sustainable building materials, implement environmentally friendly building practices, or invest in renewable energy.

These actions can improve the environment, reduce costs, and increase customer satisfaction. By incorporating these international standards, the Cubic (Mukaab) project can develop a robust framework that not only ensures compliance with industry best practices but also integrates health and safety, environmental sustainability, energy efficiency, and quality management into its overall project management strategy.

This holistic approach aligns with international standards, enhances project performance, and contributes to the achievement of best practices in sustainable project management.

6.3 Study Assumptions:

- a) Lessons learned and case studies from prosperous sustainable mega-projects are assumable to be transferable to the Cubic (Mukaab) Project, facilitating improvements in its sustainability performance.
- b) The alignment of the Cubic (Mukaab) Project with the goals of Vision 2030, Saudi Arabia's national development plan, emphasizes sustainability and innovation as integral components.
- c) The stakeholders associated with the Cubic (Mukaab) Project are presumed to exhibit willingness to adopt and implement best practices pertinent to sustainable project management.
- d) The Cubic (Mukaab) Project is assumed to possess the requisite resources and expertise essential for the implementation of best practices in sustainable project management.
- e) The external environment, encompassing factors such as economic conditions, political stability, and technological advancements, is presumed to remain relatively stable throughout the implementation phase of the Cubic (Mukaab) Project.

6.2 Affected Factors:

To empirically assess the aforementioned hypothesis, the research endeavors to investigate various influencing factors, encompassing:

- a) The specific relevance of lessons learned and case studies to the unique context of the Cubic (Mukaab) Project.
- b) Deriving best practices from the identified lessons learned and case studies.
- c) Identification and exploration of challenges integral to the successful application of these best practices to the Cubic (Mukaab) Project.
- d) Examination of potential benefits arising from the application of lessons learned and case studies to the Cubic (Mukaab) Project, including enhancements in sustainability performance and alignment with the objectives outlined in Vision 2030.

- e) The research methodology may involve the formulation and implementation of a targeted plan designed for the application of lessons learned and case studies to the Cubic (Mukaab) Project. The efficacy of this plan will subsequently be subjected to evaluation to gauge its effectiveness in enhancing the sustainability performance of the project and aligning it with the Vision 2030 objectives.

In summation, the overarching research hypothesis posits that the implementation of lessons learned and case studies drawn from successful sustainable mega-projects possesses the potential to significantly ameliorate the sustainability aspects of the Cubic (Mukaab) Project in Riyadh, Saudi Arabia, thereby contributing to the realization of the Vision 2030 goals.

6.3 Research Questions:

In the realm of project management, numerous instances illustrate the application of sustainability principles, encompassing the utilization of eco-friendly building materials, the adoption of environmentally conscious construction practices, and investments in renewable energy. These endeavors not only contribute to environmental preservation but also result in cost reductions and heightened customer satisfaction.

Against this backdrop, the following research questions have been formulated to foster a comprehensive understanding of the impacts of lessons learned and case studies on the Cubic (Mukaab) sustainable project.

Tailored to align with Saudi Arabia's Vision 2030 initiative, these inquiries aim to identify areas requiring refinement and enhancement in sustainable project management practices. The guiding inquiries for this study are delineated into two phases as follows:

6.3.1 Suggested Research Questions:

- a) To what extent have lessons learned from previous sustainable mega-projects influenced the planning and execution phases of the Cubic (Mukaab) Project in Riyadh, aligning with the principles of Vision 2030 of Saudi Arabia?
- b) How have case studies been employed in the Cubic (Mukaab) Project to inform decision-making, risk mitigation, and overall project performance within the context of sustainable mega-project management practices?
- c) What challenges and successes have been encountered in integrating sustainable practices within the Cubic (Mukaab) Project, as identified through lessons learned and case studies, and how do these align with the objectives of Vision 2030?
- d) To what extent do stakeholders, including project managers and experts, perceive the impact of lessons learned and case studies on the overall success and sustainability of the Cubic (Mukaab) Project, particularly in the context of Saudi Arabia's Vision 2030?

- e) How can the lessons learned and best practices identified through the Cubic (Mukaab) Project contribute to the advancement of sustainable mega-project management practices in the broader context of construction projects, aligning with the national goals outlined in Vision 2030?

6.3.2 Selected/Specified Research Questions:

- a) What is the impact of best practices through case studies and lessons learned on the Cubic (Mukaab) Project?
- b) What are the case studies and lesson learned can be applied for the Cubic (Mukaab) Project?
- c) Are there any sustainable projects similar to the Cubic (Mukaab) Project?
- d) How can lessons learned and case studies improve sustainable mega-projects?
- e) What are the challenges and opportunities for applying lessons learned to Cubic (Mukaab)?
- f) c. What recommendations for applying lessons learned can ensure Cubic (Mukaab)'s success?
- g) What are the key challenges and opportunities for applying best practices to Cubic (Mukaab)?
- h) What are specific recommendations for applying best practices can ensure Cubic (Mukaab)'s success?

7.0 Research Plan:

The subsequent outlines present a prospective research plan for the study entitled "The Impact of Lessons Learned and Case Studies on Sustainable Mega-Projects: Applying Best Practices for the Cubic (Mukaab) Project in Riyadh and Aligning with Vision 2030 of Saudi Arabia."

7.1 Phases of Research Study:

a) Phase 1: Literature Review

A comprehensive literature review has been conducted by the researchers to identify and synthesize extant knowledge pertaining to lessons learned, case studies, and best practices applicable to sustainable mega-projects.

Furthermore, an examination of the Cubic (Mukaab) Project documentation and Vision 2030 of Saudi Arabia has been undertaken to enhance comprehension regarding the project's sustainability objectives and alignment with national development plans.

b) Phase 2: Data Collection

Data collection activities have been executed by the researchers, encompassing lessons learned and case studies derived from successful projects and sustainable mega-projects globally.

Additionally, data concerning the perceptions and experiences of stakeholders involved in the Cubic (Mukaab) Project have been gathered through diverse methodologies, including document review, interviews, focus groups, participant observation, and surveys.

c) Phase 3: Data Analysis

Mixed-methods data analysis techniques have been employed by the researchers to scrutinize both qualitative and quantitative data.

Quantitative methods have been utilized to discern relationships between variables and test hypotheses, while qualitative methods have been applied to identify overarching themes and patterns within the data.

d) Phase 4: Findings and Recommendations

The researchers have amalgamated the findings derived from quantitative and qualitative analyses to formulate a comprehensive understanding of the impact of lessons learned and case studies on sustainable mega-projects.

Additionally, recommendations have been crafted to guide the implementation of lessons learned and case studies within the Cubic (Mukaab) Project, facilitating the attainment of its sustainability objectives and alignment with Vision 2030 of Saudi Arabia.



Figure1: Phases of Research Study

As depicted in Figure 7.1, the research study unfolded across four discernible phases, as delineated earlier. This methodical, phased approach facilitated a thorough exploration of 'The Impact of Lessons Learned and Case Studies on Sustainable Mega-Projects: Applying Best Practices for the Cubic (Mukaab) Project in Riyadh and Aligning with Vision 2030 of Saudi Arabia.' This systematic framework ensured a comprehensive investigation, addressing all facets of the study in a rigorous and methodically structured manner.

	Phase 1 Literature Review	Phase 2 Data Collection	Phase 3 Data Analysis	Phase 4 Findings and Recommendations
Activities	List of activities Identifying Relevant Literature Sources: During Phase 1, researchers systematically identified and selected pertinent academic sources, scholarly articles, and other relevant literature addressing lessons learned, case studies, and best practices in the context of sustainable mega-projects. Synthesizing Existing Knowledge: A critical synthesis of the identified literature was conducted to amalgamate and distill the existing knowledge on lessons learned and case studies associated with sustainable mega-projects. This involved analyzing and summarizing key findings from various sources. Reviewing Cubic (Mukaab) Project Documentation: Researchers thoroughly examined documentation related to the Cubic (Mukaab) Project, scrutinizing project reports, plans, and relevant materials. This activity aimed to gain insights into the specific characteristics, challenges, and objectives of the project. Exploring Vision 2030 of Saudi Arabia: As part of Phase 1, an exploration of Vision 2030 of Saudi Arabia was undertaken. This involved studying the national development plan to understand its goals and strategies, particularly in relation to sustainability, and to assess the alignment with the Cubic (Mukaab) Project. Enhancing Comprehension of Sustainability Objectives: Researchers worked to deepen their understanding of the sustainability objectives of the Cubic (Mukaab) Project. This activity involved analyzing how the project aligns with broader national development plans, ensuring a comprehensive grasp of its intended contributions to sustainable practices.	List of activities Document Review: Researchers systematically reviewed pertinent documents related to successful projects and sustainable mega-projects globally. This involved scrutinizing reports, publications, and project documentation to extract relevant lessons learned and case studies. Interviews: Conducted structured interviews with key stakeholders involved in the Cubic (Mukaab) Project. Project Management experts, consultants, directors, managers, specialists, and engineers were interviewed to gather firsthand insights into their perceptions and experiences related to sustainable mega-projects. Focus Groups: Facilitated focus group discussions involving a diverse set of stakeholders associated with the Cubic (Mukaab) Project. This method allowed for collaborative exploration of ideas, experiences, and perspectives regarding sustainable practices in mega-project management. Participant Observation: Engaged in participant observation to gain in-depth understanding and insights into the day-to-day activities and dynamics of the Cubic (Mukaab) Project. This method involved direct observation of project-related events, interactions, and processes. Surveys: Administered surveys to stakeholders involved in the Cubic (Mukaab) Project to collect quantitative data on their perceptions, preferences, and experiences. The survey instrument was designed to capture specific aspects related to sustainable practices and lessons learned in mega-project development.	List of activities Quantitative Data Analysis: Utilize statistical methods to analyze numerical data gathered during the research, including the identification of relationships between variables and hypothesis testing. Qualitative Data Analysis: Employ qualitative research techniques to scrutinize non-numerical data, such as textual information obtained from interviews, focus groups, and document reviews. Identify overarching themes and patterns in the qualitative data. Data Integration: Combine quantitative and qualitative findings to create a comprehensive understanding of the research data. Explore how the quantitative and qualitative results complement and enrich each other. Pattern Recognition: Utilize qualitative methods to identify recurring patterns, trends, or anomalies within the data, contributing to a deeper understanding of the phenomena under investigation. Triangulation: Employ the triangulation method to validate research findings by comparing results obtained through different data collection methods. This helps enhance the overall reliability and credibility of the research outcomes.	List of activities Integration of Quantitative and Qualitative Findings: Combine and synthesize the results obtained from both quantitative and qualitative analyses to present a cohesive overview of the impact of lessons learned and case studies on sustainable mega-projects. Formulation of Comprehensive Recommendations: Develop detailed and actionable recommendations based on the amalgamated findings, with a specific focus on guiding the implementation of lessons learned and case studies within the Cubic (Mukaab) Project. Alignment with Sustainability Objectives: Ensure that the formulated recommendations are aligned with the sustainability objectives of the Cubic (Mukaab) Project, taking into consideration the broader context of Vision 2030 of Saudi Arabia. Validation of Recommendations: Subject the crafted recommendations to a rigorous validation process, involving consultation with relevant stakeholders and experts to enhance their practical applicability and effectiveness. Documentation and Communication: Document the finalized recommendations systematically, providing clarity on the rationale behind each suggestion. Develop a communication strategy for effectively conveying the recommendations to key project stakeholders, fostering understanding and support for their implementation.

Table1: Phases of Research Study: A list of activities for each phase

Table1: furnishes an exhaustive compilation of activities linked to each of the four discrete phases within the research study. These activities encapsulate pivotal components of the study, spanning from the inaugural literature review to the ultimate dissemination of findings. The table functions as a referential compendium elucidating the sequential evolution of tasks throughout the entirety of the research process.

7.1 Timeline of Research Study (In Weeks):

The ensuing schedule has outlined a provisional timeline for the research study:

- a) Weeks 1-2: Undertake an extensive literature review and formulate the research plan.
- b) Weeks 2-3: Conduct interviews with key stakeholders to gather qualitative data.
- c) Weeks 3-4: Collect both qualitative and quantitative data.
- d) Weeks 4-5: Employ qualitative and quantitative data analysis techniques.
- e) Weeks 5-6: Formulate recommendations for the Cubic (Mukaab) project.
- f) Weeks 6-10: Draft the research report.
- g) Weeks 10-12: Disseminate the research findings.

7.3 Limits of Research Study:

The forthcoming research paper have been acknowledged the following limitations and constraints:

- a) Spatial: The investigation has been confined to the Cubic (Mukaab) Project located in Riyadh, Saudi Arabia.
- b) Human: The study has been involved Project Management experts, including consultants, directors, managers, engineers, and coordinators.
- c) Temporal: The study's duration has been restricted to a 12-week timeframe.
- d) Subjectivity: The research has been focused on exploring lessons learned and case studies from successful sustainable mega-projects, aiming to acquire comprehensive data regarding best practices in mega-project sustainability. The ultimate objective had to apply these insights to the Cubic (Mukaab) Project in Riyadh, aligning it with Vision 2030 of Saudi Arabia.

Despite the delineated limitations, the research anticipates making a substantial contribution to the advancement of knowledge concerning the impact of lessons learned and case studies on sustainable mega-projects. Additionally, the study has poised to furnish valuable recommendations for implementing lessons learned and case studies within the Cubic (Mukaab) Project, facilitating the attainment of its sustainability objectives and alignment with Vision 2030 of Saudi Arabia.

8.0 Outcomes and Benefits of Research Study:

The anticipated outcomes and benefits of this research study have been encompassed:

- a) Enhanced Insight: A more profound comprehension of leveraging lessons learned and case studies to enhance the planning and execution of sustainable mega-projects.

- b) **Challenges and Opportunities:** Identification of key challenges and opportunities inherent in the application of lessons learned and best practices to the Cubic (Mukaab) project.
- c) **Recommendations:** Formulation of a set of recommendations tailored for the Cubic (Mukaab) project, delineating how lessons learned and best practices can be applied to ensure its success as a sustainable mega-project.
- d) **Dissemination:** Widespread dissemination of research findings to diverse stakeholders, including government officials, project experts such as consultants, directors, managers, engineers, and coordinators in management, sustainability, development, academics, and researchers.
- e) **Knowledge Contribution:** Contribution to the knowledge base on sustainable mega-projects, thereby fostering the success not only of the Cubic (Mukaab) project but also of analogous sustainable mega-projects globally.

9.0 Terms of Research Study:

1. Lessons Learned:

Knowledge and insights gained from previous experiences, both successful and unsuccessful, relevant to sustainable mega-projects.

2. Case Studies:

Detailed analyses of specific sustainable mega-projects, providing valuable insights into their successes and challenges.

3. Best Practices:

Proven and effective approaches for implementing sustainable principles in mega-projects, derived from lessons learned and case studies.

4. Cubic (Mukaab) Project:

A mega-project located in Riyadh, Saudi Arabia, aiming for sustainability and aligning with Vision 2030.

5. Sustainability:

Meeting present needs without compromising the ability of future generations to meet their own needs, encompassing environmental, social, and economic aspects.

6. Vision 2030:

Saudi Arabia's national development vision, outlining ambitious goals for economic diversification, social progress, and environmental sustainability.

7. Mega-Project:

A large-scale, complex project with significant economic, social, and environmental impacts.

8. Integration:

Seamless incorporation of lessons learned and best practices into the planning, execution, and management of the Cubic (Mukaab) project.

9. Impact:

The positive and negative effects of applying lessons learned and best practices on the sustainability performance of the Cubic (Mukaab) project.

10. Recommendations:

Specific suggestions for improving the sustainability of the Cubic (Mukaab) project based on the insights gained from lessons learned and best practices.

Second Chapter

Theoretical Frameworks and Literature Review

1.0 Theoretical Frameworks:

This research has undertaken an examination of the implications of incorporating lessons learned and case studies on project success and sustainability, with a particular emphasis on the Cubic project. The theoretical framework employed in this study is rooted in knowledge management, organizational learning, and sustainability principles.

It seeks to analyze the influence of lessons learned and case studies on various aspects of project dynamics, including decision-making, risk mitigation, and long-term impact. The primary objective of the study is to discern best practices for integrating these valuable tools into project management processes, ultimately contributing to the success and sustainability of the Cubic project.

1.1 Purpose of Study:

The study has endeavored to investigate the substantial influence of lessons learned and case studies on the sustainability of projects, centering its inquiry on the specific context of the Cubic (Mukaab) Project in Riyadh.

The overarching objective is to apply best practices derived from various theoretical frameworks, aiming to optimize the project's alignment with Vision 2030, the ambitious national development plan of Saudi Arabia.

1.2 Rationale for Theories:

Each theoretical framework is carefully chosen to provide a comprehensive understanding of different facets influencing sustainable project management:

1) Organizational Learning Theory (OLT):

Comprehending the processes through which organizations acquire, disseminate, and apply knowledge establishes a dynamic framework for learning from experiences, thereby fostering continuous improvement. This theory includes:

- a) **Single-loop vs. Double-loop Learning:** This component involves an evaluation of how lessons and cases instigate both single-loop learning (focused on error correction) and double-loop learning (entailing adjustments to mental models) within the context of the Cubic project.
- b) **Organizational Learning Capacity:** This facet entails an assessment of Cubic's capacity to capture, analyze, and apply lessons and cases, contributing to its overall organizational learning agility.
- c) **Learning from Success & Failure:** This aspect involves an analysis of how Cubic strategically employs both positive and negative case studies to cultivate a culture of continuous improvement.

2) Knowledge Management Theory (KMT):

This theory guides the effective creation, storage, sharing, and application of knowledge within the project context, ensuring optimal utilization of intellectual assets.

3) Best Practices Theory (BPT):

This theory offers a systematic approach for identifying and implementing proven methods, emphasizing outcome-focused strategies for sustainable project management.

4) Project Management Theory (PMT):

This theory provides a structured framework for planning, executing, and completing projects successfully, ensuring that the Cubic (Mukaab) Project follows a systematic and well-managed approach.

5) Sustainability Theory (ST):

This theory serves as the foundational theory for embedding sustainable practices into the project, aligning with the broader goals of sustainable development and Vision 2030.

- a) Triple Bottom Line (TBL): Evaluate how lessons and cases contribute to Cubic's performance across economic, environmental, and social sustainability dimensions.
- b) Long-term Project Impact: Analyze how lessons and cases influence Cubic's project design and execution to ensure positive lasting effects.
- c) Stakeholder Engagement: Explore how lessons and cases are used to engage stakeholders and build consensus around sustainable project goals.

6) Socio-Technical Systems Theory (STS):

This theory examines the interplay between social and technical aspects within the organizational context, offering insights into the collaborative dynamics influencing sustainable project success.

1.3 Significance of the Study:

a) Contributions to Knowledge:

This study contributed to the theoretical advancement of sustainable project management by synthesizing insights from multiple theoretical perspectives.

b) Practical Implications:

Practical recommendations have derived from the application of theoretical frameworks offer actionable insights for practitioners, project managers, and decision-makers involved in sustainable urban development projects.

c) Alignment with Vision 2030:

The study has directly addressed the national vision of Saudi Arabia, providing a roadmap for aligning the Cubic (Mukaab) Project with Vision 2030's overarching goals, contributing to the socio-economic development of the country.

1.4 Theoretical Frameworks Structure:

The research has been structured to systematically apply each theoretical framework:

1) Organizational Learning Theory (OLT):

Explored how the Cubic Project can facilitate a culture of learning, adapting, and improving through the stages of experience, reflection, generalization, and application.

2) Knowledge Management Theory (KMT):

Investigated the principles of knowledge creation, capture, sharing, and application within the Cubic (Mukaab) Project's context, through:

- a) Explicit vs. Tacit Knowledge: Differentiate between readily codified lessons learned and the implicit, experiential knowledge captured in case studies.
- b) Knowledge Sharing & Transfer: Analyze how lessons and cases are shared within Cubic, influencing project teams and organizational learning.
- c) Knowledge Communities & Networks: Explore the role of communities and networks in facilitating knowledge exchange and application of lessons learned

3) Best Practices Theory (BPT):

Identified and applied best practices in sustainable project management, emphasizing evidence-based approaches and continuous improvement.

4) Project Management Theory (PMT):

Utilized PMT to structure and manage the Cubic Project systematically, ensuring effective execution and alignment with sustainability goals.

5) Sustainability Theory (ST):

Embedded sustainability principles into the project, guided by a holistic perspective, long-term focus, and equity considerations.

6) Socio-Technical Systems Theory (STS):

Explored the interplay between social and technical elements within the Cubic (Mukaab) Project, highlighting their impact on sustainable outcomes.

The research study has been adopting a multifaceted approach by integrating diverse theoretical frameworks, aiming to provide both theoretical depth and practical guidance for achieving sustainable development aligned with the Vision 2030 of Saudi Arabia through the Cubic (Mukaab) Project.

1.4.1 Organizational Learning Theory (OLT):

Organizational Learning Theory delineates a systematic process wherein organizations acquire, disseminate, and interpret information, utilizing this knowledge to enhance overall performance. This iterative process permeates all strata of an organization, spanning from top-tier management to frontline employees.

1.4.1.1 The Four Stages of Organizational Learning:

The iterative process of organizational learning, comprising the four stages of experience, reflection, generalization, and application, constitutes a cyclical framework that facilitates perpetual adaptation and improvement within organizations. Each stage assumes a pivotal role in the systematic transformation of raw experiences into valuable organizational knowledge, thereby fortifying the capacity to augment performance.

a) Stage 1: Experience

The foundational stage of organizational learning emanates from the meticulous accumulation of knowledge garnered through the routine activities inherent in daily organizational operations. As organizations engage in their prescribed functions, a spectrum of experiences, ranging from triumphs to setbacks, emerges. These experiences serve as a reservoir of information, offering fertile ground for learning and organizational advancement.

b) Stage 2: Reflection

Beyond the mere accrual of experiences, the imperative of organizational learning necessitates profound reflection to extract meaningful lessons. Reflection entails a purposeful contemplation of experiences, involving the scrutiny of their root causes, consequences, and broader implications. This deliberate process empowers organizations to discern patterns, identify trends, and glean insights that can inform and guide future actions.

c) Stage 3: Generalization

The ambit of organizational learning transcends the confines of specific experiences, extending to the ability to generalize lessons across diverse contexts. This stage entails the transfer of knowledge derived from particular experiences to broader frameworks, empowering organizations to apply their accrued insights to a myriad of challenges and opportunities.

d) Stage 4: Application

The veritable test of organizational learning manifests in its application to optimize overall performance. This stage involves the assimilation of lessons learned into the organizational fabric, permeating practices, policies, and procedures. Through the seamless integration of acquired knowledge into operational frameworks, organizations can elevate their effectiveness, enhance efficiency, and fortify adaptability.

The cyclical nature inherent in organizational learning underscores the paramountcy of continuous improvement. As organizations apply their acquired insights and traverse new experiences, they initiate another cycle of reflection, generalization, and application. This iterative process serves to continually refine organizational knowledge, fortifying the adaptive capabilities required to navigate the ever-evolving contours of the business landscape.



Figure1: The cyclical nature inherent in organizational learning underscores the paramountcy of continuous improvement

1.4.1.2 Key Concepts in Organizational Learning Theory:

a) Single-Loop Learning:

Single-loop learning is a focused learning paradigm directed towards the correction of mistakes or resolution of problems. This process entails the identification of the root cause of a problem, followed by strategic steps to preclude its recurrence.

b) Double-Loop Learning:

In contrast, double-loop learning represents a more ambitious approach involving the questioning of underlying assumptions and beliefs. This form of learning has the potential to induce substantial changes in an organization's processes, structures, or cultural dynamics.

c) Triple-loop learning:

Triple-loop learning is the process of questioning and challenging the underlying assumptions that govern an organization's actions. It is a deeper level of learning than single-loop learning, which focuses on making changes to correct mistakes or problems, and double-loop learning, which involves learning from experience and making adjustments to strategies and processes.

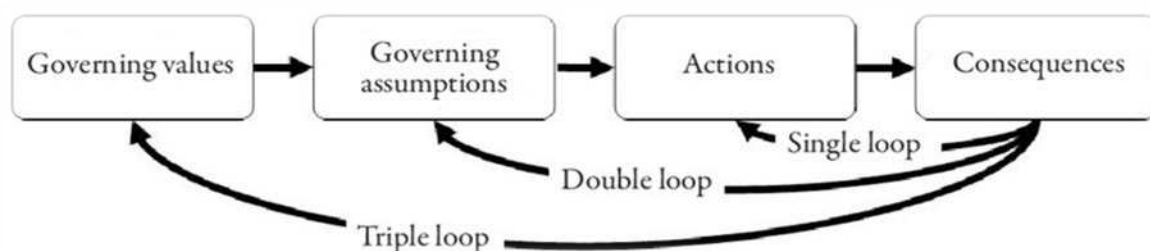


Figure2: Key Concepts in Organizational Learning Theory: Single-loop, Double-Loop & Triple-loop

d) Learning Culture:

A learning culture is an organizational environment fostering and supporting learning across all hierarchical levels. This culture is characterized by attributes such as open communication, shared values, and a proclivity for experimentation.



Figure3: Transition from a compliance culture to learning culture in the organization

The Organizational Learning Theory constitutes an extensive exploration of how organizations procure, store, transfer knowledge, and subsequently leverage that knowledge to enhance their overall performance. This field of study is intricate and dynamic, drawing influence from an array of disciplines, including psychology, sociology, and management.

1.4.1.3 Perspectives on Organizational Learning:

Organizational learning stands as a pivotal determinant of success in the contemporary and dynamic business landscape. It constitutes a multifaceted process encompassing the acquisition, storage, transfer, and utilization of knowledge, thereby fostering enhanced performance and heightened adaptability. Diverse perspectives on organizational learning converge on fundamental elements that underpin an organization's capacity for continual learning and growth, will be through:

1. Acquisition:

Organizations source knowledge from a myriad of outlets, including experiences, experimentation, and external inputs such as consultants and training programs.

a) Experience:

Knowledge accrual transpires through the daily operations and outcomes of organizations, elucidating valuable insights derived from both successes and failures.

b) Experimentation:

Organizations proactively cultivate learning opportunities through controlled experimentation, affording them the ability to test novel ideas, processes, and technologies within a secure environment.

c) External Inputs:

Knowledge acquisition extends to external realms, encompassing insights garnered from consultants, training programs, and industry benchmarks, offering perspectives and expertise not inherently present within the organization.

2. Storage:

Knowledge preservation within organizations is realized through formal documentation, informal communication, and the institutionalization of organizational memory.

a) Formal Documentation:

Structured storage mechanisms, including manuals, procedures, and reports, facilitate the accessibility and dissemination of knowledge within organizations.

b) Informal Communication:

Tacit knowledge is embedded within organizational culture and practices through informal communication channels such as conversations, stories, and shared experiences.

c) Institutionalization of Organizational Memory:

Organizations establish systems and processes to institutionalize their organizational memory, ensuring the capture, storage, and sharing of valuable lessons for the benefit of future generations of employees.

3. Transfer:

Facilitating knowledge transfer to individuals and teams is achieved through diverse mechanisms, including coaching, mentoring, and collaborative endeavors.

a) Coaching:

Structured knowledge transfer occurs through coaching, where experienced individuals guide and support others in acquiring and applying new knowledge.

b) Mentoring:

A more informal approach to knowledge transfer is realized through mentoring, wherein experienced individuals provide personalized guidance and support to less experienced counterparts, fostering a culture of learning.

c) Collaborative Endeavors:

Knowledge sharing and learning thrive in collaborative projects and teams, breaking down silos and promoting the diffusion of knowledge across the organization.

3. Use:

Knowledge deployment within organizations manifests through the development of new products and services, process improvements, and informed decision-making.

a) New Products and Services:

Organizations leverage their knowledge to innovate, developing products and services that align with the evolving needs of their customer base.

b) Process Improvements:

Operational processes undergo refinement as organizations utilize their knowledge, resulting in heightened efficiency, cost reduction, and improved customer satisfaction.

c) Informed Decision-Making:

Knowledge informs decision-making processes, equipping organizations with a deeper understanding of customers, competitors, and market trends.

By adeptly navigating the realms of knowledge acquisition, storage, transfer, and utilization, organizations fortify their capacity to learn, adapt, and thrive in the ever-evolving business landscape. Organizational learning, as an ongoing and iterative process, necessitates sustained commitment and effort from all echelons of the organization.

1.4.1.4 Significance of Organizational Learning in Sustainable Project Management:

Organizational learning plays a crucial role in sustainable project management (SPM) by enabling organizations to continuously improve their sustainability practices and achieve long-term sustainability goals. Through organizational learning, organizations can capture knowledge from past experiences, identify and address sustainability challenges, and adapt to changing environmental, social, and economic conditions. The Organizational learning stands as a pivotal process in sustainable project management due to its enabling organizations to:

a) Learn from Experiences:

Organizations assimilate insights from both successes and failures in past projects, enhancing their performance in subsequent endeavors.

b) Adapt to Change:

Organizations adeptly adjust to shifts in the market, technological advancements, and other external factors by learning from their experiences and those of other entities.

c) Innovate:

Leveraging knowledge acquired from experiences and external sources, organizations drive innovation in the development of new products, services, and processes.

1.4.1.5 Relevance to Sustainable Project Management

Sustainable project management entails the application of project management principles to projects with the overarching objective of achieving sustainability goals. Sustainability, in this context, is defined as the capacity to meet present needs without compromising the ability of future generations to meet their own needs.

The process of sustainable project management involves the meticulous management of projects to minimize adverse environmental and social impacts. The Organizational Learning Theory emerges as a valuable contributor to sustainable project management by facilitating the following key aspects:

a) Develop a Shared Understanding of Sustainability:

Organizations undertaking sustainable projects necessitate a shared comprehension of sustainability principles for effective project development and implementation. Organizational learning can play a pivotal role in fostering this shared understanding by providing a structured framework for discourse and deliberation on sustainability issues.

b) Measure and Track Progress:

Effective measurement and tracking systems are imperative for organizations to assess their progress toward sustainability goals. Organizational learning aids in the development of these systems, ensuring accurate quantification and assessment of sustainability progress.

c) Continuous Improvement:

Sustainable project management requires organizations to continually enhance their sustainability performance. Organizational learning contributes by identifying areas for improvement and facilitating the implementation of innovative solutions to bolster sustainable practices.

d) Identify and Avoid Potential Problems:

Drawing from past experiences, organizations can learn to identify and mitigate potential issues in future projects, thereby averting adverse environmental or social impacts.

e) Improve Decision-Making:

Leveraging knowledge and experience, organizations can make informed decisions in various phases of project management, including planning, execution, and evaluation, fostering better alignment with sustainability goals.

f) Share Best Practices:

Organizations can enhance the overall sustainability of the project management industry by sharing lessons learned from successful projects with their counterparts. This sharing of best practices promotes a collective advancement in sustainable project management practices.

g) Identify and Learn from Past Mistakes:

Reflecting on past projects enables organizations to discern patterns of behavior or decision-making that resulted in negative environmental or social impacts. This knowledge is then utilized to prevent the recurrence of similar mistakes in the future.

h) Share Knowledge and Best Practices:

Establishing systems for the dissemination of knowledge and best practices specific to sustainable project management ensures that all project managers remain informed about the latest approaches and techniques, fostering a community of shared knowledge.

i) Adapt to Changing Conditions:

The ever-evolving landscape of sustainability demands organizational adaptability to new challenges and opportunities. Organizational learning functions as a strategic tool, enabling organizations to stay abreast of emerging trends and develop innovative approaches to sustainable project management.

Relevance to Sustainable Project Management	Benefits of Organizational Learning Theory
Develop a Shared Understanding of Sustainability	Fosters a structured framework for discourse and deliberation on sustainability issues.
Measure and Track Progress	Aids in the development of effective measurement and tracking systems for sustainability progress.
Continuous Improvement	Facilitates the identification of areas for improvement and the implementation of innovative solutions to bolster sustainable practices.
Identify and Avoid Potential Problems	Provides a mechanism for learning from past experiences to identify and mitigate potential issues in future projects.
Improve Decision-Making	Enables organizations to make informed decisions that are better aligned with sustainability goals.
Share Best Practices	Promotes collective advancement in sustainable project management practices through the sharing of lessons learned.
Identify and Learn from Past Mistakes	Facilitates the discernment of patterns of behavior or decision-making that resulted in negative environmental or social impacts, preventing their recurrence.
Share Knowledge and Best Practices	Ensures that all project managers remain informed about the latest approaches and techniques, fostering a community of shared knowledge.
Adapt to Changing Conditions	Enables organizations to stay abreast of emerging trends and develop innovative approaches to sustainable project management.

Table2: Key aspects of Relevance to Sustainable Project Management

1.4.1.6 Applying “Organizational Learning Theory” to the Cubic Project:

The Cubic (Mukaab) project, a substantial urban development endeavor in Riyadh, aspires to attain the highest benchmarks in sustainability. The application of Organizational Learning Theory to this project manifests in several strategic approaches, encompassing:

1. Establishment of a Learning Culture:

- a) Encouraging the project team to cultivate a learning culture, fostering the exchange of knowledge and experiences among team members.
- b) Facilitation through regular meetings, workshops, and online forums to facilitate knowledge sharing and collaborative learning.

2. Documentation of Lessons Learned:

- a) Systematically documenting lessons derived from both successes and failures encountered during the course of the project.
- b) The assimilation of this documented information serves as a valuable resource to inform and enhance decision-making processes in subsequent projects.

3. Creation of a Knowledge Base:

- a) Initiating the development of a centralized repository specifically designed for storing and disseminating knowledge pertinent to sustainable project management.
- b) Inclusion of diverse elements such as case studies, best practices, and research findings within this knowledge base to serve as a comprehensive reference for the project team.

Approach/Strategy of Applying Organizational Learning Theory	Description: How to apply Organizational Learning Theory
Establishment of a Learning Culture	Encourage knowledge sharing, collaboration, and continuous learning among the project team.
Documentation of Lessons Learned	Systematically capture lessons from both successes and failures.
Creation of a Knowledge Base	Develop a centralized repository for storing and disseminating sustainable project management knowledge.

Table3: Approach/Strategy of Applying Organizational Learning Theory

By integrating Organizational Learning Theory into the Cubic Project through the establishment of a learning culture, documentation of lessons learned, and the creation of a knowledge base, the project aims to fortify its capacity for adaptive learning, continuous improvement, and the effective application of sustainable practices.

1.4.2 Knowledge Management Theory (KMT):

It refers to the set of principles and practices that organizations employ to create, capture, share, and utilize knowledge effectively. It encompasses a wide range of approaches and techniques, ranging from simple document management systems to complex knowledge-sharing platforms and collaborative workspaces.

1.4.2.1 The Four Stages of Knowledge Management:

a) Knowledge Identification and Capture:

The first stage involves identifying and capturing both explicit and tacit knowledge within the organization. Explicit knowledge is codified information that can be easily stored and shared, such as documents, reports, and manuals. Tacit knowledge, on the other hand, is embedded in individuals' experiences, skills, and know-how, and can be more difficult to capture and share.

b) Knowledge Storage and Organization:

Once knowledge has been captured, it needs to be stored and organized in a way that makes it easily accessible to those who need it. This may involve creating knowledge repositories, such as databases, intranets, or communities of practice.

c) Knowledge Sharing and Dissemination:

Knowledge sharing is the process of making knowledge available to others within the organization. This can be done through a variety of means, such as training programs, mentoring, and social networking platforms.

d) Knowledge Application and Utilization:

The final stage of KM theory involves applying knowledge to solve problems, improve processes, and make better decisions. This requires individuals and teams to be able to access, understand, and apply the knowledge that is available to them.

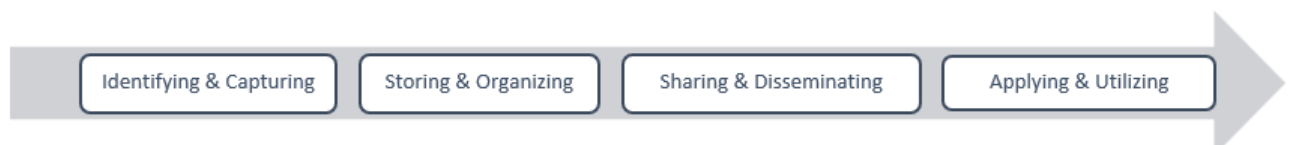


Figure4: The cyclical nature inherent in of Knowledge Management

In other hand, the core components of KM theory include:

- a) **Knowledge creation:** The process of generating new knowledge through innovation, research, experience, or collaboration.
- b) **Knowledge capture:** The act of recording and storing knowledge in a form that can be easily accessed and utilized.
- c) **Knowledge sharing:** The dissemination of knowledge among individuals or groups within an organization.
- d) **Knowledge application:** The use of knowledge to solve problems, improve decision-making, and achieve organizational goals.

1.4.2.2 Key Concepts in Knowledge Management Theory:

a) **Knowledge as a Valuable Asset:**

This theory recognizes that knowledge is a critical resource that can provide organizations with a competitive advantage. Knowledge, in its various forms, is essential for innovation, problem-solving, decision-making, and organizational learning. Effective KM practices enable organizations to harness the power of knowledge to improve their performance and achieve their strategic objectives.

b) **Knowledge Creation, Sharing, and Utilization:**

This theory emphasizes the cyclical nature of knowledge creation, sharing, and utilization. Knowledge is created through various activities such as research, innovation, collaboration, and experience. Once created, knowledge needs to be shared effectively throughout the organization to ensure its accessibility and utilization. The effective utilization of knowledge leads to improved decision-making, problem-solving, and organizational performance.

c) **Knowledge Codification and Personalization:**

This theory recognizes the distinction between codified and personalized knowledge. Codified knowledge is explicit and can be captured in documents, databases, or other formal systems. Personalized knowledge, on the other hand, is tacit and embedded in individual expertise, experiences, and relationships. Effective KM strategies address both codified and personalized knowledge to ensure that all forms of valuable knowledge are captured, shared, and utilized.

d) **Knowledge Management as a Continuous Process:**

This theory emphasizes that knowledge management is not a one-time event but an ongoing process that requires continuous adaptation and improvement. Organizations need to continuously identify, capture, organize, share, and utilize knowledge to stay relevant, competitive, and innovative in a rapidly changing environment.

e) People as the Key to Knowledge Management:

This theory recognizes that people are the creators, sharers, and users of knowledge. Effective KM practices foster a culture of knowledge sharing, collaboration, and learning within the organization. It encourages individuals to contribute their knowledge, share their expertise, and learn from others to enhance collective knowledge and organizational performance.

f) Technology as an Enabler of Knowledge Management:

This theory acknowledges the role of technology in facilitating knowledge management processes. Technology tools, such as content management systems, knowledge repositories, and collaborative platforms, can help organizations capture, store, organize, and share knowledge more effectively. However, technology alone is not sufficient; it must be integrated into organizational culture and processes to achieve successful KM outcomes.

1.4.2.3 Different Perspectives on Knowledge Management:

a) The Resource-Based View:

The resource-based view (RBV) of KM theory emphasizes knowledge as a strategic asset that can provide organizations with a sustainable competitive advantage. It suggests that organizations should identify, develop, and leverage their unique knowledge resources to outperform their competitors. The RBV sees knowledge as a source of differentiation and innovation, enabling organizations to create and maintain a competitive edge.

b) The Process-Oriented View:

The process-oriented view of KM theory focuses on the processes and practices involved in managing knowledge throughout its lifecycle. It emphasizes the importance of creating, capturing, storing, organizing, sharing, and applying knowledge effectively. This perspective sees knowledge as a dynamic flow that needs to be managed across the organization to achieve strategic goals.

c) The Social-Constructivist View:

The social-constructivist view of KM theory emphasizes the social and contextual nature of knowledge creation and sharing. It suggests that knowledge is not simply a collection of facts but is shaped by individual experiences, interactions, and social norms. This perspective sees knowledge as a product of social interaction and collaboration, highlighting the importance of fostering a culture of knowledge sharing and learning within the organization.

d) The Knowledge-Based View:

The knowledge-based view (KBV) of KM theory emphasizes the centrality of knowledge in organizational performance. It suggests that organizations are fundamentally knowledge-based entities, and their success

depends on their ability to create, acquire, and apply knowledge effectively. This perspective sees knowledge as a key driver of innovation, adaptability, and competitiveness.

e) The Practice-Oriented View:

The practice-oriented view of KM theory emphasizes the practical application of KM principles and practices in real-world settings. It encourages organizations to focus on practical solutions and tangible benefits rather than theoretical models and frameworks. This perspective sees KM as an ongoing process of experimentation, learning, and adaptation, tailored to the specific needs and context of the organization.

1.4.2.4 Significance of Knowledge in Sustainable Project Management:

Knowledge plays a crucial role in sustainable project management (SPM), enabling organizations to balance economic, social, and environmental considerations throughout the project lifecycle. By effectively managing knowledge, organizations can identify and address sustainability risks, develop sustainable solutions, monitor and track sustainability performance, and share knowledge and best practices. Here are some key examples of how knowledge is significant in sustainable project management:

a) Identifying and Assessing Sustainability Risks:

Knowledge enables organizations to anticipate, assess, and mitigate potential sustainability risks associated with projects. Knowledge of environmental regulations, social impacts, and resource constraints can help organizations make informed decisions that minimize negative impacts and maximize positive contributions.

b) Developing Sustainable Solutions:

Knowledge is the foundation for developing sustainable solutions that balance economic, social, and environmental considerations. Organizations can leverage knowledge from various sources, including past projects, industry best practices, and research findings, to identify and implement sustainable solutions that meet project objectives while minimizing environmental damage, promoting social equity, and ensuring economic viability.

c) Monitoring and Tracking Sustainability Performance:

Knowledge is essential for monitoring and tracking the sustainability performance of projects. Organizations can establish key performance indicators (KPIs) and collect data to measure and evaluate the environmental, social, and economic impacts of their projects. This knowledge allows them to identify areas for improvement and make adjustments to ensure that projects are aligned with sustainability goals.

d) Sharing Knowledge and Best Practices:

Knowledge sharing and dissemination are crucial for promoting sustainable project management practices across an organization and beyond. Organizations can create knowledge repositories, facilitate collaborative learning platforms, and encourage knowledge exchange among project teams to enhance collective understanding and promote the adoption of sustainable practices.

e) Enhancing Innovation and Adaptability:

Knowledge provides the foundation for innovation and adaptability in sustainable project management. Organizations can leverage knowledge to develop new technologies, processes, and solutions that address sustainability challenges and adapt to changing environmental and social conditions.

f) Supporting Sustainable Decision-Making:

Knowledge plays a critical role in informed decision-making throughout the project lifecycle. Organizations can use knowledge to evaluate the sustainability implications of different design alternatives, resource allocation decisions, and operational strategies, ensuring that sustainability principles are integrated into all aspects of project planning, execution, and evaluation.

g) Fostering a Culture of Sustainability:

Knowledge sharing and collaboration promote a culture of sustainability within an organization, where sustainability principles become embedded in the organization's values, practices, and decision-making processes. This cultural shift is essential for achieving long-term sustainability goals.

1.4.2.5 Relevance to Sustainable Project Management

Sustainable project management (SPM) is an approach to project management that aims to balance the economic, social, and environmental impacts of a project. SPM practices seek to minimize the negative impacts of projects and maximize their positive contributions to society and the environment. KM theory plays a critical role in SPM by helping organizations:

a) Identify and assess sustainability risks:

Knowledge management can provide organizations with the information they need to identify and assess the potential sustainability risks of a project.

b) Develop sustainable solutions:

Knowledge management can help organizations develop sustainable solutions to project challenges by providing access to relevant knowledge and best practices

c) Monitor and track sustainability performance:

Knowledge management can help organizations monitor and track the sustainability performance of a project by providing mechanisms for collecting, analyzing, and sharing data.

d) Share knowledge and best practices:

Knowledge management can facilitate the sharing of knowledge and best practices related to SPM within and across organizations.

Key Aspects of Knowledge Management Theory	Description: Relevance to Sustainable Project Management
Identify and assess sustainability risks	KM can provide organizations with the information they need to identify and assess the potential sustainability risks of a project.
Develop sustainable solutions	KM can help organizations develop sustainable solutions to project challenges by providing access to relevant knowledge and best practices.
Monitor and track sustainability performance	KM can help organizations monitor and track the sustainability performance of a project by providing mechanisms for collecting, analyzing, and sharing data.
Share knowledge and best practices	KM can facilitate the sharing of knowledge and best practices related to SPM within and across organizations.

Table4: Key aspects of Relevance to Sustainable Project Management

1.4.2.6 Applying “Knowledge Management Theory” to the Cubic Project:

The Cubic project, also known as Mukaab, is a groundbreaking development in Riyadh, Saudi Arabia, aiming to create a vibrant and sustainable urban center. Knowledge management theory can play a crucial role in ensuring that the Cubic project is successful in achieving its sustainability goals. Here are some specific examples of how knowledge management theory can be applied to the Cubic project:

a) Identifying and Assessing Sustainability Risks:

The Cubic project team can utilize knowledge management principles to identify and assess potential sustainability risks associated with the project. This involves gathering and analyzing data on environmental regulations, social impacts, and resource constraints. By understanding these risks, the team can develop strategies to mitigate them and minimize negative impacts.

b) Developing Sustainable Solutions:

Knowledge management can facilitate the development and implementation of sustainable solutions for the Cubic project. This involves collecting and sharing knowledge from various sources, including past projects, industry best practices, and research findings. By drawing upon this collective knowledge, the project team can design and implement sustainable solutions that meet project objectives while minimizing environmental damage, promoting social equity, and ensuring economic viability.

c) Monitoring and Tracking Sustainability Performance:

Effective knowledge management can support the monitoring and tracking of sustainability performance throughout the Cubic project lifecycle. This involves establishing key performance indicators (KPIs) and collecting data to measure and evaluate the environmental, social, and economic impacts of the project. By tracking progress against these KPIs, the project team can identify areas for improvement and make adjustments to ensure that the project remains aligned with sustainability goals.

d) Sharing Knowledge and Best Practices:

Knowledge sharing and dissemination are crucial for promoting sustainable project management practices within the Cubic project team and beyond. This involves creating a knowledge repository, facilitating collaborative learning platforms, and encouraging knowledge exchange among team members and stakeholders. By sharing knowledge and best practices, the project team can enhance collective understanding and promote the adoption of sustainable practices across the project lifecycle.

e) Enhancing Innovation and Adaptability:

Knowledge management can foster innovation and adaptability in sustainable project management for the Cubic project. This involves encouraging knowledge creation, experimentation, and learning from experiences. By fostering a culture of continuous improvement, the project team can develop new sustainable solutions, adapt to changing environmental and social conditions, and respond effectively to emerging challenges.

f) Supporting Sustainable Decision-Making:

Knowledge management plays a critical role in informed decision-making throughout the Cubic project lifecycle. This involves providing project decision-makers with access to relevant knowledge, including sustainability assessments, risk analyses, and best practices. By making informed decisions that align with sustainability principles, the project team can ensure that the Cubic project contributes positively to the environment, society, and economy.

g) Fostering a Culture of Sustainability:

Knowledge management principles can promote a culture of sustainability within the Cubic project team. This involves embedding sustainability values and practices into the project's planning, execution, and evaluation phases. By fostering a culture of sustainability, the project team can encourage individual and collective commitment to achieving long-term sustainability goals.

Approach/Strategy of Applying Knowledge Management Theory	Description: How to apply Knowledge Management Theory
Identifying and Assessing Sustainability Risks	Gather and analyze data on environmental regulations, social impacts, and resource constraints to identify and assess potential sustainability risks.
Developing Sustainable Solutions	Collect and share knowledge from various sources to develop and implement sustainable solutions that minimize environmental damage, promote social equity, and ensure economic viability.
Monitoring and Tracking Sustainability Performance	Establish key performance indicators (KPIs) and collect data to measure and evaluate environmental, social, and economic impacts to ensure alignment with sustainability goals.
Sharing Knowledge and Best Practices	Create a knowledge repository, facilitate collaborative learning platforms, and encourage knowledge exchange to enhance collective understanding and promote sustainable practices.
Enhancing Innovation and Adaptability	Foster a culture of continuous improvement by encouraging knowledge creation, experimentation, and learning from experiences to develop new sustainable solutions and adapt to changing conditions.
Supporting Sustainable Decision-Making	Provide project decision-makers with access to relevant knowledge, including sustainability assessments, risk analyses, and best practices, to make informed decisions that align with sustainability principles.
Fostering a Culture of Sustainability	Embed sustainability values and practices into the project's planning, execution, and evaluation phases to promote a culture of sustainability and encourage individual and collective commitment to achieving long-term sustainability goals.

Table5: Approach/Strategy of Applying Knowledge Management Theory

1.4.3 Best Practices Theory (BPT):

The Best Practices Theory constitutes a conceptual framework designed to discern and implement the most efficacious methods or processes to attain a specific goal or objective. This theoretical framework places paramount importance on the assimilation of insights derived from the experiences of others, emphasizing the application of established techniques to optimize performance and realize desired outcomes.

In the realm of sustainable project management, the Best Practices Theory offers a methodical approach to the identification, evaluation, and adoption of practices that have exhibited efficacy in comparable projects with a sustainability focus. As a

management concept, Best Practices Theory underscores the significance of identifying, implementing, and continually refining the most effective and efficient methods for executing a specific task or process. Its overarching aim is to institute a standardized approach that has demonstrated success in achieving predefined outcomes.

1.4.3.1 Key principles of best practices theory:

a) Identifying best practices:

Gathering information and data from various sources, including case studies, research, and expert opinions, to identify the most effective practices for a particular context.

b) Implementing best practices:

Integrating identified best practices into organizational processes and procedures, ensuring that they are effectively adopted and utilized.

c) Continuous improvement:

Regularly evaluating the effectiveness of implemented best practices and making adjustments as needed to ensure they remain relevant and effective.

1.4.3.2 Key Elements of Best Practices Theory:

a) Focus on outcomes:

The focus is on identifying and implementing practices that have a proven track record of success in achieving specific outcomes.

b) Evidence-based approach:

Best practices are typically based on empirical evidence, such as research studies, case studies, and data analysis.

c) Flexibility and adaptability:

Best practices should be flexible enough to be adapted to the specific context of the organization or project.

d) Continuous improvement:

Best practices should be continuously reviewed and updated to reflect new knowledge and changing circumstances.

1.4.3.3 Significance of Best Practices in Sustainable Project Management:

Best practices in sustainable project management (SPM) play a crucial role in ensuring that projects are planned, executed, and evaluated in a way that minimizes negative environmental, social, and economic impacts while maximizing positive

contributions. By adopting best practices, organizations can achieve their project objectives while also contributing to a more sustainable future.

1.4.3.4 Key Significance of Best Practices in Sustainable Project Management:

a) Enhanced Sustainability Performance:

Best practices provide a framework for organizations to identify, implement, and monitor sustainable practices throughout the project lifecycle. This leads to improved sustainability performance, including reduced environmental impact, increased social benefits, and enhanced economic viability.

b) Risk Mitigation and Reduction:

By identifying and addressing potential sustainability risks early on, organizations can minimize negative impacts and avoid project failures. Best practices provide guidance for assessing and managing sustainability risks, ensuring that projects are planned and executed in a way that minimizes environmental damage, social disruption, and economic losses.

c) Informed Decision-Making:

Best practices provide a foundation for making informed decisions that align with sustainability principles. Organizations can use best practices to evaluate the sustainability implications of design alternatives, resource allocation strategies, and operational practices, ensuring that sustainability considerations are integrated into all aspects of project planning, execution, and evaluation.

d) Continuous Improvement and Innovation:

Best practices foster a culture of continuous improvement and innovation in sustainable project management. Organizations can use best practices to benchmark their performance against industry standards, identify areas for improvement, and develop new and innovative solutions to sustainability challenges.

e) Knowledge Sharing and Collaboration:

Best practices promote knowledge sharing and collaboration among project teams, organizations, and stakeholders. This facilitates the exchange of knowledge and best practices, leading to a collective understanding of sustainable project management principles and practices.

f) Enhanced Stakeholder Engagement:

Best practices emphasize the importance of stakeholder engagement throughout the project lifecycle. By involving stakeholders in the planning, execution, and evaluation of projects, organizations can ensure that sustainability considerations are aligned with the needs and aspirations of the communities and environments affected by the project.

g) Long-Term Sustainability Goals:

Best practices support the achievement of long-term sustainability goals. By integrating sustainability principles into all aspects of project management, organizations can contribute to a more sustainable future, creating positive impacts that extend beyond the project lifecycle.

1.4.3.5 Relevance of Best Practices Theory to Sustainable Project Management:

Best practices theory is highly relevant to sustainable project management (SPM) due to its focus on achieving positive outcomes while minimizing negative impacts. In the context of SPM, best practices can help organizations:

a) Identify and implement sustainable solutions:

Best practices can provide a roadmap for developing and implementing sustainable solutions that meet project objectives while minimizing environmental damage, promoting social equity, and ensuring economic viability.

b) Monitor and track sustainability performance:

Best practices can establish benchmarks and guidelines for monitoring and tracking sustainability performance throughout the project lifecycle, ensuring that projects remain aligned with sustainability goals.

c) Share knowledge and best practices:

Best practices can facilitate the sharing of knowledge and best practices among project teams and stakeholders, promoting a culture of continuous improvement and innovation in sustainable project management.

d) Enhance decision-making for sustainability:

Best practices can provide a framework for making informed decisions that align with sustainability principles, ensuring that sustainability considerations are integrated into all aspects of project planning, execution, and evaluation.

Key Aspects of Best Practices Theory	Description: Relevance to Sustainable Project Management
Identifying and implementing sustainable solutions	Best practices can provide a roadmap for developing and implementing sustainable solutions that meet project objectives while minimizing environmental damage, promoting social equity, and ensuring economic viability.
Monitoring and tracking sustainability performance	Best practices can establish benchmarks and guidelines for monitoring and tracking sustainability performance throughout the project lifecycle, ensuring that projects remain aligned with sustainability goals.
Sharing knowledge and best practices	Best practices can facilitate the sharing of knowledge and best practices among project teams and stakeholders, promoting a culture of continuous improvement and innovation in sustainable project management.
Enhancing decision-making for sustainability	Best practices can provide a framework for making informed decisions that align with sustainability principles, ensuring that sustainability considerations are integrated into all aspects of project planning, execution, and evaluation.

Table6: Key aspects of Relevance to Sustainable Project Management

1.4.3.6 Applying Best Practices to the Cubic Project:

The Cubic project in Riyadh, Saudi Arabia, is a large-scale development aiming to create a vibrant and sustainable urban center. Best practices theory can play a crucial role in ensuring that the Cubic project achieves its sustainability goals. Here are some examples of how best practices can be applied to the Cubic project:

- a) **Adopting energy-efficient technologies:** Best practices in sustainable building design can guide the selection and implementation of energy-efficient technologies, such as renewable energy systems, green building materials, and smart building controls.
- b) **Implementing sustainable waste management practices:** Best practices in waste management can promote the reduction, reuse, and recycling of waste materials throughout the construction and operation of the Cubic project.
- c) **Promoting sustainable transportation options:** Best practices in urban planning can encourage the use of sustainable transportation modes, such as public transportation, cycling, and pedestrian-friendly infrastructure.
- d) **Creating green spaces and natural habitats:** Best practices in landscape architecture can incorporate green spaces, natural habitats, and biodiversity-friendly features into the Cubic project's design, contributing to a healthier and more sustainable environment.

- e) **Engaging stakeholders and promoting community sustainability:** Best practices in stakeholder engagement can foster collaboration with local communities, incorporating their needs and aspirations into the project's design and implementation, and promoting sustainability initiatives that benefit the wider community.

Approach/Strategy of Applying Best Practices Theory	Description: How to apply Best Practices Theory
Adopting energy-efficient technologies	Best practices in sustainable building design guide the selection and implementation of energy-efficient technologies, such as renewable energy systems, green building materials, and smart building controls.
Implementing sustainable waste management practices	Best practices in waste management promote the reduction, reuse, and recycling of waste materials throughout the construction and operation of the Cubic project.
Promoting sustainable transportation options	Best practices in urban planning encourage the use of sustainable transportation modes, such as public transportation, cycling, and pedestrian-friendly infrastructure.
Creating green spaces and natural habitats	Best practices in landscape architecture incorporate green spaces, natural habitats, and biodiversity-friendly features into the Cubic project's design, contributing to a healthier and more sustainable environment.
Engaging stakeholders and promoting community sustainability	Best practices in stakeholder engagement foster collaboration with local communities, incorporating their needs and aspirations into the project's design and implementation, and promoting sustainability initiatives that benefit the wider community.

Table7: Approach/Strategy of Applying Knowledge Management Theory

1.4.4 Project management theory (PMT):

Project management theory provides a framework for understanding and managing the complex processes involved in planning, executing, and completing projects successfully. It encompasses various principles, methodologies, and tools that enable project managers to effectively guide projects from initiation to completion.

1.4.4.1 Key Elements of Project Management Theory:

Project management theory is characterized by several key elements:

a) Scope Management:

Defining and managing the scope of the project ensures that the project delivers the intended outcomes and avoids unnecessary work or scope creep.

b) Schedule Management:

Planning, organizing, and controlling the project schedule ensures timely completion of project deliverables and milestones.

c) Cost Management:

Planning, budgeting, and controlling project costs ensures efficient resource allocation and adherence to financial constraints.

d) Quality Management:

Defining, measuring, and controlling quality standards ensures that project deliverables meet the required specifications and satisfy stakeholder expectations.

e) Risk Management:

Identifying, assessing, and mitigating potential risks helps prevent project failures and minimizes negative impacts.

f) Resource Management:

Allocating, managing, and optimizing project resources, including personnel, equipment, and materials, ensures efficient utilization and avoids resource constraints.

g) Communication Management:

Maintaining effective communication with stakeholders throughout the project lifecycle ensures clear understanding, facilitates collaboration, and promotes stakeholder engagement.

h) Stakeholder Management:

Identifying, engaging, and managing project stakeholders effectively ensures that their needs, expectations, and potential impacts are considered throughout the project lifecycle.

i) Additional elements:

Including Human Resources, Integration, and Procurement, constitute fundamental facets of project management theory. Human Resources Management encompasses the adept planning, organization, and administration of project team members, ensuring their possession of requisite skills, experience, and motivation for the attainment of project objectives.

Integration Management involves the meticulous coordination and alignment of diverse project components to realize the desired outcomes. Procurement Management, on the other hand, entails the systematic acquisition of goods and services essential for the successful completion of a project.

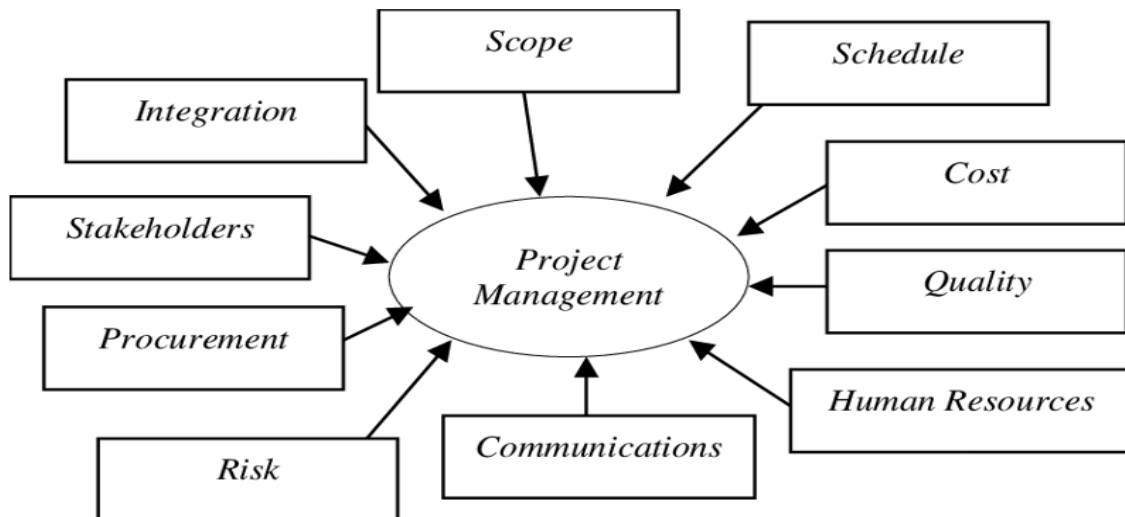


Figure5: Key Elements of Project Management Theory

1.4.4.2 Relevance of Project Management Theory to Sustainable Project Management:

Project management theory plays a critical role in sustainable project management (SPM) by providing a structured approach for achieving sustainable project outcomes. It enables organizations to integrate sustainability principles into project planning, execution, and evaluation, ensuring that projects contribute positively to environmental, social, and economic objectives. In the context of SPM, project management theory can help organizations:

a) Define sustainable project objectives:

Project management theory provides a framework for clearly defining project objectives that align with sustainability principles and contribute to the organization's overall sustainability goals.

b) Plan and implement sustainable project activities:

Project management theory guides the planning and execution of project activities in a way that minimizes negative environmental, social, and economic impacts. This includes selecting sustainable materials, implementing energy-efficient practices, and promoting social equity throughout the project lifecycle.

c) Monitor and control project performance:

Project management theory provides tools and techniques for monitoring and controlling project performance against sustainability criteria. This involves tracking key performance indicators (KPIs) related to environmental, social, and economic sustainability, identifying deviations from sustainability goals, and implementing corrective actions.

d) Manage stakeholder expectations and engagement:

Project management theory promotes effective stakeholder engagement and communication, ensuring that sustainability considerations are integrated into stakeholder expectations and that stakeholders are involved in decision-making processes related to sustainability.

Key Aspects of Project Management Theory	Description: Relevance to Sustainable Project Management
Define Sustainable Project Objectives	Project management theory provides a framework for clearly defining project objectives that align with sustainability principles and contribute to the organization's overall sustainability goals.
Plan and Implement Sustainable Project Activities	Project management theory guides the planning and execution of project activities in a way that minimizes negative environmental, social, and economic impacts. This includes selecting sustainable materials, implementing energy-efficient practices, and promoting social equity throughout the project lifecycle.
Monitor and Control Project Performance	Project management theory provides tools and techniques for monitoring and controlling project performance against sustainability criteria. This involves tracking key performance indicators (KPIs) related to environmental, social, and economic sustainability, identifying deviations from sustainability goals, and implementing corrective actions.
Manage Stakeholder Expectations and Engagement	Project management theory promotes effective stakeholder engagement and communication, ensuring that sustainability considerations are integrated into stakeholder expectations and that stakeholders are involved in decision-making processes related to sustainability.

Table8: Key aspects of Project Management Theory in Relevance to Sustainable Project Management

1.4.4.3 Application of Project Management Theory to the Cubic Project:

The Cubic project in Riyadh, Saudi Arabia, is a large-scale development aiming to create a vibrant and sustainable urban center. Project management theory can play a crucial role in ensuring that the Cubic project achieves its sustainability goals. Here are some examples of how project management principles can be applied to the Cubic project:

a) Establishing clear and measurable sustainability goals:

Clearly defined sustainability goals provide a framework for measuring progress and evaluating the overall sustainability performance of the project.

b) Incorporating sustainability considerations into project planning:

Sustainability principles should be integrated into all aspects of project planning, from design and procurement to construction and operation.

c) Implementing sustainable practices throughout the project lifecycle:

Sustainable practices should be adopted throughout the project lifecycle, from resource management and waste reduction to energy efficiency and environmental impact mitigation.

d) Monitoring and tracking sustainability performance:

Regular monitoring and tracking of sustainability performance data allow for continuous improvement and adaptation of sustainable practices.

e) Engaging stakeholders and promoting sustainable behavior:

Stakeholder engagement and communication are crucial for promoting sustainable behavior and ensuring that sustainability considerations are integrated into individual and organizational practices.

Approach/Strategy of Applying Project Management Theory	Description: How to apply Project Management Theory
Establishing clear and measurable sustainability goals	Define specific and quantifiable sustainability goals to assess the project's overall sustainability performance.
Incorporating sustainability considerations into project planning	Integrate sustainability principles into all phases of project planning, including design, procurement, construction, and operation.
Implementing sustainable practices throughout the project lifecycle	Adopt sustainable practices across the project's lifespan, encompassing resource management, waste reduction, energy efficiency, and environmental impact mitigation.
Monitoring and tracking sustainability performance	Regularly monitor and track sustainability performance data to identify areas for improvement and adapt sustainable practices accordingly.
Engaging stakeholders and promoting sustainable behavior	Actively engage stakeholders and promote sustainable behavior through communication, education, and incentives.

Table9: Approach/Strategy of Applying Project Management Theory

1.4.5 Sustainability Theory (ST):

Sustainability theory encompasses the principles, concepts, and frameworks for understanding and achieving sustainable development. It explores the interconnectedness of environmental, social, and economic systems and the need to balance these dimensions to ensure long-term sustainability. Sustainability theory provides a foundation for developing and implementing sustainable practices in various sectors, including project management.

1.4.5.1 Key Elements of Sustainability Theory

Sustainability theory is characterized by several key elements:

a) Holistic Perspective:

Sustainability theory adopts a holistic perspective, considering the interrelationships between environmental, social, and economic systems. It recognizes that addressing sustainability challenges requires a comprehensive approach that integrates these dimensions.

b) Long-Term Focus:

Sustainability theory emphasizes long-term thinking and planning, ensuring that decisions made today do not compromise the well-being of future generations. It advocates for balancing short-term gains with long-term sustainability goals.

c) Resilience and Adaptability:

Sustainability theory promotes resilience and adaptability in the face of changing environmental, social, and economic conditions. It encourages organizations and societies to anticipate and respond to challenges in a way that maintains sustainability.

d) Equity and Justice:

Sustainability theory emphasizes equity and justice, ensuring that the benefits of sustainable development are shared fairly among all stakeholders. It addresses issues of social and environmental justice, striving to create a more equitable and sustainable future for all.

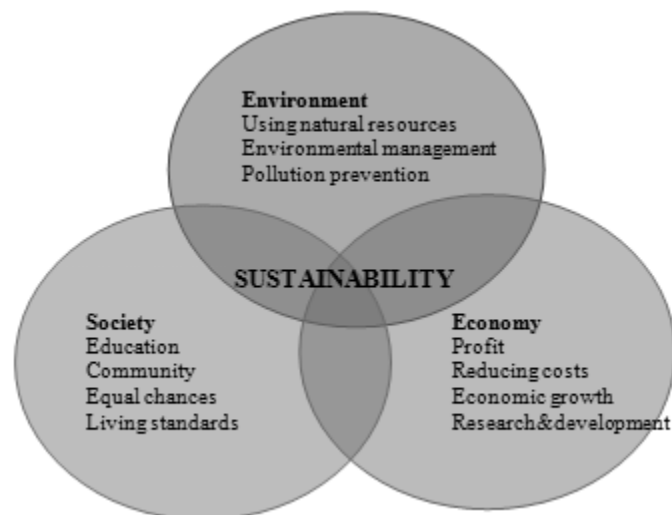


Figure6: Key Elements of Sustainability

1.4.5.2 Relevance of Sustainability Theory to Sustainable Project Management

1.4.5.2.1 The Cornerstone of Sustainable Project Management

Sustainability theory plays a crucial role in sustainable project management (SPM) by providing a framework for making decisions and implementing practices that minimize negative impacts and maximize positive contributions to society and the environment. In the context of SPM, sustainability theory can help organizations:

a) Define Sustainable Project Objectives:

Sustainability theory guides the definition of project objectives that align with sustainability principles and contribute to broader sustainability goals.

b) Evaluate Sustainability Implications of Project Activities:

Sustainability theory provides a framework for evaluating the environmental, social, and economic implications of project activities throughout the project lifecycle.

c) Select and Implement Sustainable Solutions:

Sustainability theory informs the selection and implementation of sustainable solutions that minimize environmental damage, promote social equity, and ensure economic viability.

d) Monitor and Track Sustainability Performance:

Sustainability theory promotes the monitoring and tracking of sustainability performance using key performance indicators (KPIs) to measure progress and identify areas for improvement.

e) Engage Stakeholders and Collaborate for Sustainability:

Sustainability theory emphasizes stakeholder engagement and collaboration to ensure that sustainability considerations are integrated into decision-making processes and that all stakeholders have a voice in shaping sustainable project outcomes.

1.4.5.2.2 Driving Continuous Improvement in Sustainable Project Management

Sustainability theory is highly relevant to sustainable project management (SPM) as it provides a framework for integrating sustainability principles into project planning, execution, and evaluation. SPM aims to balance economic, social, and environmental considerations throughout the project lifecycle, ensuring that projects contribute to sustainable development goals.

Sustainability theory guides SPM practices in several ways:

a) Identifying and Assessing Sustainability Impacts:

Sustainability theory helps organizations identify and assess potential environmental, social, and economic impacts of projects. This involves understanding the project's context, analyzing potential risks and opportunities, and considering cumulative impacts.

b) Developing Sustainable Solutions:

Sustainability theory informs the development of sustainable solutions that minimize negative impacts and maximize positive contributions. This involves selecting sustainable technologies, materials, and practices, considering social equity and environmental protection throughout the project lifecycle.

c) Monitoring and Tracking Sustainability Performance:

Sustainability theory guides the establishment of key performance indicators (KPIs) and data collection mechanisms to monitor and track project performance against sustainability goals. This involves measuring environmental impacts, social outcomes, and economic benefits.

d) Promoting Stakeholder Engagement and Collaboration:

Sustainability theory emphasizes stakeholder engagement and collaboration to ensure that sustainability considerations are integrated into project planning, decision-making, and implementation. This involves involving stakeholders from various backgrounds and interests, fostering dialogue, and addressing their concerns.

e) Continuous Learning and Improvement:

Sustainability theory promotes continuous learning and improvement in SPM practices. This involves reflecting on project outcomes, identifying lessons learned, and adapting strategies to enhance sustainability performance in future projects.

1.4.5.2.3 Applying Sustainability Theory to the Cubic Project:

The Cubic project in Riyadh, Saudi Arabia, is a large-scale development aiming to create a vibrant and sustainable urban center. Sustainability theory can play a crucial role in ensuring that the Cubic project achieves its sustainability goals. Here are some examples of how sustainability theory can be applied to the Cubic project:

a) Incorporating sustainability principles into project design and planning:

Sustainability principles should be embedded into the project's design and planning stages to minimize environmental impacts, promote social equity, and ensure economic viability.

b) Adopting sustainable construction practices:

Sustainable construction practices, such as using energy-efficient materials and implementing waste reduction strategies, should be incorporated into the project's construction phase.

c) Promoting sustainable transportation options:

The project should encourage the use of sustainable transportation modes, such as public transportation, cycling, and pedestrian-friendly infrastructure, to reduce reliance on fossil fuels and promote a healthier environment.

d) Creating green spaces and natural habitats:

Integrating green spaces, natural habitats, and biodiversity-friendly features into the project's design can contribute to a healthier and more sustainable environment.

e) Engaging stakeholders and promoting community sustainability:

The project should engage with local communities, incorporate their needs and aspirations into the project's design and implementation, and promote sustainability initiatives that benefit the wider community.

1.4.6 Socio-Technical Systems Theory (STS):

Socio-technical systems (STS) theory is a broad framework for understanding and designing complex systems that involve both human and technical components. It emphasizes the interdependencies between social and technical elements, recognizing that the effective functioning of a system depends on the interactions between people, technology, and the organizational and social context in which they operate.

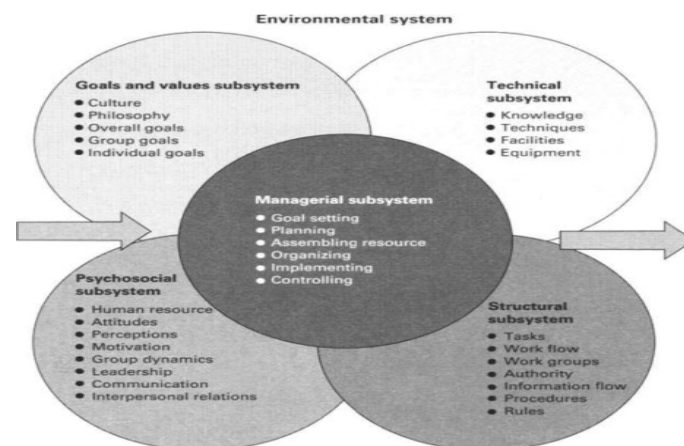


Figure7: Socio-Technical System - an overview

1.4.6.1 Key Elements of Socio-Technical Systems Theory

STS theory is characterized by several key elements:

a) Holistic Perspective:

STS theory views systems as holistic entities, considering the interactions between social, technical, and organizational factors rather than focusing on individual components in isolation.

b) Co-evolution of Social and Technical Elements:

STS theory recognizes that social and technical elements co-evolve and influence each other. Changes in one aspect of the system can lead to changes in other aspects, requiring continuous adaptation and refinement.

c) Emergent Properties:

STS theory highlights the emergence of new properties and behaviors from the interactions between social and technical elements. These emergent properties are not simply the sum of the individual parts but arise from the complex interactions between them.

d) Contextual Sensitivity:

STS theory acknowledges that the design and operation of systems are influenced by their specific context, including the organizational culture, social norms, and external environment.

1.4.6.2 Relevance of Socio-Technical Systems Theory to Sustainable Project Management

Socio-technical systems theory is highly relevant to sustainable project management (SPM) as it provides a framework for understanding and managing the complex interactions between people, technology, and sustainability considerations. In the context of SPM, STS theory can help organizations:

a) Design for Social Sustainability:

STS theory emphasizes the importance of considering social factors in the design and implementation of sustainable projects. This involves understanding the needs, values, and concerns of stakeholders, ensuring that the project aligns with social sustainability goals, and promoting social equity and inclusion.

b) Integrate Technology for Sustainable Solutions:

STS theory guides the selection and implementation of technology in a way that supports sustainable project objectives. This involves considering the environmental impacts of technology, ensuring that technology is used responsibly and ethically, and promoting technological innovation for sustainability.

c) Manage Organizational Change for Sustainability:

STS theory recognizes that organizational change is often necessary to achieve sustainable project outcomes. It provides a framework for understanding and managing organizational change processes, including addressing resistance to change, building consensus, and fostering a culture of sustainability within the organization.

d) Promote Collaborative Learning and Adaptation:

STS theory emphasizes continuous learning and adaptation in SPM. This involves reflecting on project outcomes, identifying lessons learned, and adapting strategies to enhance sustainability performance in future projects.

1.4.1.6.3 Applying Socio-Technical Systems Theory to the Cubic Project

The Cubic project in Riyadh, Saudi Arabia, is a large-scale development aiming to create a vibrant and sustainable urban center. Socio-technical systems theory can play a crucial role in ensuring that the Cubic project achieves its sustainability goals. Here are some examples of how STS theory can be applied to the Cubic project:

a) Engaging stakeholders in co-designing sustainable solutions:

The Cubic project team should actively engage stakeholders from various backgrounds and interests in the design and implementation of sustainable solutions. This collaborative approach can foster innovation, address diverse perspectives, and ensure that social sustainability considerations are integrated into the project.

b) Leveraging technology for environmental sustainability:

The project should employ technologies that minimize environmental impacts, such as energy-efficient systems, renewable energy sources, and waste reduction strategies. STS theory can guide the selection and implementation of these technologies, considering their social and organizational implications.

c) Addressing organizational challenges for sustainability:

The project team should recognize that organizational change is often necessary to adapt to sustainable practices. STS theory can provide tools for understanding and managing organizational change, such as communication strategies, training programs, and incentives for sustainable behavior.

d) Promoting continuous learning and improvement:

The Cubic project should continuously learn from its experiences and adapt its sustainability practices based on lessons learned. STS theory emphasizes the importance of feedback loops, knowledge sharing, and a culture of continuous improvement to achieve sustainable project outcomes.

2.0 Literature Review:

2.1 Importance of the Literature Review:

A well-crafted literature review serves several crucial functions in the research:

- a) Provides context: Establishes the existing body of knowledge on sustainable development, megaprojects, lessons learned, case studies, and Vision 2030.
- b) Highlights research gaps: Identifies areas where existing knowledge is limited or where further investigation is needed.
- c) Justifies your research: Demonstrates the relevance and significance of your research question and objectives.
- d) Supports the findings: Links the research findings to existing knowledge and provides evidence for the arguments.
- e) Demonstrates the expertise: Shows your understanding of the field and your ability to critically analyze and synthesize information from various sources.

2.2 Reasons for Conducting the Literature Review:

There are several key reasons why conducting a thorough literature review is critical for your research:

- a) To avoid reinventing the wheel: By learning from past research, we can build upon existing knowledge and avoid duplicating efforts.
- b) To identify best practices: By reviewing successful case studies, we can identify proven strategies and approaches for achieving sustainable development objectives.
- c) To inform your research design: By understanding the limitations of previous research, we can design your study in a way that overcomes those limitations and contributes new insights.
- d) To strengthen your arguments: By grounding our research in established knowledge, we can make more convincing and authoritative claims.

2.3 Objectives of the Literature Review:

The specific objectives of the literature review should be tailored to research questions and objectives. However, some general objectives include:

- a) To identify and critically analyze existing research on sustainable development, megaprojects, lessons learned, case studies, and Vision 2030.
- b) To assess the current state of knowledge and identify any gaps in the research.
- c) To identify best practices and lessons learned from successful sustainable development projects.
- d) To develop a theoretical framework for understanding the impact of lessons learned and case studies on sustainable projects.
- e) To inform the research design and methodology for this study.
- f) To provide a foundation for analyzing and interpreting the research findings.

2.4 Study Sample (Previous Studies):

2.4.1 Overview:

Prior investigations have underscored the dearth of indigenous research specifically dedicated to the Cube (Mukaab) Project. Consequently, the project is compelled to lean on foreign studies to elucidate the nuanced significance of lessons learned and case studies in the context of extensive sustainable projects.

The absence of local studies germane to the Cube (Mukaab) Project accentuates the imperative of extrapolating insights from foreign research. Foreign studies represent invaluable repositories, furnishing a copious reserve of knowledge and experiential acumen pertinent to large-scale sustainable projects.

These studies furnish exhaustive analyses delineating the impact of lessons learned and case studies on project outcomes and sustainability. Through a scrutiny of analogous projects implemented abroad, copious data has been systematically collected, analyzed, and evaluated.

These foreign studies offer profound insights into the determinants shaping the success of such projects, expounding upon efficacious strategies for augmenting sustainability.

Furthermore, case studies assume a pivotal role in comprehending the application of sustainable projects within distinct contextual frameworks.

An examination of antecedent case studies from foreign projects facilitates the extraction of instructive lessons concerning project implementation, encountered challenges, and successful strategies employed. These case studies empower project teams to glean insights into best practices and potential pitfalls, enabling informed decision-making and optimization of project outcomes.

In conclusion, the dearth of localized investigations dedicated to the Cube (Mukaab) Project mandates a reliance on foreign studies to fathom the significance of lessons learned and case studies in the realm of extensive sustainable projects.

By harnessing the knowledge distilled from foreign research, project teams stand to benefit from the experiences of analogous projects, thereby fortifying their capacity to apply proven strategies and enhance the sustainability and success of the Cube (Mukaab) Project.

2.4.2 Research Coverage:

The literature review for this research has encompassed the following pivotal areas:

a) Sustainable Mega-Projects:

The literature review delineated the conceptual framework of sustainable mega-projects, elucidating their significance, challenges, and benefits. It further identified key sustainability considerations integral to mega-projects, including environmental, social, and economic impacts.

b) Lessons Learned and Case Studies:

The literature review has underscored the importance of assimilating insights from the experiences of others in the implementation of sustainable mega-projects. It identified exemplary sustainable mega-projects globally and elucidate the crucial lessons derived from these endeavors.

c) Best Practices for Sustainable Mega-Projects:

The literature review has pinpointed and expound upon best practices germane to the planning, design, construction, operation, and maintenance of sustainable mega-projects. These best practices would be distilled from lessons learned in the context of successful sustainable mega-projects worldwide.

d) The Cubic (Mukaab) Project:

The literature review has furnished an exhaustive overview of the Cubic (Mukaab) Project, delineating its goals, objectives, and scope. Additionally, it identified the key sustainability challenges confronting the project.

e) Vision 2030 of Saudi Arabia:

The literature review has provided an in-depth exploration of the goals and objectives enshrined in Vision 2030, Saudi Arabia's national development plan. It accentuated the role that sustainable mega-projects can play in realizing the aspirations of Vision 2030.

2.4.3 Relevance:

The literature review has maintained direct relevance to the research proposal, with a focused examination of sustainable mega-projects, lessons learned from successful instances, best practices for successful execution, the Cubic (Mukaab) Project, and Vision 2030 of Saudi Arabia.

2.4.4 Scope:

The literature review has encompassed the following thematic areas:

a) The Concept of Sustainable Mega-Projects and Their Importance:

Definition and elucidation of the concept of sustainable mega-projects, emphasizing their importance and discussing associated benefits, such as contributions to economic growth, job creation, and environmental protection.

b) Challenges and Risks Associated with Implementing Sustainable Mega-Projects:

Identification and discussion of challenges and risks intrinsic to the implementation of sustainable mega-projects, including technical, financial, environmental, and social challenges.

c) Lessons Learned and Case Studies from Successful Sustainable Mega-Projects:

Identification and discussion of lessons learned from globally successful sustainable mega-projects, offering insights into effective planning, design, construction, operation, and maintenance.

d) Best Practices for Executing Sustainable Mega-Projects Successfully:

Identification and discussion of best practices in the execution of sustainable mega-projects, spanning project management, technical design, financial management, environmental management, and social engagement.

e) The Cubic (Mukaab) Project and Its Alignment with Vision 2030 of Saudi Arabia:

Comprehensive coverage of the Cubic (Mukaab) Project, detailing its alignment with Vision 2030 as a giant cube-shaped city under development in Riyadh. Vision 2030 seeks to transform Saudi Arabia into a diversified and sustainable economy, with the Cubic (Mukaab) Project designed as an innovative and sustainable city.

2.4.5 Selected Studies (Previous Research Paper):

2.4.5.1 Journal Of Al Azhar University Engineering Sector Vol. 12, No. 42, January, 2017, 199-211.

TOWARDS SUSTAINABLE URBAN DEVELOPMENT IN ARID, REGIONS: MASDAR CITY AS A CASE STUDY by Mohammed Farouk El-Aby

2.4.5.1.1 Summary:

This article explores the concept of sustainable urban development in arid regions, focusing on Masdar City as a case study. Masdar City is a planned city located in Abu Dhabi, United Arab Emirates, aiming to become a model for sustainable living in desert environments. The article analyzes the city's approach to sustainability through various aspects:

- a) Renewable energy: Masdar City heavily incorporates renewable energy sources, such as solar and wind power, to reduce reliance on fossil fuels and minimize carbon footprint.
- b) Resource efficiency: The city implements strategies for water conservation, waste management, and sustainable building practices to conserve resources and minimize environmental impact.
- c) Smart transportation: Masdar City prioritizes sustainable transportation options like personal rapid transit (PRT) and electric vehicles to reduce air pollution and promote low-carbon mobility.
- d) Social sustainability: The city focuses on creating a vibrant and inclusive community by providing green spaces, educational facilities, and healthcare services for its residents.

2.4.5.1.2 Key Findings:

- a) Masdar City demonstrates the feasibility and effectiveness of implementing sustainable development principles in arid regions.
- b) The city's approach provides valuable insights and best practices for other arid regions aiming for sustainable urban development.
- c) Challenges remain, including integrating Masdar City fully with the surrounding Emirate and ensuring long-term economic viability.

2.4.5.1.3 Significance for Sustainable Urban Development:

- a) Masdar City serves as a model for sustainable urban development in arid regions, showcasing innovative technologies and strategies.
- b) The successes and challenges of Masdar City provide valuable lessons for other arid regions to consider when planning and developing their own sustainable cities.
- c) The article contributes to the growing body of knowledge on sustainable urban development and its potential to address environmental and social challenges in arid regions.

2.4.5.1.4 Limitations:

The article primarily focuses on the positive aspects of Masdar City and may not fully address the potential limitations or challenges faced by the project. The long-term sustainability of Masdar City and its scalability to larger urban areas remain to be seen.

2.4.5.1.5 Further Research:

- a) Investigating the economic feasibility and long-term sustainability of Masdar City as a model for urban development.
- b) Exploring the social and cultural aspects of sustainable urban development in arid regions.
- c) Analyzing the potential for replicating and adapting Masdar City's sustainable strategies in other arid regions with different contexts and challenges.

2.4.5.1.6 Investigation on the research:

2.4.5.1.6.1 Research Gap or Problem Addressed:

The authors aimed to address the research gap or problem of developing sustainable urban cities in arid regions. They focused on studying the experiment of Abu Dhabi in transforming from dependence on petrol to sustainable urban development, with a specific case study of Masdar City. The research aimed to analyze the pros and cons of sustainable development in arid areas and provide recommendations for achieving sustainable development in such environments. The authors emphasized the importance of social participation, economic sustainability, and environmental sustainability in the development of sustainable.

2.4.5.1.6.2 Specific Objectives of the Study

1. Analyzing the shift from petro-urbanism to sustainable urban development in Abu Dhabi Emirate.
2. Studying and evaluating the strategies of sustainability in Masdar City.
3. Analyzing the case study of Masdar City according to the principles of social participation, economic sustainability, and environmental sustainability.
4. Providing recommendations for the development of cities in arid areas in a sustainable manner.
5. Examining the importance of using natural resources in arid areas in a sustainable manner.
6. Conducting economic and environmental studies for investment in sustainable urban development.

2.4.5.1.6.3 Methodology of the Research

The authors conducted their research using an analytical descriptive methodology to study the strategic shift from petro-urbanism to urban sustainability in Abu Dhabi Emirate. They also used the case study methodology to analyze and evaluate the strategies of sustainability in Masdar City.

The research focused on three principal aspects: studying the factors leading to the shift from petro-urbanism to urban sustainability, analyzing the system of sustainability in Masdar City, and evaluating the case study according to the principles of social participation, economic sustainability, and environmental sustainability.

The research concludes with several results and recommendations, emphasizing the importance of developing cities.

2.4.5.1.6.4 Results and Conclusions of the Study

The study on sustainable urban development in arid regions, with Masdar City as a case study, concluded that it is important to provide an integrated system for developing cities in arid areas in a sustainable manner. This includes active social participation, economic sustainability, and environmental sustainability. The study also emphasized the importance of adopting the principles of sustainability as an alternative to dependence on petrol, as seen in Masdar City. The research provided recommendations such as setting governmental strategic plans, supporting scientific research in renewable energy, and enhancing environmental awareness among citizens.

2.4.5.1.6.5 Key Lessons from the Case Study of Masdar City:

a) Importance of Integrated System:

The case study highlights the importance of providing an integrated system that works on developing cities in arid areas in a sustainable manner. This includes considering environmental, economic, social, and political factors to transform cities into sustainable urban developments.

b) Focus on Renewable Energy:

Masdar City serves as a model for sustainable urban development by reducing carbon emissions and relying on renewable energy sources. The city aims to generate at least 20% of its energy from renewable sources, with the rest coming from external renewable sources.

c) Efficient Energy Consumption:

Masdar City focuses on reducing energy consumption through the use of energy-saving technologies and efficient construction practices. The city has achieved significant reductions in electricity and water consumption compared to the average levels in the UAE.

d) Sustainable Transportation:

Masdar City promotes sustainable transportation options, such as the Personal Rapid Transit system and electric cars. These initiatives aim to reduce reliance on cars and promote cleaner modes of transportation.

e) Social Participation:

While Masdar City prioritizes environmental sustainability and economic viability, the case study highlights the need for greater social participation in the planning process. Involving local residents and addressing their needs and concerns can enhance acceptance and ensure the compatibility of sustainable development with the local lifestyle.

Overall, the case study of Masdar City emphasizes the importance of an integrated approach to sustainable urban development, with a focus on renewable energy, efficient resource consumption, sustainable transportation, and social participation.

2.4.5.1.6.6 Lessons for Applying to Other Sustainable Megaprojects:

a) Integrated System Approach:

The lessons from Masdar City can be applied to other sustainable megaprojects by adopting an integrated system approach. This means considering the interconnection between social, economic, and environmental sustainability and ensuring that all aspects are addressed in the planning, design, and operation of the project.

b) Social Participation:

It is important to prioritize social participation in the planning phase of sustainable megaprojects. This involves engaging with local communities and stakeholders to understand their needs and preferences, and incorporating their input into the project design. This can help ensure acceptance and compatibility with the local society.

c) Use of Sustainable Construction Materials:

Sustainable megaprojects can benefit from using environmentally-friendly construction materials. This includes sourcing materials from sustainably run forests, using recycled materials such as aluminium and steel, and utilizing environment-friendly concrete. These choices can help reduce carbon emissions and minimize the environmental impact of the project.

d) Transportation Solutions:

Sustainable transportation solutions should be a key consideration in megaprojects. Masdar City's adoption of Personal Rapid Transport and electric cars demonstrates the importance of investing

in low-carbon transportation options. This can help reduce emissions and promote a more sustainable and efficient transportation system.

e) Partnerships and Collaboration:

Collaboration with international companies and organizations can bring valuable expertise and resources to sustainable megaprojects. Masdar City's partnerships with companies like Siemens, Mitsubishi, and General Electric, as well as the establishment of The International Renewable Energy Agency (IRENA), highlight the benefits of such collaborations in driving innovation and achieving sustainability goals.

By applying these lessons, other sustainable megaprojects can strive to achieve a balance between social, economic, and environmental sustainability, engage with local communities, use sustainable construction materials, prioritize sustainable transportation, and foster partnerships for success.

2.4.5.2 The impact of project sustainability management (PSM) on project success A systematic literature review Amin Khalifeh University of Bolton, Bolton, UK Peter Farrell School of Engineering, University of Bolton, Bolton, UK, and Malek Al-edenat Department of Business, Faculty of Wellbeing and Social Sciences, University of Bolton, Bolton, UK

2.4.5.2.1 Overview:

This article provides information about five studies that focus on incorporating sustainability into project management. It discusses the types of incorporation, project success dimensions, and the sample of respondents considered in each study. The studies vary in terms of industry focus and country focus.

2.4.5.2.2 Key points:

- a) The document mentions five studies that explore the incorporation of sustainability into project management.
- b) The studies focus on two types of incorporation: project process sustainability and project product sustainability.
- c) Each study considers project success dimensions, including project management success and project outcome success.

- d) The studies involve different samples of respondents, such as business directors, project team members, and experts from universities.
- e) The studies have varying industry and country focuses.

2.4.5.2.3 Key Findings:

The study by Adriana and Ioana-Maria (2013) focuses only on disclosure aspects of company reports and does not consider stakeholder judgments. This means that the authors solely rely on the data presented in the reports and cannot be certain about a company's compliance or inclusion of all sustainability elements.

The studies by Martens and Carvalho (2016b), Carvalho and Rabechini (2017), and Khalilzadeh et al. (2016) are limited to specific countries such as the USA, Brazil, Peru, and the South Pars region. These studies do not provide a comprehensive view of project success across multiple countries

. The selected studies have limitations such as geographical bias, limited access to reports in other countries, non-probabilistic sampling, and a lack of consideration for multiple stakeholders when measuring project success.

Recommendations for further research include conducting more surveys-based studies rather than case studies, exploring different types of industries, considering multiple stakeholders, and using stratified and probabilistic sampling for a more generalizable view.

The Project success is subjective and difficult to measure, and future studies should focus on exploring perceptions and expected impacts on project success rather than relying on closed projects for data. The lack of empirical contributions in the field of project sustainability management highlights the need for more research in both developed and developing countries.

2.4.5.2.4 Significance of the Study: The impact of project sustainability management (PSM) on project success

The study aims to investigate the relationship between project sustainability management (PSM) and project success. It recognizes the growing importance of sustainability as a new school of thought in project management and seeks to provide a better understanding of how PSM can support project success. The findings of this study may contribute to decision-making processes in project management and potentially lead to a paradigm shift in managing projects. However, it is important to note that more research is needed in this area due to the limited number of relevant empirical studies available.

2.4.5.2.5 Limitations:

- a) Limited to specific stakeholders: The studies by Carvalho and Rabechini (2017), Martens and Carvalho (2016a, b), and Khalilzadeh et al. (2016) only consider a particular type of stakeholders as respondents and do not include multiple stakeholders.

- b) Limited geographical scope: Some studies focus on specific countries or regions, such as the UK, South Africa, USA, Brazil, Peru, and the South Pars region, which may introduce geographical bias.
- c) Non-probabilistic sample bias: The studies by Carvalho and Rabechini (2017), Martens and Carvalho (2016a, b) use non-probabilistic samples, which may limit the generalizability of their findings.
- d) Limited access to experts and reports: The study by Martens and Carvalho (2016a) faced difficulties in accessing experts, while Adriana and Ioana-Maria (2013) and Martens and Carvalho (2016b) had limited access to reports in other countries.
- e) Lack of consideration for multiple stakeholders: Some studies do not consider the perspectives of multiple stakeholders, which may limit the comprehensiveness of their findings.

2.4.5.2.6 Further Research:

- a) Conduct more studies in both developed and developing countries to address the lack of empirical contributions in the topic area.
- b) Focus on surveys rather than case studies for future research, as surveys are suitable for testing insights and hypotheses to develop new knowledge.
- c) Explore different types of industries, such as information systems and service sectors, which have been rarely examined in the literature.
- d) Consider multiple stakeholders when measuring project success, as this is an important gap in knowledge that may significantly impact results.
- e) Apply a stratified and probabilistic sample in future research for a more generalized and confirmatory view.
- f) Instead of examining the impact of PSM on project success through a sample of closed projects, future survey-based studies should explore the perceptions around this relationship and the expected impact on project success.

These recommendations aim to address the limitations and gaps identified in the existing studies and contribute to a better understanding of the relationship between PSM and project success.

2.4.5.2.7 Investigation on the research:

The research focuses on disclosure aspects of project sustainability management (PSM) and does not consider stakeholder judgments. The studies selected have limitations such as geographical bias and limited access to reports in other countries. The research recommends conducting more surveys-based studies in both developed and developing countries to fill the empirical gap.

It also suggests considering multiple stakeholders and using stratified and probabilistic samples for a more generalized view. Additionally, future research should explore perceptions around the relationship between PSM and project success

2.4.5.2.7.1 Research Gap or Problem Addressed:

The given document discusses the research gap or problem addressed in the field of project sustainability management (PSM). It highlights the lack of empirical contributions and the need for further research in both developed and developing countries. The document suggests that future research should be based on surveys rather than case studies to test insights and hypotheses. It also recommends exploring different types of industries and considering multiple stakeholders when measuring project success. Overall, the document emphasizes the need for more research to understand the relationship between PSM and project success and to consider sustainability as a new school of thought in project management.

2.4.5.2.7.2 Specific Objectives of the Study:

The specific objectives of the study are to:

- a) Investigate the relationship between project sustainability management (PSM) and project success.
- b) Facilitate decision making by considering sustainability as a new school of thought in project management.
- c) Identify the limitations of previous studies on PSM and project success.
- d) Provide recommendations for further research in the field of PSM and project success.
- e) Contribute to a better understanding of the impact of PSM on project success.
- f) Explore the perceptions and expected impact of PSM on project success through survey-based studies.
- g) Consider the role of multiple stakeholders in measuring project success.
- h) Encourage future research in both developed and developing countries.
- i) Focus on different types of industries, such as information systems and service sectors, which have been rarely examined in the literature.
- j) Apply a stratified and probabilistic sample in future research for a more generalised and confirmatory view.

2.4.5.2.7.3 Methodology of the Research:

The research methodology involved conducting a systematic literature review (SLR) to identify relevant studies on the relationship between project sustainability management (PSM) and project success. The authors searched for studies published before 2019 using search engines like Google Scholar and Scopus, with specific search terms related to sustainability and project success. The initial sample selection resulted in 37 studies, which were then filtered based on relevance and content analysis. The final selected sample comprised five empirical studies that focused on the relationship between PSM and project success. The authors applied content analysis to these studies, categorizing them based on study type, strategy, industry focus, and country focus. The limitations of each study were also considered.

2.4.5.2.7.4 Results and Conclusions of the Study:

The study found that there is a lack of empirical contributions in the topic area of project sustainability management (PSM) and project success. Only five empirical studies were found that focused on the relationship between PSM and project success. These studies were conducted between 2013 and 2018 and consisted of four journal articles and one book chapter.

The research strategy for four of the studies was a survey using questionnaires, while one study used multiple case studies based on company reports. Three studies examined both developed and developing countries, while two studies focused only on developing countries. The studies also covered different types of industries, such as oil and gas, banking, real estate, cosmetics, chemicals, electronics, information technology, construction, automotive, aerospace, communication, mining, retail, electricity, agriculture, and medicine.

The study concludes that there is a need for more research on the relationship between PSM and project success. While the findings of the selected studies suggest that PSM has the potential to increase the success of projects and improve stakeholder satisfaction, the limited number of empirical studies and the specific limitations of these studies should be taken into consideration. The study also highlights the importance of considering multiple stakeholders and using surveys rather than case studies in future research on PSM and project success.

2.4.5.2.7.5 Key Lessons from the impact of project sustainability management (PSM) on project success:

- a) Incorporating sustainability into project management may support project success, but more evidence is needed as there are limited empirical studies on this topic.
- b) Considering sustainability as a new school of thought in project management is premature, and further research is recommended.
- c) Project success should be the main focus when incorporating sustainability into project management practices.
- d) The most challenging elements of project success that need to be addressed are cost and time.
- e) PSM is a complex and difficult concept, and there are many unanswered questions regarding its impact on project success.
- f) The relationship between PSM and project success is inadequately addressed in the literature, and more empirical evidence is needed.
- g) The current study may facilitate decision making in considering sustainability as a new school of thought in project management and may lead to a potential paradigm shift in managing projects.
- h) There are limitations to the studies chosen, which may have affected the results and outcomes of this study.
- i) The identified gaps and limitations of the selected empirical studies provide a good basis for future research in this area.
- j) Organizations should pay more attention to incorporating sustainability into their project management practices to improve the efficiency and effectiveness of projects.
- k) The findings of this study highlight the need for more research on the impact of PSM on project success and the potential benefits of incorporating sustainability into project management.
- l) Overall, this systematic literature review emphasizes the importance of considering sustainability in project management and the need for further investigation in this field.

2.4.5.2.7.6 Lessons for Applying to Other Sustainable Megaprojects:

a) Importance of Project Management:

The article emphasizes the importance of project management in sustainable megaprojects. It suggests that managing projects effectively is crucial for achieving sustainability goals.

b) Integration of Sustainability:

The article highlights the need for integrating sustainability into project management practices. It suggests that sustainability should be considered throughout the project lifecycle, from planning to execution and evaluation.

c) Stakeholder Engagement:

The article emphasizes the importance of engaging stakeholders in sustainable megaprojects. It suggests that involving stakeholders in decision-making processes and considering their perspectives can lead to better project outcomes.

d) Measurement and Evaluation:

The article suggests that measuring and evaluating sustainability performance is essential for ensuring the success of megaprojects. It emphasizes the need for using appropriate indicators and metrics to assess the project's impact on the environment, society, and the economy.

e) Knowledge Sharing:

The article highlights the importance of knowledge sharing and learning from past experiences. It suggests that sharing best practices and lessons learned from previous sustainable megaprojects can help improve future project outcomes.

f) Continuous Improvement:

The article emphasizes the need for continuous improvement in sustainable megaprojects. It suggests that project managers should strive to learn from mistakes, adapt to changing circumstances, and implement innovative solutions to enhance project sustainability.

Overall, the article provides valuable insights into the key lessons for applying to other sustainable megaprojects. It emphasizes the importance of project management, integration of sustainability, stakeholder engagement, measurement and evaluation, knowledge sharing, and continuous improvement. These lessons can guide project managers in successfully implementing sustainable practices in future megaproject.

2.4.5.3 Review of Drivers of Sustainability in Mega Infrastructure Projects: An Institutional Approach. Nicola Thounaojam, Ganesh Devkar, Boeing Laishram:

2.4.5.3.1 Overview:

The research discusses a systematic literature review conducted to identify the drivers for sustainability in megaprojects. The review followed three phases: planning the review, conducting the review, and analyzing and reporting the review.

The literature search was conducted using the Scopus database, and keywords were identified using trial-and-error and snowballing techniques.

The publications were filtered based on language, peer-review, and journal articles. Content analysis was carried out using a deductive approach with categories informed by institutional theory.

The findings identified regulative, normative, and cultural-cognitive elements as drivers for sustainability in megaprojects.

2.4.5.3.2 Key points:

- a) The systematic literature review aimed to identify the drivers for sustainability in megaprojects.
- b) The review followed three phases: planning, conducting, and analyzing and reporting.
- c) The literature search was conducted using the Scopus database and keywords identified through trial-and-error and snowballing techniques.
- d) The publications were filtered based on language, peer-review, and journal articles.
- e) Content analysis was carried out using a deductive approach with categories informed by institutional theory.
- f) The findings identified regulative, normative, and cultural-cognitive elements as drivers for sustainability in megaproject.

2.4.5.3.3 Key Findings:

- a) The study conducted a systematic literature review to identify the institutional drivers for sustainability in megaprojects. The review followed three phases: planning the review, conducting the review, and analyzing and reporting the review.
- b) In total, 33 papers were selected for the literature review, and the content analysis was carried out using a deductive approach with categories informed by institutional theory (regulative, normative, and cultural-cognitive).
- c) The findings revealed three regulative elements, five normative elements, and three cultural-cognitive elements that can drive sustainability in megaprojects. These elements include regulatory pressure, knowledge and competence among employees, and the exchange of knowledge and experiences from peer projects.

2.4.5.3.4 Significance of the Study:

The study is significant because it lays a solid foundation for researchers to further investigate the institutional systems that drive sustainability in megaprojects. It employs a systematic literature review methodology to identify critical institutional drivers for sustainability in megaprojects.

By analyzing and reporting the review findings, the study contributes to the existing knowledge on the institutional factors that can effectively promote sustainability in megaprojects. This research fills a gap in the literature and provides valuable insights for decision-makers and policymakers in accelerating and directing sustainable practices in megaprojects.

2.4.5.3.5 Limitations:

- a) **Limited Scope:** This study focuses specifically on the institutional drivers for sustainability in megaprojects and does not provide a comprehensive analysis of all factors influencing sustainability in these projects.
- b) **Data Availability:** This study relies on a systematic literature review and content analysis of selected papers. The findings are based on the available literature and may not capture all relevant information or perspectives on the topic.
- c) **Language Limitation:** The literature search and review process was conducted in English, which may have excluded relevant studies published in other languages.
- d) **Publication Bias:** This study primarily includes peer-reviewed journal articles, which may introduce a bias towards positive findings and exclude unpublished or negative results.
- e) **Generalizability:** The findings and conclusions drawn from the selected papers may not be applicable to all megaprojects or contexts, as the studies included in the review may have focused on specific regions or industries.
- f) **Time Constraints:** This study does not provide information on the timeframe of the literature search and review process, which may limit the inclusion of recent studies or developments in the field.
- g) **Methodological Limitations:** This study mentions the use of a deductive approach and predefined categories for content analysis. However, it does not provide detailed information on the specific criteria used for data extraction and analysis.
- h) **Incomplete Information:** This study does not provide a comprehensive list of all references cited in the content, limiting the ability to access and verify the original sources.
- i) **Subjectivity:** This study relies on the interpretation and categorization of the authors based on their understanding of the institutional theory and the selected papers. Different researchers may have different interpretations and categorizations, leading to potential subjectivity in the analysis.
- j) **Lack of Contextual Information:** This study does not provide specific details about the megaprojects or the institutional contexts in which they operate, making it difficult to fully understand the applicability and relevance of the identified.

2.4.5.3.6 Further Research:

a) Drivers for Megaproject Sustainability:

This study provides a systematic literature review on the drivers for sustainability in megaprojects. The review methodology followed three phases: planning the review, conducting the review, and analyzing and reporting the review. The literature search was conducted using the Scopus database, and 33 papers were selected for the review. The content analysis was carried out using a deductive approach informed by the institutional theory. The findings of the review can serve as a foundation for further research on why some institutional systems drive megaproject sustainability while others do not.

b) Keywords for Literature Search:

This study mentions that the keywords used for the literature search are shown in Table 1. These keywords were identified using trial-and-error and snowballing techniques. The search query was based on a "building blocks" strategy, where the topic of study is broken into facets/blocks, and variants and synonyms for each facet are added together using Boolean operators to form a final search query.

c) Phases of the Review:

This study describes the three phases of the systematic literature review. In the planning phase, the Scopus database was employed for the literature search. In the conducting phase, publications were filtered based on language, peer-review status, and being journal articles. Papers relevant to the research question were selected based on title, abstract, and full manuscript analysis. In the analyzing and reporting phase, content analysis was carried out using a deductive approach with categories informed by the institutional theory.

d) Institutional Drivers for Megaproject Sustainability:

This study states that the content analysis was carried out using a deductive approach with categories informed by the institutional theory. The institutional theory includes three categories: regulative, normative, and cultural-cognitive. The review aimed to identify critical institutional drivers for sustainability in megaprojects.

e) Limitations and Future Research:

This study does not explicitly mention the limitations of the study or provide suggestions for future research. Therefore, it is not possible to provide specific information on the limitations or areas for further research based on the given document data.

2.4.5.3.7 Investigation on the research:

The research conducted a systematic literature review to investigate the drivers for sustainability in megaprojects. The review followed three phases: planning the review, conducting the review, and analyzing and reporting the review. The Scopus database was used for the literature search, and keywords were identified using trial-and-error and snowballing techniques.

In total, 33 papers were selected for the literature review, and content analysis was carried out using a deductive approach informed by institutional theory. The findings identified regulative, normative, and cultural-cognitive elements as drivers for sustainability in megaprojects.

2.4.5.3.7.1 Research Gap or Problem Addressed:

The research gap or problem addressed in the study is the lack of understanding of the drivers that can effectively promote the sustainability of mega infrastructure projects (MIPs). The study aims to fill this gap by conducting a systematic literature review to identify the drivers for sustainability in MIPs. By using the lens of institutional theory and a deductive approach, the study identifies 11 drivers for sustainability in MIPs from reviewing 33 selected peer-reviewed articles. The findings of the study can enhance the understanding of project stakeholders and policymakers regarding the drivers for sustainability and can help improve policies, strategies, norms, and culture to support MIPs in contributing to sustainable development goals.

2.4.5.3.7.2 Specific Objectives of the Study:

The objective of the study is to review and identify the drivers for sustainability in mega infrastructure projects (MIPs). The study aims to explore the institutional forces (regulative, normative, and cultural-cognitive) that influence the successful management of sustainability-related targets in MIPs. Through a systematic literature review, the study identifies 11 drivers for sustainability in MIPs, which can enhance the understanding of project stakeholders and policymakers and contribute to the improvement of policies, strategies, norms, and culture to support sustainable development goals in MIP.

2.4.5.3.7.3 Methodology of the Research:

The research followed a systematic literature review methodology, consisting of three phases: planning the review, conducting the review, and analyzing and reporting the review. In the planning phase, the Scopus database was used for literature search, employing a "building blocks" strategy with keywords related to institutional elements and sustainability in megaprojects. The second phase involved filtering publications based on language, peer-review, and relevance to the research question. In the final phase, content analysis was conducted using a deductive approach informed by the institutional theory. The findings were categorized into regulative, normative, and cultural-cognitive elements that drive sustainability in megaprojects.

2.4.5.3.7.4 Results and Conclusions of the Study:

The study conducted a systematic literature review to identify critical institutional drivers for sustainability in megaprojects. A total of 33 papers were selected for the review, and content analysis was carried out using a deductive approach informed by institutional theory. The analysis focused on three categories of institutional drivers: regulative, normative, and cultural-cognitive.

The findings of the study suggest that the presence of multilateral/international agencies with a solid environmental and social safeguard framework can influence the sustainability of megaprojects. Additionally, the knowledge and competence

of employees in understanding the need for sustainability practices, as well as the goals and commitments of the project company towards sustainability, were identified as important drivers.

Furthermore, the exchange of knowledge and experiences from peer projects was found to positively impact the implementation of sustainable practices in megaprojects. Overall, the study lays a solid foundation for further research into why some institutional systems drive megaproject sustainability while others do not.

In conclusion, the study highlights the importance of institutional drivers in promoting sustainability in megaprojects. The findings provide valuable insights for researchers and practitioners in the field of built environment research, and contribute to the establishment of evidence-based practices in the megaprojects.

2.4.5.3.7.5 Key Lessons:

a) **Importance of Institutional Forces:**

The study highlights the significance of institutional forces, including regulative, normative, and cultural-cognitive factors, in driving sustainability in mega infrastructure projects (MIPs). These forces play a crucial role in shaping the adoption of sustainable practices in MIPs.

b) **Need for Research on Institutional Drivers:**

The research emphasizes that there is a lack of exploration and understanding of the institutional drivers that can effectively promote sustainability in MIPs. This calls for further attention and research in this area to enhance stakeholders' understanding and improve policies, strategies, norms, and culture related to MIPs and sustainable development goals.

c) **Drivers for Sustainability in MIPs:**

The study identifies 11 drivers for sustainability in MIPs through a systematic literature review. These drivers include environmental and social legislative and regulatory mechanisms, incentives and penalties, contractual contents, standards and certifications, vocational training and meetings, shared vision and organizational culture, innovation in sustainable models, imitation of successful strategies, ongoing dialogue and learning, stakeholder engagement, and project governance.

d) **Role of Organizations and Governments:**

The research highlights the role of project organizations and governments in driving sustainability in MIPs. They need to develop effective policies, regulations, and contractual clauses, as well as promote sustainable practices through incentives and penalties. Organizations should also foster a shared vision and organizational culture towards sustainable development goals.

e) **Collaboration and Learning:**

The study emphasizes the importance of ongoing dialogue and learning between government clients and market actors in driving long-term change and sustainability in infrastructure projects. Collaboration and knowledge

sharing regarding successful and sustainable models or technologies are crucial for the development of sustainable MIPs.

Overall, the review provides valuable insights into the drivers of sustainability in mega infrastructure projects and emphasizes the need for further research and attention to enhance sustainability practices in MIPs.

2.4.5.3.7.6 Lessons for Applying to Other Sustainable Megaprojects:

a) Importance of Institutional Drivers:

The document highlights the need to understand the institutional drivers that promote sustainability in megaprojects. While existing research in other sectors has examined institutional drivers for sustainability, there is a lack of exploration in the context of megaprojects. Therefore, it is crucial to identify and understand these drivers to effectively promote sustainability in future megaprojects.

b) Integration of Sustainable Practices:

The implementation of sustainable practices in megaprojects is becoming increasingly important. However, integrating these principles into project processes depends on various triggering factors or drivers. Therefore, decision-makers and policymakers should focus on understanding and incorporating these drivers to accelerate and direct sustainable practices in future megaprojects.

c) Addressing Sustainability Challenges:

Megaprojects face significant sustainability challenges, including resource consumption, carbon emissions, and conflicts between stakeholders. To address these challenges, it is necessary to go beyond the traditional focus on schedule, budget, and specifications. Decision-makers and policymakers should consider the economic, social, and environmental impacts of megaprojects and prioritize sustainable development.

d) Learning from Institutional Theory:

The application of institutional theories can provide valuable insights into managing megaprojects. By understanding how institutional systems drive megaproject sustainability, decision-makers can make informed decisions and implement effective strategies. This knowledge can help in avoiding common pitfalls and ensuring the long-term sustainability of future megaprojects.

Overall, the document emphasizes the importance of understanding institutional drivers, integrating sustainable practices, addressing sustainability challenges, and learning from institutional theory when applying lessons to other sustainable megaprojects.

Third Chapter

Practical/Scientific Study and Methodological Procedures

1.0 Practical/Scientific Study:

The research aims to conduct a practical and scientific investigation into the impact of lessons learned and case studies on sustainable projects, focusing specifically on the Cubic (Mukaab) Project in Riyadh and its alignment with the Vision 2030 objectives of Saudi Arabia. The study seeks to provide empirical insights into how the application of best practices, derived from lessons learned and case studies, influences the success and sustainability of large-scale projects with a specific focus on urban development and sustainability initiatives.

2.0 Methodological Procedures:

2.1 Interviews:

Conduct interviews with key stakeholders involved in the Cubic (Mukaab) Project, including project managers, architects, and government officials. In-depth interviews have been conducted with project experts in Saudi Arabia to gain nuanced insights into their experiences with the application of lessons learned and case studies in sustainable project management.

2.2 Surveys:

Administer surveys to gather quantitative data on public perception and satisfaction regarding the sustainability aspects of the project. The Surveys has been conducted with project managers in Saudi Arabia to elicit data on their experiences pertaining to the utilization of lessons learned and case studies in sustainable project management.

2.3 Lesson Learned & Case Studies Examination:

A thorough analysis of lessons learned and case studies from sustainable projects in Saudi Arabia will be undertaken to discern best practices in the utilization of these insights in project management.

2.4 Data Collection:

From the survey, interviews, and case studies have been analyzed using a variety of methods, including:

- a) Quantitative analysis: has been used to analyze the data from the survey. This has been involved using statistical methods to identify patterns and trends in the data.
- b) Qualitative analysis: has been used to analyze the data from the interviews and case studies. This has been involved using thematic analysis to identify key themes in the data.
- c) Mixed methods analysis: has been used to combine the findings from the quantitative and qualitative analysis. This has been involved using a variety of methods to integrate the findings from the different sources of data.

The research employs a mixed-methods approach, incorporating both quantitative and qualitative methodologies. Quantitative data is acquired through a survey administered to practitioners engaged in sustainable projects within Saudi Arabia. The qualitative aspect involves the collection of data through interviews with project experts possessing substantial

experience in utilizing lessons learned and case studies to oversee sustainable projects, exemplified by the Cubic (Mukaab) project.

2.5 Data Analysis:

The qualitative data derived from interviews and case studies underwent thematic analysis to discern key themes and patterns. Thematic analysis, as a qualitative research method, systematically identifies and analyzes patterns of meaning within a dataset. A coding process was employed by the researchers to identify and label key themes, subsequently analyzing the coded data to unveil relationships between these themes and to cultivate a profound understanding of the impact of lessons learned and case studies on sustainable mega-projects.

Concurrently, the quantitative data underwent analysis using statistical techniques to explore relationships among lessons learned, case studies, and best practices for sustainable mega-projects. Various statistical methodologies, including correlation analysis and regression analysis, were applied by the researchers to identify and evaluate these relationships. Statistical analysis was further employed to test the hypotheses posited in the research.

The culmination of both qualitative and quantitative data analyses has been integrated to construct a comprehensive understanding of the influence of lessons learned and case studies on sustainable mega-projects. These insights have been utilized by the researchers to formulate recommendations for the application of lessons learned and case studies specifically tailored for the Cubic (Mukaab) Project, intending to facilitate the realization of its sustainability objectives and alignment with the Vision 2030 initiative of Saudi Arabia.

2.6 Data Integration:

The researchers have amalgamated quantitative and qualitative data to construct a holistic comprehension of the influence of lessons learned and case studies on sustainable mega-projects. Additionally, the data has been utilized to formulate recommendations tailored for the application of lessons learned and case studies to the Cubic (Mukaab) Project, with the aim of attaining its sustainability objectives and aligning with Vision 2030 of Saudi Arabia.

2.7 Alignment with Vision 2030:

- a) Investigate the alignment of the Cubic (Mukaab) Project with the Vision 2030 goals of Saudi Arabia, particularly in terms of economic prosperity, environmental sustainability, and social cohesion.
- b) Analyze policy documents and strategic plans to assess the project's contribution to the national vision.

2.8 Synthesis and Recommendations:

- c) Synthesize findings from the case study, literature review, and comparative analysis.

- d) Develop recommendations for applying best practices in sustainable projects, considering the specific context of the Cubic (Mukaab) Project and its alignment with Vision 2030.

This methodological approach ensures a comprehensive investigation into the impact of lessons learned and case studies on the Cubic (Mukaab) Project's sustainability, contributing valuable insights to the broader field of sustainable urban development.

3.0 Methodologies of Research Study:

3.1 Interviews:

3.1.1 1. Purpose of Study:

The research employs an interview-based research methodology to gain valuable insights into the perspectives of key stakeholders involved in the Cubic (Mukaab) Project in Riyadh. This approach aims to understand how lessons learned, case studies, and best practices contribute to the sustainability of the project, aligning it with the broader goals of Vision 2030 for Saudi Arabia.

3.1.2 Rationale for Interviews:

Interviews have been chosen as the primary data collection method due to their ability to provide in-depth, qualitative information directly from individuals involved in different capacities within the project. This approach facilitates a nuanced understanding of the impact of lessons learned and the application of best practices from diverse viewpoints.

3.1.3 Significance of the Study:

This study aims to contribute valuable insights to the field of sustainable project management, offering practical recommendations for enhancing project sustainability through the application of lessons learned and best practices. The findings are anticipated to provide guidance not only for the Cubic (Mukaab) Project but also for similar initiatives aligned with Vision 2030 in Saudi Arabia.

3.1.4 Selection of Interviewees:

The interviewees represent a spectrum of project roles, ensuring a comprehensive examination of the project's dynamics. The selected roles are:

- a) Project Consultant
- b) Project Director
- c) Project Manager
- d) Project Specialist
- e) Project Engineer

This diverse selection aims to capture the varied perspectives and responsibilities within the project team, contributing to a holistic understanding of the research topic.

3.1.5 Interview Structure:

Structured interviews have been conducted with each participant, utilizing a set of predefined questions tailored to their specific role. The questions were designed to elicit insights into the impact of lessons learned, the application of case studies, and the integration of best practices in promoting sustainability within the Cubic (Mukaab) Project. The following questions have been selected for this study in order to collect data to identify recurring themes, patterns, and key findings:

- 1) What do you know about the Cubic (Mukaab) Project?
- 2) In your opinion, how can the Cubic (Mukaab) Project align with Vision 2030 of Saudi Arabia?
- 3) Referring to your experience, what does the Cubic (Mukaab) Project need to be Aligning with Vision 2030 of Saudi Arabia?
- 4) What can lessons learned and case studies from successful sustainable projects add to the Cubic (Mukaab) Project?

3.1.6 Data Analysis of Conducted Interviews:

a) Question 1: An overview of the Cubic (Mukaab) Project?

The responses from the interviews provide a comprehensive overview of how various stakeholders perceive the Cubic (Mukaab) Project. The qualitative data analysis reveals recurring themes, patterns, and key findings that shed light on different aspects of the project.

Key Recurring Themes	Patterns	Key Findings
The Cubic (Mukaab) Project is a visionary urban transformation project that will contribute to the New Murabba development and have a significant impact on Riyadh's landscape.	Interdisciplinary collaboration is essential for the success of the project.	Sustainability is a cornerstone of the project.
The project is committed to sustainability and will incorporate cutting-edge green technologies.	Innovation and engineering excellence are key to the project's success.	The project has the potential to revitalize Riyadh's urban core and promote economic growth.
The project is complex and ambitious, and will require meticulous planning, coordination, and innovative engineering solutions.	The project is aligned with Vision 2030, Saudi Arabia's national development plan.	Interdisciplinary collaboration is essential for the success of the project.

Each role involved in the project provides a unique perspective on the project, reflecting their distinct responsibilities and expertise.		The project will require innovative engineering solutions to address the challenges it presents.
---	--	--

Table:10 Describes the data analysis reveals a nuanced understanding of the Cubic (Mukaab) Project from different perspectives, highlighting recurring themes, patterns, and key findings that collectively contribute to a holistic view of the project's significance and potential impact.

Role	Keywords	Focus	Contribution
Project Consultant	Sustainability, visionary undertaking, green technologies, regional benchmark	Sustainability	Highlighting the project's commitment to sustainability as a key driver.
Project Director	Success, timeline, budget, quality, urban core revitalization, economic growth, social development, Vision 2030 alignment	Project management and overall impact	Emphasizing the project's complexity and importance within Saudi Arabia's development goals.
Project Manager	Day-to-day operations, efficiency, team expertise, execution, concept to reality	Project execution and logistics	Focusing on the practical aspects and team effort required to bring the vision to life.
Project Specialist	Innovative solutions, architectural design, construction challenges, structural design, advanced materials, stability, resilience	Engineering and technical details	Highlighting the innovative and challenging aspects of the project's design and construction.
Project Engineer	Technical execution, safety, quality, mechanical, electrical, plumbing systems, efficiency, performance	Engineering systems and infrastructure	Focusing on the technical expertise and crucial role of these systems in the project's functioning.

Table11: Describes the data analysis of the Cubic (Mukaab) Project which has been collected from the conduct interviews

b) Question 2: Aligning the Cubic (Mukaab) Project with Vision 2030 of Saudi Arabia

Key Recurring Themes	Patterns	Key Findings
Embracing Sustainable Practices	Integration of Vision 2030 Goals	Comprehensive Sustainability Strategy
Economic Diversification	Holistic Approach	Economic Contribution and Local Development
Smart Technologies and Innovation	Integration of Vision 2030 Goals	Innovation as a Catalyst
Local Workforce Development	Holistic Approach	Cultural and Social Integration
Engagement with Local Communities	Holistic Approach	Long-Term Vision and Leadership

Table12: Describes the data analysis reveals consistent themes, patterns, and key findings that collectively provide valuable insights into how the Cubic (Mukaab) Project can effectively align with Vision 2030 of Saudi Arabia. The identified aspects encompass strategic planning, proactive leadership, sustainability integration, innovation, and stakeholder collaboration as crucial elements for successful alignment.

The responses from the interviews were analyzed to identify recurring themes, patterns, and key findings regarding how the Cubic (Mukaab) Project can align with Vision 2030 of Saudi Arabia. The qualitative nature of the data allowed for a nuanced exploration of perspectives and experiences from diverse roles within the project.

All stakeholders emphasize the importance of aligning the project with Vision 2030's core principles of economic diversification, sustainable development, and social progress. Specific actions like sustainable practices, local workforce development, and smart technologies are highlighted for each area of alignment. The project has the potential to contribute significantly to Vision 2030 goals by fostering economic growth, environmental protection, and empowered communities.

Role	Areas of Alignment	Specific Actions	Contribution to Vision 2030 Goals
Project Consultant	Sustainability, economic diversification, quality of life	Sustainable practices (construction, energy, waste), job creation, innovation, social & cultural development	Diversification, sustainability, thriving communities
Project Director	Economic diversification, sustainable development, social progress	Sustainable design & construction, energy efficiency, smart technologies, local workforce development	Economic growth, environmental protection, social well-being
Project Manager	Economic diversification, environmental sustainability, social development	Renewable energy, energy efficiency, sustainable construction, local employment & skill development, community engagement	Diversification, environmental responsibility, empowered communities
Project Specialist	Sustainable practices, innovation	Eco-friendly materials, energy & water conservation, green technologies (LEED/BREEAM), R&D for sustainable solutions	Environmental leadership, knowledge creation, innovation ecosystem
Project Engineer	Sustainable engineering practices	Energy-efficient structures, renewable energy, water management, sustainable materials & construction, digitalization & smart technologies	Resource efficiency, environmental sustainability, economic competitiveness

Table13: Describes the data analysis of how to align with Vision 2030: Cubic (Mukaab) Project

c) Question 3: The needs of Aligning the Cubic (Mukaab) Project with Vision 2030 of Saudi Arabia

The responses from the interviews were analyzed to identify recurring themes, patterns, and key findings regarding how the Cubic (Mukaab) Project can align with Vision 2030 of Saudi Arabia. The qualitative nature of the data allowed for a nuanced exploration of perspectives and experiences from diverse roles within the project.

Key Recurring Themes	Description	Patterns	Key Findings
Strategic Planning and Collaboration	Conducting assessments, fostering partnerships, and engaging with stakeholders	Emphasis on collaboration and stakeholder engagement	Strategic Alignment Framework
Proactive Approach and Leadership	Strong leadership, effective communication, and a clear vision	Emphasis on continuous learning and adaptability	Leadership and Team Dynamics
Systematic Approach and Sustainability Integration	Setting clear objectives, integrating sustainable design and construction practices, and prioritizing energy efficiency and environmental conservation	Emphasis on sustainable practices	Sustainable Engineering Integration
Innovation and Knowledge Sharing	Identifying and applying best practices from global projects	Collaboration and stakeholder engagement	Innovation and Best Practices Integration
Sustainable Engineering Practices	Energy-efficient designs, renewable energy utilization, and efficient water management	Emphasis on sustainable practices	Integrating Sustainable Engineering Practices

Table14: Describes the data analysis reveals consistent themes, patterns, and key findings that collectively provide valuable insights into how the Cubic (Mukaab) Project can effectively align with Vision 2030 of Saudi Arabia. The identified aspects encompass strategic planning, proactive leadership, sustainability integration, innovation, and stakeholder collaboration as crucial elements for successful alignment.

Role	Key Focus for Alignment	Specific Actions
Project Consultant	Strategic Planning & Collaboration	1) Conduct comprehensive assessment of alignment with Vision 2030. 2) Prioritize sustainable practices, innovation, and advanced technologies. 3) Foster partnerships with stakeholders, government, and industry experts.
Project Director	Proactive Approach & Effective Communication	1) Establish a dedicated team knowledgeable about Vision 2030 goals. 2) Continuously monitor and evaluate progress against Vision 2030 objectives. 3) Engage with relevant government agencies and stakeholders.
Project Manager	Systematic Approach & Sustainability Integration	1) Establish clear sustainability objectives and key performance indicators. 2) Integrate sustainable design and construction practices. 3) Promote local employment, skill development, and knowledge transfer.
Project Specialist	Innovation & Knowledge Sharing	1) Identify and apply best practices from global sustainable projects. 2) Conduct research, benchmark against international standards, and learn from case studies. 3) Invest in R&D for innovative solutions aligned with Vision 2030. 4) Collaborate with universities, research institutions, and industry experts.

Project Engineer	Sustainable Engineering Practices	1) Prioritize energy-efficient designs, renewable energy sources, and efficient water management systems. 2) Adopt green building standards and certifications. 3) Consider life cycle impacts of infrastructure and optimize resource.
------------------	-----------------------------------	---

Table6: The table summarizes the key points from each role's perspective, highlighting their specific focus for aligning the Cubic (Mukaab) Project with Vision 2030.

d) Question 4: Lessons learned and case studies play a crucial role in the success of the Cubic Project, aligning it with Saudi Arabia's Vision 2030 and ensuring its sustainable and efficient execution.

The responses from the interviews present a wealth of information regarding the potential contributions of lessons learned and case studies from successful sustainable projects to the Cubic (Mukaab) Project. The qualitative data analysis reveals recurring themes, patterns, and key findings across different roles.

Key Recurring Themes	Description	Patterns	Key Findings
Strategic Planning and Collaboration	Conducting assessments, fostering partnerships, and engaging with stakeholders	Emphasis on collaboration and stakeholder engagement	Strategic Alignment Framework
Proactive Approach and Leadership	Strong leadership, effective communication, and a clear vision	Emphasis on continuous learning and adaptability	Leadership and Team Dynamics
Systematic Approach and Sustainability Integration	Setting clear objectives, integrating sustainable design and construction practices, and prioritizing energy efficiency and environmental conservation	Emphasis on sustainable practices	Sustainable Engineering Integration
Innovation and Knowledge Sharing	Identifying and applying best practices from global projects	Collaboration and stakeholder engagement	Innovation and Best Practices Integration
Sustainable Engineering Practices	Energy-efficient designs, renewable energy utilization, and efficient water management	Emphasis on sustainable practices	Integrating Sustainable Engineering Practices

Table15: Describes the data analysis reveals consistent themes, patterns, and key findings that collectively provide valuable insights into how the Cubic (Mukaab) Project can effectively align with Vision 2030 of Saudi Arabia and show how Lessons learned and case studies play a crucial role in the success of the Cubic (Mukaab) Project, aligning it with Saudi Arabia's Vision 2030 and ensuring its sustainable and efficient execution.

Role	Key Insights from Lessons Learned & Case Studies	Project Phase Impact
Project Consultant	1) Strategic alignment with Vision 2030 goals. 2) Risk mitigation strategies from similar projects. 3) Identification of innovative solutions and best practices.	Planning & Development
Project Director	1) Effective stakeholder engagement models. 2) Resource optimization techniques for sustainability. 3) Robust performance monitoring and KPI development.	Implementation & Delivery
Project Manager	1) Critical elements for successful project planning. 2) Collaborative tools and communication strategies. 3) Iterative approach for continuous improvement.	All Project Phases
Project Specialist	1) Technical expertise from successful sustainable projects. 2) Lessons in risk management and contingency planning. 3) Performance evaluation methods and criteria for sustainability.	Design & Construction, Operation & Maintenance
Project Engineer	1) Technical innovations and advancements in sustainable design. 2) Efficient construction practices and site management approaches. 3) Effective integration of engineering systems for optimized performance.	Design & Construction, Operation & Maintenance

Table16 The table summarizes the key insights from each role's perspective, highlighting how lessons learned and case studies can benefit specific project phases.

3.1.7 Discussion:

3.1.7.1 Coding and Categorization of Interview Data:

To code, categorize, and interpret the interview data, the project team utilized a systematic approach. The following steps were taken:

- a) **Data Collection:** The team collected interview data from various project stakeholders, including project consultants, project directors, project managers, and project specialists. These interviews provided valuable insights and perspectives on aligning the Cubic (Mukaab) Project with Vision 2030 of Saudi Arabia.
- b) **Thematic Analysis:** The interview data was analyzed using a thematic analysis approach. The team identified recurring themes, patterns, and key ideas within the data. These themes were then used to categorize the interview responses and extract relevant information.
- c) **Coding and Categorization:** The team assigned codes to specific segments of the interview data based on the identified themes. This coding process helped in organizing and structuring the data for further analysis. The categorized data was then used to answer specific questions related to the Cubic (Mukaab) Project.
- d) **Interpretation:** The coded and categorized interview data was interpreted to gain a comprehensive understanding of the project's alignment with Vision 2030. The team looked for commonalities, trends, and recommendations within the data to inform decision-making and project planning.

Overall, the coding, categorization, and interpretation of the interview data allowed the project team to extract valuable insights and recommendations for aligning the Cubic (Mukaab) Project with Vision 2030 of Saudi Arabia.

3.1.7.2 Tools or Frameworks Used for Analysis:

- a) **Case Studies:** Case studies provide valuable insights into successful sustainable projects and serve as a tool for analysis. By studying these case studies, project teams can gain knowledge about innovative technologies, engineering solutions, and construction methodologies that have proven effective in achieving sustainability goals.
- b) **Performance Evaluation Methods:** Lessons learned from case studies allow project teams to understand the performance evaluation methods and criteria used in successful projects. By adopting similar evaluation frameworks, project teams can objectively assess the sustainability performance of their own project and make necessary adjustments to ensure success.
- c) **Key Performance Indicators (KPIs):** Case studies can guide project teams in establishing robust performance monitoring mechanisms. By understanding the KPIs and metrics employed in previous projects, project teams can develop effective monitoring systems to track progress, identify deviations, and make timely adjustments to ensure project success.

These tools and frameworks enable project teams to analyze and learn from successful sustainable projects, identify areas for improvement, and optimize the design, construction, and operational phases of their own project.

3.1.7.3 The main themes or insights that emerged from the interview:

1. Project Manager:

- a) Lessons learned and case studies provide valuable insights into successful project planning, including factors such as project scope, timeline, resource allocation, and risk assessment.
- b) Collaboration and communication are key aspects of successful projects, and case studies can offer strategies and tools for effective teamwork and stakeholder engagement.

2. Project Specialist:

- a) Case studies offer opportunities to explore technical aspects of sustainable projects, such as innovative technologies, engineering solutions, and construction methodologies.
- b) Lessons in risk management from case studies can help identify potential risks, develop contingency plans, and establish robust risk management approaches.
- c) Performance evaluation methods and criteria used in successful projects can be adopted to assess the sustainability performance of the Cubic Project objectively.

3. Project Consultant:

- a) Lessons learned and case studies can help align the Cubic Project with the goals and objectives of Vision 2030 by identifying strategies, approaches, and best practices that have proven effective in achieving sustainable outcomes.

- b) The analysis of lessons learned and case studies can help identify potential risks and challenges during project implementation and develop proactive measures to minimize risks.
- c) Case studies can provide insights into innovative solutions and efficient practices that can be applied to the Cubic Project, leading to improved sustainability, cost-effectiveness, and operational efficiency.

4. Project Director:

- a) Case studies can provide insights into effective stakeholder engagement strategies employed in previous projects, enabling better engagement with government entities, local communities, and private organizations in the Cubic Project.
- b) Performance evaluation methods and criteria used in successful projects can be adopted to measure the impact of the Cubic Project, identify areas for improvement, and ensure alignment with Vision 2030.
- c) The Cubic Project should prioritize sustainability as a core principle throughout the project lifecycle, integrating sustainable design and construction practices, energy efficiency, waste reduction, and environmental conservation.

5. Project Engineer:

- a) Case studies provide insights into innovative engineering solutions, technical advancements, and construction practices implemented in sustainable projects.
- b) Lessons learned from case studies can optimize the construction phase of the Cubic Project by minimizing waste generation, reducing energy consumption, and ensuring adherence to sustainable construction standards.
- c) Sustainable projects often involve the integration of various engineering systems, and case studies can provide insights into the successful integration of HVAC, lighting, renewable energy, and water management systems.

6. Overall Themes:

- a) Successful sustainable projects emphasize project planning, collaboration, and communication, technical expertise, risk management, performance evaluation, stakeholder engagement, technical innovations, construction practices, integration of systems, and alignment with Vision 2030.
- b) Lessons learned and case studies offer valuable insights, recommendations, and best practices that can be applied to the Cubic Project to enhance its sustainability, cost-effectiveness, operational efficiency, and alignment with Vision 2030.

3.1.7.4 Limitations of the Interview Method:

- a) **Small Sample Size:** The employment of the interview method may be constrained by its reliance on a limited sample size. Consequently, the findings and conclusions derived from the interviews might lack representativeness for the entire population or project. It is imperative to recognize the potential for bias and the restricted informational scope associated with a small sample.

- b) **Potential for Bias:** Interviews are susceptible to various biases, encompassing both interviewer and respondent biases. Unintentional influences from interviewers, such as tone, body language, or question phrasing, may impact participant responses. Likewise, respondents might provide biased or incomplete information influenced by their perspectives or motivations. Vigilance against these biases is essential, necessitating measures to mitigate their impact on the integrity of the interview process.
- c) **Subjectivity:** The nature of interviews relies on subjective information furnished by participants, introducing the influence of personal opinions, experiences, or interpretations. This subjectivity poses challenges in generalizing findings or drawing objective conclusions. To ensure a comprehensive understanding of the project, it is crucial to consider multiple perspectives and validate interview data through other information sources.
- d) **Time and Resource Constraints:** The conduct of interviews can impose significant demands on time and resources, particularly when dealing with expansive projects or diverse stakeholder groups. Limitations in time and resources may restrict the number or depth of interviews conducted. Recognizing this constraint is essential when interpreting findings and making decisions based on interview data.

In conclusion, while the interview method offers valuable insights, it is imperative to acknowledge its inherent limitations. These limitations encompass the small sample size, potential for bias, subjectivity in responses, and constraints in time and resources. Awareness of these limitations empowers researchers and project managers to make informed decisions, supplementing interview data with additional research methods to ensure a thorough understanding of the project.

3.1.7.4 Context of the Interviews and Influence on Responses:

The scope of the interviews in the provided document centers on the Cubic (Mukaab) Project and its alignment with Vision 2030 of Saudi Arabia. Each interview participant, encompassing the project consultant, project director, project engineer, project manager, and project specialist, shares insights based on their respective roles, elucidating how lessons learned and case studies from successful sustainable projects can contribute to the (Mukaab) Project and its alignment with Vision 2030.

The responses elicited from the interviewees are inherently influenced by their specific roles and areas of expertise. For instance, the project consultant accentuates strategic alignment, risk mitigation, and innovation and efficiency. The project director underscores stakeholder engagement, collaboration, and continuous improvement. The project engineer directs attention towards technical innovations, construction practices, and the integration of systems. The project manager places emphasis on project planning, collaboration, and continuous improvement. Simultaneously, the project specialist highlights technical expertise, risk management, and performance evaluation.

In sum, the responses manifest the diverse perspectives and expertise of the interviewees, collectively offering a comprehensive panorama of how lessons learned and case studies can inform and enrich the alignment of the (Mukaab) Project with Vision 2030. The contextual focus of the interviews ensures a nuanced consideration of various project facets,

such as strategic planning, stakeholder engagement, technical innovations, and performance evaluation, in relation to sustainability and the overarching goals of Vision 2030.

3.1.7.5 Conclusions and Recommendations:

These case studies contribute a comprehensive understanding of various dimensions within sustainable projects, encompassing technical innovations, construction practices, systems integration, resource optimization, and performance monitoring. Analyzing these insights enables the project team to discern effective strategies, methodologies, and best practices validated in attaining sustainability objectives.

Furthermore, the examination of case studies facilitates the identification of potential risks and challenges inherent in project implementation. A nuanced comprehension of how analogous projects addressed similar issues empowers the development of proactive measures, ensuring seamless project delivery.

Successful projects often incorporate innovative solutions and efficient practices. Through a thorough examination of these case studies, the project team can pinpoint innovative technologies, methodologies, and processes applicable to the Cubic Project, thereby enhancing sustainability, cost-effectiveness, and operational efficiency.

Drawing insights from lessons learned and case studies of successful sustainable projects yields key findings that underpin conclusions or recommendations for the Cubic (Mukaab) Project. These findings underscore the significance of continuous improvement, technical expertise, risk management, performance evaluation, technical innovations, construction practices, systems integration, resource optimization, and performance monitoring. Integrating these insights across the project's planning, design, construction, and operational phases enables the Cubic Project to bolster its sustainability performance, align with Vision 2030 goals, mitigate risks, optimize resource utilization, and foster effective collaboration and communication among project teams and stakeholders. Moreover, embracing innovative technologies, efficient construction practices, and robust performance monitoring mechanisms ensures the project maximizes its environmental and economic impact.

In summary, lessons learned and case studies derived from successful sustainable projects constitute a valuable repository of knowledge and practical insights, enriching the planning, design, construction, and operation phases of the Cubic (Mukaab) Project, aligning it with the goals and objectives of Vision 2030 in Saudi Arabia.

3.2 Survey:

3.2.1 Introduction:

In the contemporary landscape of project management, the pursuit of sustainability has emerged as a paramount objective, necessitating a nuanced comprehension of best practices and lessons learned. This research aims to explore "The Impact of Lessons Learned and Case Studies on Sustainable Projects," with a specific emphasis on the application of these insights to the Cubic (Mukaab) project. By investigating the dynamics of integrating lessons learned and case studies, the goal is to unravel the intricate connections between these practices and the success of sustainable projects, thereby contributing to the refinement of project management strategies in the domain of sustainability.

The survey comprises eight primary sections (refer to Section 1.6), encompassing questions designed to ascertain the descriptive characteristics of the sample concerning work sector, gender, age, educational qualification, years of experience, level of expertise, participants' employer sector, scope of projects participated in, description of the project role, and the focal point of the research (see Section 1.6).

The evaluation of the impact extent of patterns and actions has been directed towards different project management roles, scopes, and sectors. This involves the examination of various job titles within project management (refer to Section 1.6). The analysis of survey sections has been conducted broadly and from the perspectives of project coordinators, engineers, managers, directors, consultants, and other roles related to project management. Additionally, it is approached from the standpoint of government, semi-government, private sectors, and independent business entities, highlighting roles such as clients, client representatives, consultants, third parties, main contractors, and sub-contractors. The survey focuses on diverse project scopes such as industrial, construction, infrastructure, etc. (see Section 1.6), involving roles in design, engineering, procurement and construction (EPC), supervision and surveillance, logistics and supply chain, and auditing.

The survey has been distributed among a cohort of project experts with experience in project management and sustainability to ensure the collection of accurate data. A total of 100 responses have been garnered from participants, constituting the research sample.

3.2.2 Objective of Study:

The primary objective of this study is to assess the influence of lessons learned and case studies on large-scale sustainable projects, with a specific focus on the Cube Project in Riyadh. This evaluation will be conducted by implementing best practices and aligning with the goals outlined in Saudi Arabia's Vision 2030.

3.2.3 The Significant of Study:

Sustainable mega projects hold significant importance in fostering sustainable economic and social development, demanding specialized capabilities and skills in project management. These skills include the adept utilization of lessons learned and case studies.

Therefore, this study assumes crucial significance as it endeavors to assess the influence of lessons learned and case studies on the success of substantial sustainable projects. This evaluation is conducted through the application of best practices, focusing on the Cube Project in Riyadh, and aligning with the strategic goals outlined in the Kingdom of Saudi Arabia's Vision 2030.

3.2.4 Participant Insights and Anonymity:

The candid and forthcoming responses from participants bear pivotal significance for the successful outcome of this study. The firsthand experiences and perspectives they provide are poised to make substantial contributions to our cumulative knowledge within the domain of sustainable project management. In order to uphold the reliability and veracity of their responses, the survey has been meticulously crafted to safeguard the anonymity of participants. No personally identifiable information will be divulged, and responses will be amalgamated and scrutinized collectively. The paramount importance of privacy is duly recognized, and all collected information will be handled with the utmost confidentiality.

3.2.5 Consent for Survey Participation:

Dear Participant,

We extend our sincere gratitude to you for actively participating in this research study. Your willingness to contribute your time and insights is immensely appreciated.

Your valuable input plays a crucial role in advancing our understanding of how lessons learned and case studies impact sustainable projects, with a specific focus on the Cubic (Mukaab) project. By sharing your experiences, you have contributed to the collective knowledge that will shape the discourse on sustainable project management.

We recognize and value the importance of your perspectives, and we are grateful for your commitment to furthering the objectives of this research. Your engagement has been instrumental, and we extend our heartfelt thanks for your invaluable contribution.

Thank you once again for your participation and for being a vital part of this study.

Warm regards,

Anwar Nasseraldeen H Kriri

Searchers Leaders

Email: ankriri11@gmail.com

Phone: +966-534-898-985

3.2.6 Purpose and Benefits of Survey:

Sustainable projects represent a pivotal frontier wherein environmental, social, and economic considerations intersect. This study aims to elucidate the significance of lessons learned and case studies as essential instruments for cultivating sustainability within project frameworks, utilizing the ongoing Cubic project as a paradigmatic example. Through the amalgamation of experiences encapsulated in these lessons and case studies, the aspiration is to distill actionable insights

capable of informing and optimizing project practices, thereby contributing to the broader discourse on sustainable project management.

In the pursuit of sustainability, the integration of best practices becomes not merely a strategic imperative but also a collective responsibility. This research endeavors to discern patterns, challenges, and success factors that emerge during the application of lessons learned and case studies, presenting a navigational guide for project professionals amidst the dynamic landscape of sustainable project management.

The study's primary objective is to investigate the impact of incorporating lessons learned and case studies on the success and sustainability of projects, with specific attention to the Cubic (Mukaab) project. Employing a survey methodology, the study will collate data from experts in project management and sustainability to address the following key inquiries:

- a) To what extent are lessons learned and case studies presently integrated into Cubic (Mukaab) project management processes?
- b) How do lessons learned and case studies exert influence on project decision-making, risk mitigation, and overall project performance?
- c) In what manners do lessons learned and case studies contribute to the sustainable development goals of the Cubic (Mukaab) project?
- d) What are the perceived strengths and weaknesses of Cubic (Mukaab) project's current approach to incorporating lessons learned and case studies?
- e) What best practices for utilizing lessons learned and case studies in project management are identified by Cubic (Mukaab) project participants?

3.2.7 Rationale for survey:

The survey method is a strategic choice for your research, offering a practical and efficient means of collecting quantitative data from a broad range of stakeholders involved in or impacted by the Cubic (Mukaab) project. It aligns well with the goals of study, providing a foundation for rigorous analysis and the generation of insights into the application of best practices in project management and sustainability. Using surveys in this research provides a robust and versatile approach to understanding the multifaceted relationship between lessons learned, case studies, and project sustainability. By capturing diverse perspectives, measuring perceptions, and quantifying impacts, we can gain valuable insights and develop actionable recommendations for the Cubic (Mukaab) project to maximize the positive contribution of these knowledge management tools to its sustainable project endeavors.

3.2.8 Significance of the Study:

Utilizing a survey method in this research titled "The Impact of Lessons Learned and Case Studies on Sustainable Projects: Applying Best Practices for the Project of Cubic" holds significant value for several reasons:

- a) **Capturing a Wide Range of Perspectives:** Surveys allow you to gather data from a diverse range of individuals involved in Cubic's project life cycle, including project managers, team members, stakeholders, and external experts. This broadens the scope of the study and ensures you capture the multifaceted perspectives on the impact of lessons learned and case studies.
- b) **Measuring Attitudes and Perceptions:** Beyond concrete data on project outcomes, surveys enable you to delve into the subjective experiences and perceptions of participants. This reveals how individuals feel about the usefulness, accessibility, and effectiveness of lessons learned and case studies in Cubic's project environment.
- c) **Quantifying the Impact on Sustainability:** Surveys can incorporate quantitative scales to measure the perceived or observed influence of lessons and case studies on specific sustainability indicators relevant to Cubic's project. This allows you to statistically assess their contribution to achieving economic, environmental, and social sustainability goals.
- d) **Identifying Best Practices and Gaps:** Analyzing survey responses can reveal patterns and trends in how lessons and case studies are currently used within Cubic. This helps identify areas where existing practices are successful and pinpoints potential gaps or areas for improvement in knowledge management and utilization.
- e) **Cost-Effectiveness and Efficiency:** Compared to other methods like in-depth interviews or observations, surveys offer a cost-effective and efficient way to gather data from a large sample. This optimizes resource allocation and allows you to reach a wider range of participants within a shorter timeframe.
- f) **Longitudinal Tracking:** Surveys can be conducted at multiple stages of the Cubic project, allowing you to track changes in attitudes, perceptions, and practices over time. This provides valuable insights into the evolving impact of lessons learned and case studies and facilitates the assessment of long-term learning and sustainability outcomes.

Overall, the survey method provides a robust and versatile tool for this research. It enables you to gather comprehensive data, quantify the impact on sustainability, identify best practices and gaps, and track changes over time, ultimately contributing to a well-rounded understanding of how lessons learned and case studies can drive success in sustainable projects like the Cubic (Mukaab) Project.

3.2.9 Target Population:

Participants involved in the Cubic project with diverse project management roles:

- a) Project Consultant
- b) Project Director
- c) Project Manager
- d) Project Engineer
- e) Project Coordinator
- f) Others related to project management

3.2.10 Survey Length:

The determination of the optimal length for the survey is contingent upon various factors, encompassing the intricacy of the research inquiries, the requisite depth of information, and the attention span of the participants. Nevertheless, it is generally recommended to maintain surveys in a succinct format, ensuring the collection of essential data. The survey breakdown has incorporated the Likert scale in the following manners:

3.2.10.1 Introduction and General Demographical Information (Section 1):

Brief introduction and participant demographics (10 questions) includes:

- a) Gender (Male/Female).
- b) Age (from 20 to more than 60 years).
- c) Educational Background (High school, High diploma, Bachelor's degree, Master degree and Ph.D. or other equivalent).
- d) Job title/Occupational Position (Consultant, Director, Manager, Engineer, Coordinator and Other related to project management).
- e) Level of Expertise in Project Management (Novic, Intermediate, Advanced, Expert and Proficient).
- f) The participants' employer that they are working in (Government, Semi-government, Private, Own-business, and Job seeker).
- g) The project role of the participants' employer that they are working in (Client, Consultant, Contractors, and 3rd party).
- h) The project type that the participants are working in (Construction, Infrastructure, Industrial, or related to other business matters).
- i) The project scope of the participants' employer that they are working for (Design, EPC, Surveillance, Supply chain and Auditing).

3.2.10.2 Assessing Comprehension in the Context of Sustainable Mega-Projects (Section 2):

In assessing participants' comprehension within the context of sustainable mega-projects through a survey, several key questions were employed. Firstly, respondents were queried about their understanding of the concept of sustainable mega-projects. Subsequently, participants were asked to express the extent to which they concurred with the notion that sustainable mega-projects possess significant potential to contribute to the attainment of sustainable development goals. Another crucial aspect explored was the participants' perspectives on the importance of integrating sustainability principles into the planning, design, and implementation phases of mega-projects. The survey further delved into the identification of primary challenges perceived by participants in the implementation of sustainable practices within mega-projects. Lastly, participants were prompted to articulate their expectations for the Cubic (Mukaab) project, specifically with regard to its anticipated contribution to sustainable development. These inquiries collectively aimed to elucidate participants'

comprehension, attitudes, and expectations regarding the integration of sustainability considerations in mega-project initiatives.

This section has been comprised five carefully selected questions designed to evaluate the participants' comprehension of sustainability within the context of Mega-Projects, as presented in the below table:

No.	Qusetion	Answers
1	To what you understand the concept of sustainable mega-projects?	Extremely well
		Moderately well
		Somewhat well
		Not very well
		Not at all
2	To what you extent do you agree that sustainable mega-projects can contribute significantly to achieving sustainable development goals?	Strongly agree
		Agree
		Neutral
		Disagree
		Strongly disagree
3	How important do you consider incorporating sustainability principles into the planning, design, and implementation of mega-projects?	Extremely important
		Very important
		Moderately important
		Somewhat important
		Not important
4	What is the key challenge do you think in implementing sustainable practices in mega-projects?	Balancing economic, social, and environmental considerations
		Integrating sustainability into existing project management frameworks
		Measuring and evaluating the sustainability performance of mega-projects
		Obtaining stakeholder buy-in and support for sustainable practices
		Overcoming technical and technological limitations
5	What are your expectations for the Cubic (Mukaab) project in terms of its contribution to sustainable development?	Set a new standard for sustainable mega-projects
		Demonstrate the feasibility of large-scale sustainable infrastructure
		Serve as a model for future sustainable cities
		Catalyze advancements in sustainable technologies
		Make a significant contribution to Saudi Arabia's Vision 2030

Table17: Illustrates the Content Encompassed by Section 2 in the Survey.

3.2.10.3 Evaluating Familiarity with the Cubic (Mukaab) Project in Riyadh and the Vision 2030 of Saudi Arabia (Section 3):

The survey aimed to gauge participants' familiarity with the Cubic (Mukaab) Project in Riyadh and their comprehension of Vision 2030 in Saudi Arabia. Participants were queried about their knowledge of Vision 2030 and the Cubic (Mukaab) Project,

using questions such as "To what extent are you familiar with Vision 2030 of Saudi Arabia?" and "To what extent are you familiar with the Cubic (Mukaab) Project in Riyadh?" Additionally, participants were prompted to articulate their perspectives on the alignment between the Cubic (Mukaab) Project and the objectives of Vision 2030, with questions like "To what extent do you think that the Cubic (Mukaab) Project aligns with the goals of Vision 2030 in Saudi Arabia?" The survey delved into participants' insights on major sustainability challenges foreseen for the Cubic (Mukaab) Project, as evident in questions such as "In your opinion, what are the major sustainability challenges that the Cubic (Mukaab) Project might face?" Furthermore, participants were invited to assess the project's incorporation of lessons learned from prior mega-projects, with the inquiry, "How well do you think the Cubic (Mukaab) Project has utilized lessons learned from previous mega-projects?" Finally, participants were asked to express their confidence in the Cubic (Mukaab) Project's potential to set a standard for future mega-projects in sustainability, phrased as "Do you believe that the Cubic (Mukaab) Project can serve as a benchmark for future mega-projects in terms of sustainability?" In sum, these inquiries collectively aimed to capture nuanced insights into participants' perceptions and evaluations concerning the Cubic (Mukaab) Project's alignment with Vision 2030 and its prospective influence on sustainability practices in future mega-projects.

No.	Qusetion	Answers
1	To what is you familiar with the Vision 2030 of Saudi Arabia?	Extremely familiar
		Slightly familiar
		Moderately familiar
		Very familiar
		Not at all familiar
2	To what is you familiar with the Cubic (Mukaab) Project in Riyadh?	Extremely familiar
		Slightly familiar
		Moderately familiar
		Very familiar
		Not at all familiar
3	To what extent do you think that the Cubic (Mukaab) Project aligns with the goals of Vision 2030 in Saudi Arabia?	Slightly
		Moderately
		Very much
		Completely
		Not at all
4	In your opinion, what is the major sustainability challenges that the Cubic (Mukaab) Project might face?	Environmental impact
		Social impact
		Economic sustainability
		Technological challenges
		Political/regulatory issues
5	How well do you think the Cubic (Mukaab) Project has utilized lessons learned from previous mega-projects?	Poorly
		Fairly
		Adequately
		Well
		Excellently
6	Do you believe that the Cubic (Mukaab) Project can serve as a benchmark for future mega-projects in terms of sustainability?	Slightly
		Moderately
		Very much
		Completely
		Not at all

Table18: Illustrates the Content Encompassed by Section 3 in the Survey.

3.2.10.4 Assessing Comprehension in the Context of Lessons Learned and Case Studies (Section 4):

The survey instrument employed for assessing comprehension in the context of lessons learned and case studies regarding mega-projects encompasses a series of questions aimed at gauging participants' perspectives on the significance and impact of such knowledge-sharing practices. Participants were queried on their perceptions of the importance of lessons learned and case studies in the realm of mega-projects, the influence of prior project insights on the success of current endeavors, and the necessity for a systematic approach to documenting and disseminating such knowledge in mega-project settings. Additionally, respondents provided their perspectives on the criticality of incorporating lessons learned from previous mega-projects specifically within the Cubic (Mukaab) project, as well as the perceived contributions of lessons learned and case studies to the achievement of sustainability goals and overall project efficiency. The survey also explored participants' views on the value of case studies derived from successful sustainable mega-projects in shaping the design and implementation of the Cubic (Mukaab) project, the role of lessons learned and case studies in mitigating risks, and the frequency with which participants or their organizations engage in the review and analysis of past project lessons before initiating new mega-projects. Lastly, participants were invited to express their opinions on the role of case studies in enhancing the sustainability of mega-projects. Through these inquiries, the survey aimed to capture a nuanced understanding of participants' perceptions regarding the incorporation of lessons learned and case studies in the context of mega-projects, with a specific focus on the Cubic (Mukaab) project and its sustainability goals.

No.	Qusetion	Answers	No.	Qusetion	Answers
1	How important do you think lessons learned and case studies are in the context of mega-projects?	Extremely important	6	To what extent do you agree that incorporating lessons learned and case studies can enhance the overall efficiency and effectiveness of the Cubic (Mukaab) project?	Strongly agree
		Very important			Agree
		Moderately important			Neutral
		Somewhat important			Disagree
		Not important			Strongly disagree
2	To what extent do you believe that successful mega-projects are influenced by the incorporation of lessons learned from previous projects?	Slightly	7	How valuable do you consider case studies of successful sustainable mega-projects in shaping the design and implementation of the Cubic (Mukaab) project?	Extremely Valuable
		Moderately			Very Valuable
		Very much			Moderately Valuable
		Completely			Somewhat Valuable
		Not at all			Not Very Valuable
3	Do you think there is a need for a systematic approach to documenting and disseminating lessons learned and case studies in mega-projects?	Strongly agree	8	How important do you consider the role of lessons learned and case studies in mitigating risks and challenges associated with the Cubic (Mukaab) project?	Extremely important
		Agree			Very important
		Neutral			Moderately important
		Disagree			Somewhat important
		Strongly disagree			Not important
4	To what extent do you agree that incorporating lessons learned from previous mega-projects is crucial for the success of the Cubic (Mukaab) project?	Strongly agree	9	How often do you or your organization review and analyze lessons learned from past projects before initiating a new mega-project?	Never
		Agree			Rarely
		Neutral			Occasionally
		Disagree			Frequently
		Strongly disagree			Always
5	To what extent do you believe that lessons learned and case studies can help the Cubic (Mukaab) project achieve its sustainability goals?	Strongly agree	10	In your opinion, what role do case studies play in improving the sustainability of mega-projects?	Minimal role
		Agree			Moderate role
		Neutral			Significant role
		Disagree			Essential role
		Strongly disagree			No role

Table19: Illustrates the Content Encompassed by Section 4 in the Survey.

In assessing the applicability of lessons learned and case studies in the context of the Cubic (Mukaab) project in Riyadh, participants were queried on several key dimensions. Participants were asked to gauge the relevance of lessons learned from previous mega-projects to the specific parameters of the Cubic (Mukaab) project. Additionally, respondents were prompted to express their beliefs regarding the adaptability of case studies showcasing successful sustainable mega-projects to the unique intricacies of the Cubic (Mukaab) initiative. Furthermore, participants were solicited for their perspectives on the relevance of sustainability practices and strategies identified in successful case studies to the Cubic (Mukaab) project. Insights were also sought regarding the extent to which challenges and solutions outlined in case studies could be applied to address pertinent issues within the Cubic (Mukaab) project. Lastly, participants were asked to assess the transferability of lessons learned and best practices from case studies to the specific dynamics of the Cubic (Mukaab) project. These inquiries collectively aimed to garner a nuanced understanding of participants' perceptions regarding the practicality and adaptability of lessons and insights derived from external project experiences to the Cubic (Mukaab) initiative.

No.	Qusetion	Answers
1	How applicable do you consider the lessons learned from previous mega-projects to the specific context of the Cubic (Mukaab) project in Riyadh?	Highly Applicable
		Moderately Applicable
		Somewhat Applicable
		Limited Applicability
		Not Applicable
2	To what extent do you believe that case studies of successful sustainable mega-projects can be effectively adapted to the Cubic (Mukaab) project?	Strongly agree
		Agree
		Neutral
		Disagree
		Strongly disagree
3	How relevant do you consider the sustainability practices and strategies employed in successful case studies to the Cubic (Mukaab) project?	Highly Relevant
		Moderately Relevant
		Somewhat Relevant
		Limited Relevance
		Not Relevant
4	To what extent do you agree that the challenges addressed and solutions implemented in case studies can be applied to the Cubic (Mukaab) project?	Strongly agree
		Agree
		Neutral
		Disagree
		Strongly disagree
5	How transferable do you consider the lessons learned and best practices from case studies to the Cubic (Mukaab) project?	Highly Transferable
		Moderately Transferable
		Somewhat Transferable
		Limited Transferability
		Not Transferable

Table20: Illustrates the Content Encompassed by Section 5 in the Survey.

3.2.10.6 Assessing Comprehension in the Context of the Integration of Lessons Learned and Case Studies (Section 6):

In assessing comprehension within the context of the integration of lessons learned and case studies for the Cubic (Mukaab) project, participants' perspectives were sought through a series of questions. The first question probed the clarity of understanding regarding lessons learned and best practices derived from pertinent case studies. Participants were asked to express the extent to which they agreed on the existence of a clear understanding in this regard. Subsequently, attention was directed towards the effectiveness of integrating these lessons and case studies into the planning and design phases of the Cubic (Mukaab) project, with participants providing insights into their perceptions of the integration process. Furthermore, the survey inquired about the alignment of sustainability principles and strategies within the Cubic (Mukaab) project, gauging participants' agreement on the project's incorporation of these elements guided by lessons learned and case studies. Additionally, participants were prompted to evaluate the project's adeptness in adapting and applying risk mitigation strategies identified in relevant case studies. The final question explored the extent to which participants concurred that lessons learned and case studies were instrumental in enhancing overall project management and decision-making processes for the Cubic (Mukaab) project. These inquiries collectively aimed to elucidate participants' perspectives on the practical application and assimilation of knowledge derived from lessons learned and case studies in the project's lifecycle.

No.	Qusetion	Answers
1	To what extent do you agree that there is a clear understanding of the lessons learned and best practices from relevant case studies?	Strongly agree
		Agree
		Neutral
		Disagree
		Strongly disagree
2	How effectively do you believe the lessons learned and case studies are being integrated into the planning and design of the Cubic (Mukaab) project?	Extremely Effective
		Very Effective
		Moderately Effective
		Somewhat Effective
		Not Effective
3	To what extent do you agree that the Cubic (Mukaab) project is incorporating sustainability principles and strategies aligned with the lessons learned and case studies?	Strongly agree
		Agree
		Neutral
		Disagree
		Strongly disagree
4	How well do you believe the Cubic (Mukaab) project is adapting and applying the risk mitigation strategies identified in relevant case studies?	Extremely well
		Moderately well
		Somewhat well
		Not very well
		Not at all
5	To what extent do you agree that the lessons learned and case studies are being used to enhance the overall project management and decision-making for the Cubic (Mukaab) project?	Strongly agree
		Agree
		Neutral
		Disagree
		Strongly disagree

Table21: Illustrates the Content Encompassed by Section 6 in the Survey.

3.2.10.7 Assessing Application of Best Practices (Section 7):

The assessment of the application of best practices within the context of mega-projects, specifically the Cubic (Mukaab) initiative, is integral to understanding the efficacy of project management processes. Participants' perspectives on the incorporation of best practices during various project phases, decision-making processes, the significance of dedicated teams for lessons learned, integration of sustainability considerations, and the organizational culture's openness to continuous improvement offer critical insights. In response to the first question, participants are asked to evaluate the current application of best practices in the planning phase of mega-projects, providing a nuanced understanding of the existing practices. The second question delves into the effectiveness of integrating lessons learned into decision-making processes, elucidating the practicality and impact of these insights. The third question seeks participants' experiential perspectives on the importance of dedicated teams for capturing and disseminating lessons learned throughout mega-projects, shedding light on organizational structures that facilitate knowledge management. Addressing sustainability concerns, the fourth question explores the extent to which sustainable considerations are interwoven into best practices within mega-project management. Lastly, the fifth question explores the organizational culture's receptivity to the continuous improvement of mega-project management practices, offering valuable insights into the adaptive and learning culture of the workplace. The collective responses to these questions will contribute to a comprehensive understanding of the application of best practices and inform recommendations for enhancing mega-project management effectiveness.

No.	Qusetion	Answers
1	To what extent do you think best practices are currently applied in the planning phase of mega-projects such as the cubic (Mukaab)?	Slightly
		Moderately
		Very much
		Completely
		Not at all
2	How effectively are lessons learned incorporated into the decision-making processes during the execution phase of mega-projects projects such as the cubic (Mukaab)?	Extremely Effective
		Very Effective
		Moderately Effective
		Somewhat Effective
		Not Effective
3	In your experience, how important is it to have a dedicated team responsible for capturing and disseminating lessons learned throughout a mega-project such as the cubic (Mukaab)?	Extremely important
		Very important
		Moderately important
		Somewhat important
		Not important
4	To what extent are sustainability considerations integrated into the best practices followed in mega-project management?	Slightly
		Moderately
		Very much
		Completely
		Not at all
5	How open is the organizational culture in your workplace to the continuous improvement of mega-project management practices?	Not open at all
		Slightly open
		Moderately open
		Very open
		Extremely open

Table22: Illustrates the Content Encompassed by Section 7 in the Survey.

3.2.10.8 Overall Perception (Section 8):

In gauging the overall perception of participants in the survey regarding the impact of lessons learned and case studies on the success of sustainable mega-projects, a multifaceted inquiry was undertaken. Participants were asked to provide a rating on the perceived impact of lessons learned and case studies on the success of sustainable mega-projects, aiming to capture a quantitative measure of their overall assessment (Question 1). Furthermore, participants were invited to articulate their opinions on the major factors contributing to the success of sustainable mega-projects, thereby offering qualitative insights into the perceived determinants of project success (Question 2).

The survey also sought participants' confidence levels in the construction industry's ability to adapt and implement sustainable practices in mega-projects, fostering an evaluation of their trust in the industry's capacity for sustainable development (Question 3). Participants were prompted to express their views on the extent to which government policies and regulations support the implementation of sustainable practices in mega-projects, illuminating the perceived influence of external factors on project sustainability (Question 4).

Finally, participants were encouraged to provide recommendations for enhancing the integration of lessons learned and case studies in the planning and execution of sustainable mega-projects, thereby consolidating their experiential insights into actionable improvements (Question 5).

Through this comprehensive approach, the survey aimed to capture a nuanced and holistic understanding of participants' perspectives on the dynamics influencing the success and sustainability of mega-projects in the construction industry.

No.	Question	Answers
1	How would you rate the impact of lessons learned and case studies on the success of sustainable mega-projects?	Negative
		Very negative
		Neutral
		Positive
		Very positive
2	In your opinion, what are the most major factor that contribute to the success of sustainable mega-projects?	Adequate planning
		Stakeholder engagement
		Effective risk management
		Technological innovation
		Robust lessons learned process
3	How confident are you in the ability of the construction industry to adapt and implement sustainable practices in mega-projects?	Extremely important
		Very important
		Moderately important
		Somewhat important
		Not confident at all
4	To what extent do you think government policies and regulations support the implementation of sustainable practices in mega-projects?	Slightly
		Moderately
		Very much
		Completely
		Not at all
5	What recommendations do you have for improving the integration of lessons learned and case studies in the planning and execution of sustainable mega-projects?	

Table23: Illustrates the Content Encompassed by Section 8 in the Survey.

3.2.11 Characteristics of the Study Sample:

3.2.11.1 Introduction and General Demographical Information (Section 1):

a) Gender:

Gender	Frequency	Percent
Male	52	51.5
Female	49	48.5
Total	101	100

Table24: Participants' characteristics according to their gender (n= 101)

According to the table provided, there is a nearly equal distribution of male and female participants in the study. Males constitute 51.5% (52 males) and females make up 48.5% (49 females) of the total 101 participants.

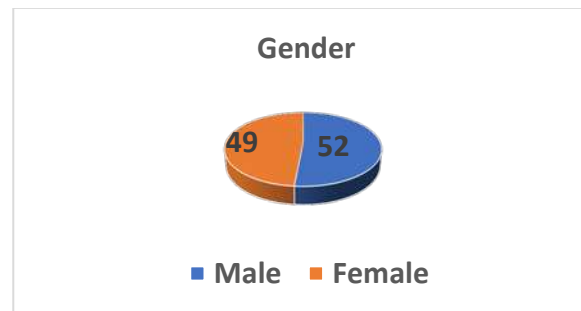


Figure 10: gender for the participants

b) Age Categories:

Age	Frequency	Percent
20-30 Years	27	26.7
30-40 Years	47	46.5
30-40 Years	16	15.8
50-60 Years	11	10.9
Total	101	100

Table25 Participants' characteristics according to their Age (n= 101)

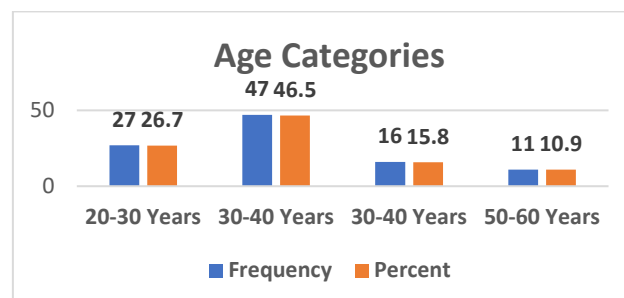


Figure 11: Age for the participants

Based on table 24 and Figure 11 which shows the Age the participants in the questionnaire, the data presented, 46.5% of the study participants are aged between 30-40 years. Additionally, 26.7% of the participants are in the 20–30-year age bracket. Participants in the 40–50-year range constitute 15.8% of the total, while those aged 50-60 years account for 10.9% of the study group.

c) Educational Background:

Educational Background	Frequency	Percent
High School	6	5.9
High Diploma	12	11.9
Bachelor's Degree	46	45.5
Master's Degree	31	30.7
Ph.D. or equivalent	6	5.9
Total	101	100

Table26 Participants' characteristics according to their Educational Background (n= 101)

This table 25 shows that educational background of the 101 survey participants varies significantly. Those with a Bachelor's degree from the largest group at 45.5%, Master's degree holders follow, comprising 30.7%, High Diploma recipients account for 11.9%. Both High School graduates and those with a Ph.D. or equivalent level of education each make up 5.9%, representing the smallest groups in the survey. This distribution highlights a diverse range of educational backgrounds among the participants

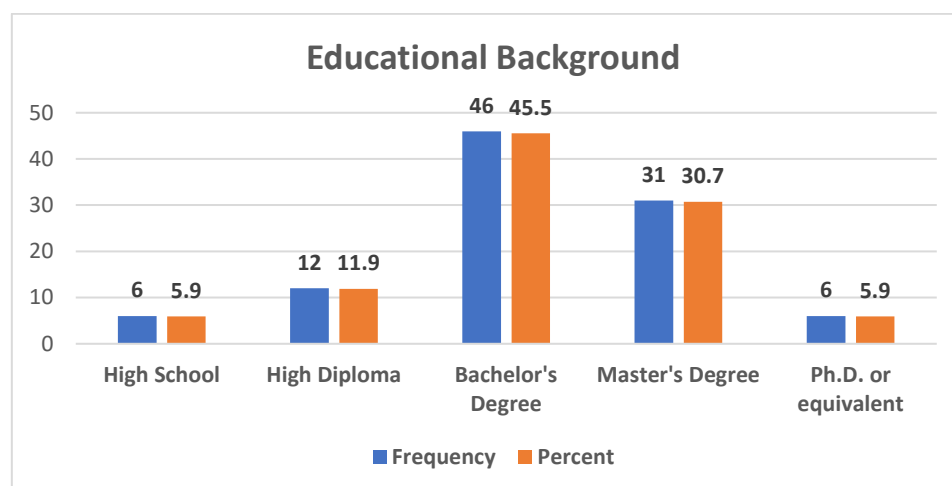


Figure 12: Educational Background for the participants

d) Job title/Occupational Position:

Job title/Occupational Position	Frequency	Percent
Project Manager	19	18.8
Project Engineer	27	26.7
Project Coordinator	15	14.9
Project Consultant	9	8.9
Others related to Projects management	31	30.7
Total	101	100

Table 26 Participants' characteristics according to their Position / Job title (n= 101)

From the table, it is evident that the largest group of survey participants, accounting for 30.7%, are involved in various roles related to project management. Following this, Project Engineers make up 26.7% of the participants, highlighting their active role in the sector.

Project Managers, responsible for overseeing project execution, represent 18.8%. Project Coordinators, crucial for organizing and facilitating project tasks, constitute 14.9%. Finally, Project Consultants, providing specialized expertise and guidance, form the smallest group at 8.9%.

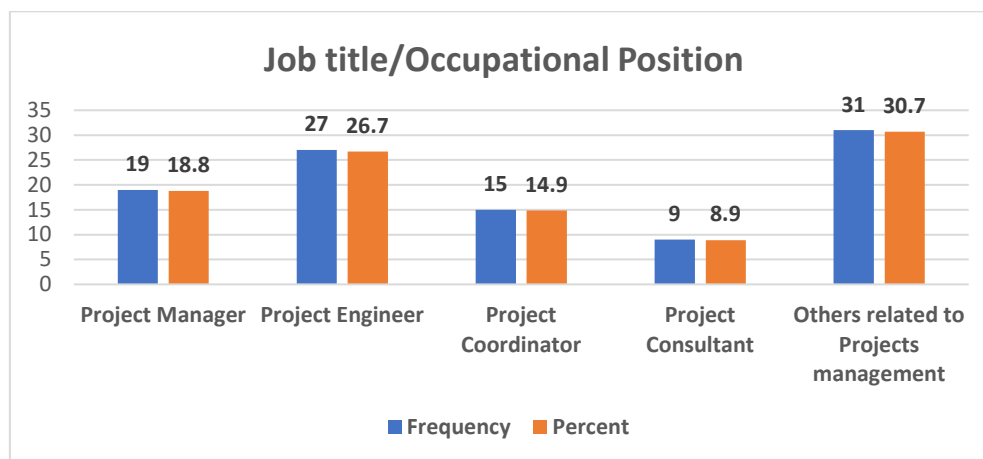


Figure 13: Position / Job title for the participants

e) **Level of Expertise in Project Management:**

Level of Expertise in Project Management:	Frequency	Percent
Novice	27	26.7
Intermediate	33	32.7
Advance	24	23.8
Expert	13	12.9
Proficient	4	4.0
Total	101	100

Table27 Participants' characteristics according to their Level of Expertise in Project Management: (n= 101)

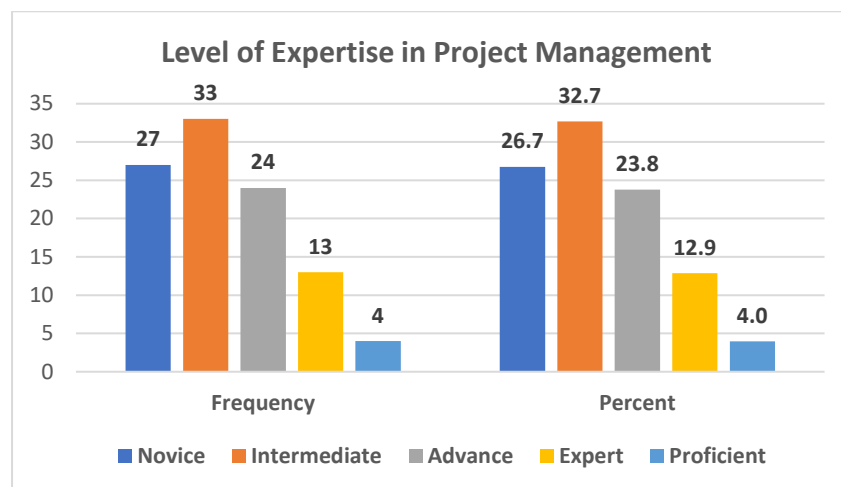


Figure 14: Level of Expertise for the participant

In the survey focusing on the level of expertise in project management among 101 participants, 32.7% are at an intermediate level, suggesting a strong foundation in project management skills.

Novices, those still acquiring fundamental skills, account for 26.7%. This is followed by 23.8% who are at an advanced level, demonstrating a deeper understanding and application of project management principles.

12.9% are classified as experts, indicating a high degree of mastery and experience. Those who are proficient, representing the pinnacle of expertise, constitute 4.0%, highlighting a smaller group with extensive expertise and leadership in project management.

f) Professional Experience in Mega-Projects:

Professional Experience in Mega-Projects:	Frequency	Percent
A year or less	37	36.6
2 years	20	19.8
3-8 years	24	23.8
9-15 years	16	15.8
More than 15 years	4	4.0
Total	101	100

Table28: Participants' characteristics according to their Professional Experience in Mega-Projects (n= 101)

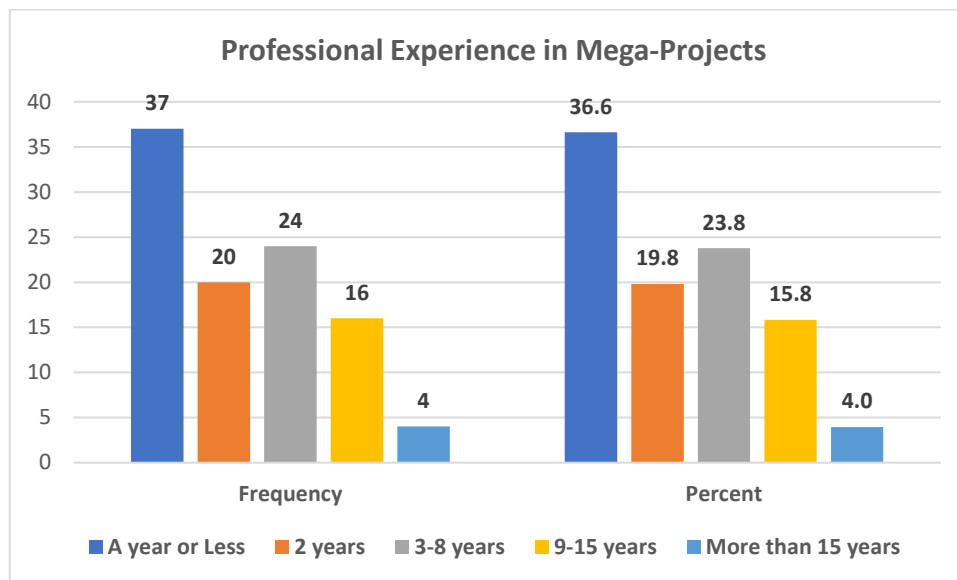


Figure 15: Professional Experience for the participants

In this survey of 101 participants with experience in mega-projects, the largest group, making up 36.6%, has one year or less of experience, indicating a substantial influx of newer professionals in this field.

Those with 2 years of experience represent 19.8%. Participants with 3 to 8 years of experience comprise 23.8%, showing a significant presence of mid-level experienced professionals. The 9 to 15 years' experience group accounts for 15.8%, while those with more than 15 years of experience in mega-projects are the smallest group at 4.0%.

g) The participants' employer that they are working in:

The participants' employer that they are working in	Frequency	Percent
Government	23	22.8
Semi-Government	12	11.9
Private Sector	40	39.6
Own Business	16	15.8
Job Seeker	10	9.9
Total	101	100

Table29 Participants' characteristics according to their employer working in (n= 101)

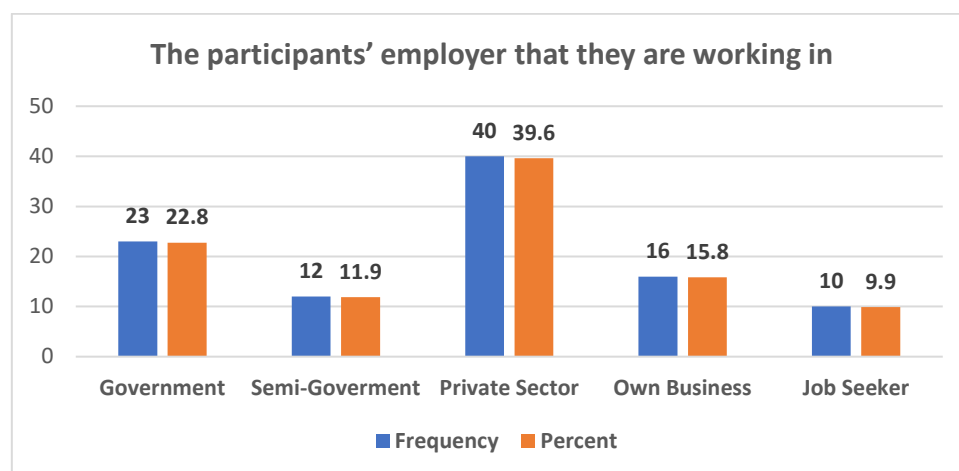


Figure 16: The employer for the participants

In the survey of 101 participants regarding their employment sectors, 39.6% are employed in the private sector, representing the largest group. This is followed by 22.8% working in government roles, indicating significant public sector involvement. Semi-government positions are held by 11.9% of the participants, while 15.8% run their own businesses. Job seekers make up 9.9% of the respondents, reflecting those currently seeking employment.

h) The project role of the participants' employer that they are working in:

The project role of the participants' employer that they are working in	Frequency	Percent
Client	25	24.8
Client Representative	20	19.8
Consultant	17	16.8
Main Contractor	19	18.8
Sub-contractor	10	9.9
3rd Party	10	9.9
Total	101	100

Table30 Participants' characteristics according to their role of your employer in the project working in (n= 101)

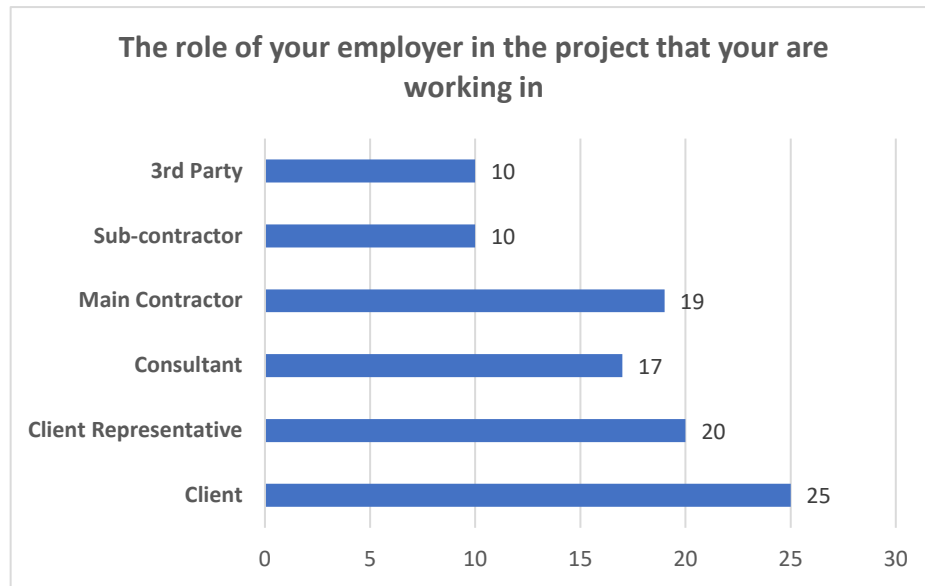


Figure 17: The employer role in the project working for the participants

Among the participants in the project, 24.8% are clients, showing their direct engagement. Another 19.8% serve as client representatives, indicating active client oversight. Main contractors account for 18.8%, highlighting their central role in the project's execution. Consultants, contributing expert advice, make up 16.8%. Sub-contractors and 3rd parties, each involved in specialized aspects, constitute 9.9% of the participants respectively.

i) **The project type that the participants are working in:**

The project type that the participants are working in	Frequency	Percent
Construction	28	27.7
Infrastructure	17	16.8
Industrial	20	19.8
Related to Business Implementation / Development	23	22.8
Related to software development / Continuous Improvement	13	12.9
Total	101	100

Table 31 Participants' characteristics according to their project type that working in (n= 101)

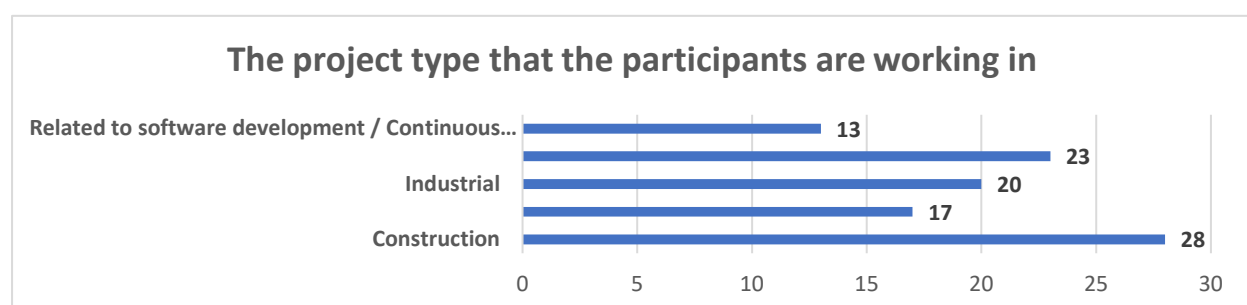


Figure 18: The project type for the participants

Based on table 31 and Figure 18 which shows the distribution across various types of projects among 101 participants in the questionnaire, in this project, 27.7% of the participants are engaged in construction activities, reflecting the project's substantial focus in this area. Business implementation and development involve 22.8% of the workforce, indicating a significant emphasis on business strategies. The industrial sector includes 19.8% of the participants, highlighting its importance in the project's scope. Infrastructure development encompasses 16.8%, showing a considerable but not dominant focus. Lastly, 12.9% are involved in software development and continuous improvement, illustrating these areas as essential, yet smaller components of the project.

j) The project scope of the participants' employer that they are working for:

The project scope of the participants' employer that they are working for	Frequency	Percent
Design	13	12.9
Engineering, Procurement and Construction	32	31.7
Supervision and Surveillance	42	41.6
Logistics and Supply Chain	7	6.9
Auditing	7	6.9
Total	101	100

Table 32: Participants' characteristics according to their employer scope for the project that working for (n= 101)

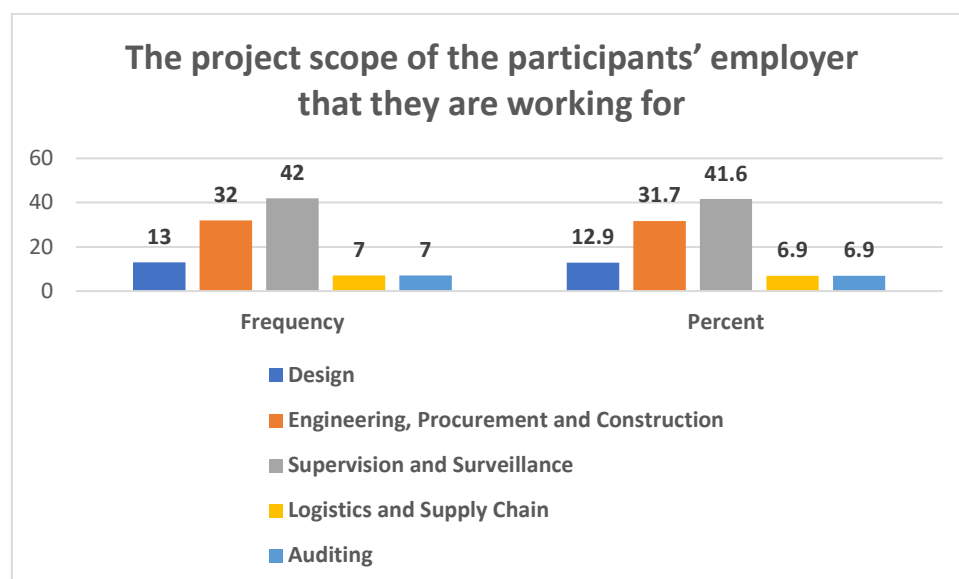


Figure 19: The scope for the project that working for the participants

Based on table 32 and Figure 19 which shows the distribution of project roles among 101 participants in the questionnaire, In this project, 41.6% of the participants are involved in Supervision and Surveillance, highlighting its importance in the project scope. The next significant group, comprising 31.7% of the participants, is engaged in Engineering, Procurement, and Construction, underscoring the project's technical and logistical focus.

Design roles account for 12.9% of the participants, indicating a notable but smaller focus on initial planning and conceptualization. Both Logistics and Supply Chain, and Auditing, represent 6.9% each, demonstrating their essential but less prominent roles in the overall project execution.

3.2.11.2 Assessing Comprehension in the Context of Sustainable Mega-Projects (Section 2):

You understand the concept of sustainable mega-projects:		
Answers	Frequency	Percent
Not at all	6	5.9
Not very well	8	7.9
Somewhat well	25	24.8
Moderately well	32	31.7
Extremely well	30	29.7
Total	101	100

Table 33: shows the frequency and percentage distribution of participants' self-assessment of their understanding of the concept of sustainable mega-projects.

This table presents survey results regarding individuals' understanding of the concept of sustainable mega-projects. Based on the findings: A small proportion of the respondents (5.9%) indicated that they do not understand the concept "at all." A slightly higher percentage, 7.9%, reported that their understanding is "not very well." About a quarter of the participants (24.8%) feel that they understand it "somewhat well." The largest segment, which represents 31.7% of respondents, believes they understand the concept "moderately well." Close to a third (29.7%) of participants rated their understanding as "extremely well."

From these data, we can deduce that the majority of respondents have a reasonably good grasp of sustainable mega-projects, with over 60% indicating that they understand the concept "moderately well" to "extremely well." This suggests a significant level of awareness of the concept among the surveyed population.

To what extent do you agree that sustainable mega-projects can contribute significantly to achieving sustainable development goals?		
Answers	Frequency	Percent
Disagree	9	8.9
Neutral	14	13.9
Agree	41	40.6
Strongly agree	37	36.6
Total	101	100

Table 34 shows the frequency and percentage distribution of participants' opinions on the extent to which they agree that sustainable mega-projects can contribute significantly to achieving sustainable development goals.

The survey results from 101 participants regarding the impact of sustainable mega-projects on achieving sustainable development goals show a strong inclination towards agreement. A significant 40.6% agree, and an even larger 36.6% strongly agree with the statement, cumulatively making up 77.2% of the respondents who view sustainable mega-projects as notably contributive to sustainable development goals. conversely, only 8.9% disagree with this viewpoint. A smaller portion, 13.9%, remains neutral. The overall mean score of 4.05 (out of a possible 5), with a standard deviation of 0.93, further underscores a general consensus among the participants about the positive role of sustainable mega-projects in achieving sustainable development objectives. This high average score, leaning towards the 'agree' and 'strongly agree' responses, reflects a predominant belief in the effectiveness of these projects in contributing to sustainable development.

How important do you consider incorporating sustainability principles into the planning, design, and implementation of mega-projects?		
Answers	Frequency	Percent
Not very important	3	3.0
Somewhat important	5	5.0
Moderately important	15	14.9
Very important	40	39.6
Extremely important	38	37.6
Total	101	100

Table 35 shows the frequency and percentage distribution of participants' opinions on the importance of incorporating sustainability principles into the planning, design, and implementation of mega-projects.

From the table, it's evident that a significant majority of the respondents place high importance on incorporating sustainability principles in mega-project planning, design, and implementation. Specifically, 39.6% view it as "Very important" and 37.6% as "Extremely important," together accounting for 77.2%, indicating a strong consensus on the crucial role of sustainability in these projects. On the other hand, 14.9% consider it "Moderately important," suggesting recognition of sustainability's significance but perhaps alongside other equally weighted project factors.

A smaller fraction of respondents perceives sustainability as less critical, with 5% deeming it "Somewhat important" and 3% viewing it as "Not very important." These findings overall reflect a positive orientation and increasing awareness toward the importance of sustainability in mega-projects

What is the key challenge you think in implementing sustainable practices in mega-projects?		
Answers	Frequency	Percent
Balancing economic, social, and environmental considerations	38	37.6
Integrating sustainability into existing project management frameworks	35	34.7
Measuring and evaluating the sustainability performance of mega-projects	16	15.8
Obtaining stakeholder buy-in and support for sustainable practices	9	8.9
Overcoming technical and technological limitation	3	3.0
Total	101	100

Table 35 shows the frequency and percentage distribution of participants' opinions on the key challenge in implementing sustainable practices in mega-projects.

The table shows that the survey responses highlight various challenges faced in implementing sustainable practices in mega-projects, as perceived by the respondents: Balancing economic, social, and environmental considerations: This is seen as the most significant challenge, highlighted by 37.6% of respondents. It reflects the complexities in achieving a balance between these three elements, necessitating intricate trade-offs and compromises in large and diverse projects.

Integrating sustainability into existing project management frameworks: Identified as a key challenge by 34.7% of participants, this points to the difficulties in adapting or developing current methodologies and practices to effectively incorporate sustainability principles. Measuring and evaluating the sustainability performance of mega-projects: Considered a major challenge by 15.8%, it reflects concerns about the lack of clear standards or metrics to assess the sustainability impact in such large and complex projects. Obtaining stakeholder buy-in and support for sustainable practices: Seen as a challenge by 8.9%, this highlights the importance of convincing various stakeholders of the value and necessity of sustainable practices. Overcoming technical and technological limitations: Regarded as a challenge by 3%, this underscores the role of innovation and technology in facilitating sustainable solutions but also points to existing limitations in this area.

What are your expectations for the Cubic (Mukaab) project in terms of its contribution to sustainable development?		
Answers	Frequency	Percent
Set a new standard for sustainable mega-projects	40	39.6
Demonstrate the feasibility of large-scale sustainable infrastructure	27	26.7
Serve as a model for future sustainable cities	16	15.8
Catalyze advancements in sustainable technologies	7	6.9
Make a significant contribution to Saudi Arabia's Vision 2030	11	10.9
Total	101	100

Table 36 shows the frequency and percentage distribution of participants' expectations for the Cubic (Mukaab) project in terms of its contribution to sustainable development.

The table36 shows the survey responses reflect varied expectations regarding the Cubic (Mukaab) project's contribution to sustainable development:

The largest group of respondents (39.6%) anticipates that the Mukaab project will establish new benchmarks in sustainable project design and execution., 26.7% of participants see the project as an opportunity to prove that sustainability can be effectively integrated into large-scale infrastructure projects.

This is significant, as it reflects a hope that the Mukaab project will overcome common challenges associated with scaling sustainable practices, about 15.8% expect the project to act as a blueprint for future urban development, indicating that the Mukaab could influence the planning and development of future cities around sustainable principles.

And 10.9% of respondents expect the project to be a key contributor to the broader goals of Saudi Arabia's Vision 2030. This reflects an understanding of the project's role not just in sustainability but also in the larger context of national development and transformation., smaller segment (6.9%) believes that the project will drive innovation in sustainable technologies.

This perspective highlights the potential for the Mukaab to not just utilize but also spur advancements in sustainable technology.

Overall, these responses indicate high expectations for the Mukaab project in terms of its potential impact on sustainable development, ranging from setting new industry standards to influencing national policy and technological innovation.

The total score of Section2	Mean	Std. Deviation	level
Understanding of Sustainable Mega-Projects	3.93	0.81	high

Table 37 Descriptive Statistics for Understanding of Sustainable Mega-Projects in Section2

Table 37 showed that the level of understanding among respondents about sustainable mega-projects measured by 3 questions using a 5-point Likert scale the total mean score of the scale achieved a high level (3.93±0.81/ high attitude level) out of five .

This reflects that the majority of participants possess a substantial grasp of what sustainable mega-projects entail, including their environmental, social, and economic integration aspects.

Such a level of comprehension is crucial for the effective planning and execution of sustainable mega-projects, impacting strategic decision-making and the management of resources and risks.

3.2.11.3 Evaluating Familiarity with the Cubic (Mukaab) Project in Riyadh and the Vision 2030 of Saudi Arabia (Section 3):

The total score of Section3	Mean	Std. Deviation	level
Knowledge about the Cubic (Mukaab) Project in Riyadh and the vision 2030 of Saudi Arabia	3.34	0.80	Moderate

Table 44 Descriptive Statistics for Knowledge about the Cubic (Mukaab) Project in Riyadh and the vision 2030 of Saudi Arabia in Section3

Table 44 showed that the level of knowledge among the respondents regarding the Cubic (Mukaab) Project in Riyadh and Vision 2030 of Saudi Arabia measured by 5 questions the total mean score of the scale achieved a moderate level (3.34 ± 0.80 / moderate attitude level).

The moderate mean score suggests that while there is a reasonable awareness and comprehension of the Cubic (Mukaab) Project and Vision 2030 among the participants, there is variability in the depth of their knowledge. This moderate level of knowledge highlights an opportunity for more focused educational and awareness efforts to deepen understanding of these significant initiatives."

3.2.11.4 Assessing the Comprehension in the Context of Lessons Learned and Case Studies (Section 4):

How important do you think lessons learned and case studies are in the context of mega-projects?		
Answers	Frequency	Percent
Not very important	5	5.0
Somewhat important	10	9.9
Moderately important	19	18.8
Very important	28	27.7
Extremely important	39	38.6
Total	101	100

Table 45 shows the frequency and percentage distribution of participants' opinions on the importance of lessons learned and case studies in the context of mega-projects."

The survey results from 101 participants regarding the importance of lessons learned and case studies in mega-projects underscore a strong belief in their value: A significant 38.6% view these as extremely important, reflecting a high recognition of their critical role in the success of mega-projects.

And 27.7% rate them as very important, further emphasizing the importance attributed to learning from past experiences and studies. Moderately important is the perspective of 18.8%, suggesting recognition of their usefulness, though not to an extreme degree.

A smaller group, 9.9%, finds them somewhat important, indicating a more measured appreciation of their relevance. Only 5.0% of the participants consider them not very important, showing that the majority recognize at least some level of importance.

To what extent do you believe that successful mega-projects are influenced by the incorporation of lessons learned from previous projects?		
Answers	Frequency	Percent
Not at all	11	10.9
Slightly	18	17.8
Moderately	21	20.8
Very much	43	42.6
Completely	8	7.9
Total	101	100

Table 46 shows the frequency and percentage distribution of participants' opinions on the extent to which successful mega-projects are influenced by the incorporation of lessons learned from previous projects."

The survey of 101 participants regarding the influence of incorporating lessons learned from previous projects on the success of mega-projects reveals a diverse range of opinions:

The majority, 42.6%, believe that the success of mega-projects is very much influenced by lessons learned from past projects, indicating a strong recognition of the value of past experiences. And 20.8% of respondents feel this influence is moderate, suggesting that while past lessons are important, they are one of several factors contributing to success.

A smaller group, 17.8%, considers the influence to be only slight, implying that other factors may play a more significant role in the project's success. about 10.9% believe that incorporating lessons learned has no influence at all, suggesting a belief that each project is unique and should be approached differently.

Finally, 7.9% of participants feel that the success of mega-projects is completely dependent on the incorporation of lessons from previous projects.

Do you think there is a need for a systematic approach to documenting and disseminating lessons learned and case studies in mega-projects?		
Answers	Frequency	Percent
Strongly disagree	3	3.0
Disagree	13	12.9
Neutral	23	22.8
Agree	32	31.7
Strongly agree	30	29.7
Total	101	100

Table 47 shows the frequency and percentage distribution of participants' opinions on the need for a systematic approach to documenting and disseminating lessons learned and case studies in mega-projects.

Based on table 47 which shows the opinions on the necessity of a systematic approach for documenting and disseminating lessons learned and case studies in mega-projects in the questionnaire, 31.7% of respondents agree and an additional 29.7% strongly agree with the need for such an approach.

This indicates a strong belief among the majority that a structured method for capturing and sharing knowledge in mega-projects is important. On the other hand, 22.8% of participants are neutral, A smaller group, comprising 12.9%, disagrees with the need for this method, while only 3.0% strongly disagree, Overall, these responses highlight a general trend towards supporting a systematic approach to knowledge management in the context of mega-projects.

To what extent do you agree that incorporating lessons learned from previous mega-projects is crucial for the success of the Cubic (Mukaab) project?		
Answers	Frequency	Percent
Strongly disagree	1	1.0
Disagree	12	11.9
Neutral	22	21.8
Agree	32	31.7
Strongly agree	34	33.7
Total	101	100

Table 48 shows the frequency and percentage distribution of participants' opinions on the importance of incorporating lessons learned from previous mega-projects for the success of the Cubic (Mukaab) project.

Based on table 48 which shows the attitudes towards incorporating lessons learned from previous mega-projects for the success of the Cubic (Mukaab) project in the questionnaire, 33.7% of respondents strongly agree that this is crucial. Additionally, 31.7% agree with the importance of integrating these lessons, collectively indicating that a significant majority view this as a key factor for success.

On the other hand, 21.8% of participants are neutral, A minority, 11.9%, disagree with the necessity of incorporating these lessons, and a very small percentage, 1.0%, strongly disagree. Overall, these responses highlight a general consensus on the value of learning from past mega-projects for the successful execution of the Cubic (Mukaab) project.

To what extent do you believe that lessons learned and case studies can help the Cubic (Mukaab) project achieve its sustainability goals?		
Answers	Frequency	Percent
Strongly disagree	0	0.0
Disagree	11	10.9
Neutral	18	17.8
Agree	36	35.6
Strongly agree	36	35.6
Total	101	100

Table 49 shows the frequency and percentage distribution of participants' opinions on how much lessons learned and case studies can help the Cubic (Mukaab) project achieve its sustainability goals.

Based on table 49 which shows the beliefs about the effectiveness of lessons learned and case studies in helping the Cubic (Mukaab) project achieve its sustainability goals in the questionnaire, a notable 35.6% of respondents strongly agree with their potential impact, while an equal percentage agree. This reflects a significant majority who believe that these tools are beneficial for reaching sustainability objectives.

Meanwhile, 17.8% of participants hold a neutral position, A minority of 10.9% disagree with the idea that lessons learned and case studies can aid in achieving sustainability goals for the project, and none of the respondents strongly disagree. Overall, the responses lean heavily towards the belief that incorporating past experiences and studies can be instrumental in the success of the Cubic (Mukaab) project in meeting its sustainability targets.

To what extent do you agree that incorporating lessons learned and case studies can enhance the overall efficiency and effectiveness of the Cubic (Mukaab) project?		
Answers	Frequency	Percent
Strongly disagree	0	0.0
Disagree	11	10.9
Neutral	12	11.9
Agree	38	37.6
Strongly agree	40	39.6
Total	101	100

Table 50 the frequency and percentage distribution of participants' opinions on the extent to which incorporating lessons learned and case studies can enhance the overall efficiency and effectiveness of the Cubic (Mukaab) project.

Based on table 50 which shows the opinions on the impact of incorporating lessons learned and case studies on the efficiency and effectiveness of the Cubic (Mukaab) project in the questionnaire, a substantial 39.6% of respondents strongly agree with

the positive influence of these practices. Additionally, 37.6% agree, cumulatively indicating that a majority view the integration of past lessons and case studies as beneficial for enhancing the project's efficiency and effectiveness. In contrast, 11.9% of participants are neutral.

A minority of 10.9% disagree with the notion that lessons learned and case studies can improve the project's performance, and none of the respondents strongly disagree. Overall, these responses highlight a predominant belief in the value of applying historical insights and studies to improve the outcomes of the Cubic (Mukaab) project.

How valuable do you consider case studies of successful sustainable mega-projects in shaping the design and implementation of the Cubic (Mukaab) project?		
Answers	Frequency	Percent
Not Very Valuable	2	2.0
Somewhat Valuable	14	13.9
Moderately Valuable	12	11.9
Very Valuable	38	37.6
Extremely Valuable	35	34.7
Total	101	100

Table 51 the frequency and percentage distribution of participants' opinions on the value of case studies of successful sustainable mega-projects in shaping the design and implementation of the Cubic (Mukaab) project.

Based on table 51 which shows the perceived value of case studies of successful sustainable mega-projects in influencing the design and implementation of the Cubic (Mukaab) project in the questionnaire, 37.6% of respondents consider them very valuable, and 34.7% regard them as extremely valuable.

This demonstrates a strong belief among the majority in the significance of these case studies for guiding project development. On the other hand, 13.9% view them as somewhat valuable and 11.9% as moderately valuable, only a small fraction, 2.0%, consider these case studies not very valuable. Overall, these responses suggest a predominant view that case studies of successful sustainable mega-projects are highly beneficial in shaping the Cubic (Mukaab) project's approach and execution.

How important do you consider the role of lessons learned and case studies in mitigating risks and challenges associated with the Cubic (Mukaab) project?		
Answers	Frequency	Percent
Not very important	1	1.0
Somewhat important	8	7.9
Moderately important	13	12.9
Very important	44	43.6
Extremely important	35	34.7
Total	101	100

Table 52 the frequency and percentage distribution of participants' opinions on the importance of lessons learned and case studies in mitigating risks and challenges associated with the Cubic (Mukaab) project."

Based on table 52 which shows the perceptions of the importance of lessons learned and case studies in mitigating risks and challenges in the Cubic (Mukaab) project in the questionnaire, a significant 43.6% of respondents consider this role very important, and 34.7% view it as extremely important. These responses indicate a strong belief in the effectiveness of utilizing past experiences and studies for risk reduction and challenge management in the project. Additionally, 12.9% see this role as moderately important.

A smaller group, 7.9%, believe it to be somewhat important, while only 1.0% consider it not very important. Overall, these results highlight a predominant view that lessons learned and case studies are crucial tools for addressing potential issues and enhancing the success of the Cubic (Mukaab) project.

How often do you or your organization review and analyze lessons learned from past projects before initiating a new mega-project?		
Answers	Frequency	Percent
Never	12	11.9
Rarely	20	19.8
Occasionally	35	34.7
Frequently	25	24.8
Always	9	8.9
Total	101	100

Table 53 the frequency and percentages of how often lessons learned from previous projects are reviewed and analyzed before starting a new mega-project.

Based on table 53 which shows the frequency of reviewing and analyzing lessons learned from past projects before initiating a new mega-project in the questionnaire, 34.7% of respondents do so occasionally, indicating a periodic but not consistent practice. A significant 24.8% review these lessons frequently, demonstrating a more regular approach.

Meanwhile, 19.8% rarely engage in this review process, and 11.9% never do, On the other end, 8.9% always review past lessons before starting a new mega-project, reflecting a strong commitment to learning from previous experiences. Overall, these results reveal a varied approach to incorporating lessons from past projects, with a tendency towards occasional rather than constant analysis.

In your opinion, what role do case studies play in improving the sustainability of mega-projects?		
Answers	Frequency	Percent
No role	8	7.9
Minimal role	18	17.8
Moderate role	25	24.8
Significant role	33	32.7
Essential role	17	16.8
Total	101	100

Table 54 shows the frequency and percentage distribution of participants' opinions on the importance of case studies in enhancing the sustainability of mega-projects

Based on table 54 which shows the perceived role of case studies in improving the sustainability of mega-projects in the questionnaire, 32.7% of respondents view case studies as playing a significant role. This is followed by 24.8% who consider their role to be moderate, Additionally, 16.8% believe case studies play an essential role in enhancing sustainability, indicating a strong belief in their critical importance.

On the other hand, 17.8% see case studies as having a minimal role, while 7.9% believe they play no role at all in the sustainability of mega-projects.

Overall, these responses indicate that a majority of participants recognize the value of case studies in contributing to sustainable practices in mega-projects, though opinions vary on the extent of their impact.

The total score of Section 4	Mean	Std. Deviation	level
Understanding of Lessons Learned and Case Studies	3.69	0.66	high

Table 55 Descriptive Statistics for Understanding of Lessons Learned and Case Studies in Section 4"

Table 55 showed that the level of understanding among respondents about Lessons Learned and Case Studies measured by 10 questions using a 5-point Likert scale the total mean score of the scale achieved a high level (3.69 ± 0.66 / high attitude level) out of five. This high mean score reflects a collective recognition of the importance and knowledge of lessons learned and case studies, which are crucial components in the realm of project management, especially for complex endeavors like mega-projects.

3.2.11.5 Evaluating the Applicability of Lessons Learned and Case Studies (Section 5):

How applicable do you consider the lessons learned from previous mega-projects to the specific context of the Cubic (Mukaab) project in Riyadh?	Frequency	Percent
Not Applicable	2	2.0
Limited Applicability	3	3.0
Somewhat Applicable	23	22.8
Moderately Applicable	28	27.7
Highly Applicable	45	44.6
Total	101	100

Table 56 presents the frequency and percentage distribution of participants' opinions on the relevance of lessons learned from previous mega-projects to the specific context of the Cubic (Mukaab) project in Riyadh."

Based on table 56 which shows Respondents' answers were about the extent to which lessons learned from previous mega projects are applicable to the specific context of the Cubic project in Riyadh, and the data suggests a positive overall perception regarding the applicability of lessons learned from previous mega-projects to the Cubic (Mukaab) project in Riyadh.

A significant majority (44.6%) of respondents find these lessons to be "highly applicable". While (27.7%) believe the lessons are Moderately applicable, indicating a strong conviction in their relevance, a smaller but noteworthy percentage (22.8%) considers them somewhat applicable. However, a cautious perspective is represented by the 5.0% of respondents who view the lessons as having limited or no applicability.

To what extent do you believe that case studies of successful sustainable mega-projects can be effectively adapted to the Cubic (Mukaab) project?	Frequency	Percent
Strongly disagree	2	2.0
Disagree	3	3.0
Neutral	19	18.8
Agree	46	45.5
Strongly agree	31	30.7
Total	101	100

Table 57 shows the frequency and percentage distribution of participants' opinions on the extent to which case studies of successful sustainable mega-projects can be effectively adapted to the Cubic (Mukaab) project."

Based on table 57 which shows the presented data that reflects respondents' perspectives on the adaptability of case studies of successful sustainable mega-projects to the Cubic (Mukaab) project, The majority of respondents (76.2%) express agreement (45.5%), or strong agreement (30.7%) with the idea that case studies can be effectively adapted to the Cubic project.

While a significant portion is neutral (18.8%), there is a comparatively small percentage in disagreement (5.0%).

This overall positive outlook suggests a belief in the potential applicability of successful sustainable mega-project strategies to the Cubic (Mukaab) project.

How relevant do you consider the sustainability practices and strategies employed in successful case studies to the Cubic (Mukaab) project?	Frequency	Percent
Not Relevant	1	1.0
Limited Relevance	10	9.9
Somewhat Relevant	19	18.8
Moderately Relevant	28	27.7
Highly Relevant	43	42.6
Total	101	100

Table 58 shows the frequency and percentage distribution of participants' opinions on the relevance of sustainability practices and strategies from successful case studies to the Cubic (Mukaab) project

Based on table 58 which shows that the provided data illustrates respondents' perceptions of the relevance of sustainability practices and strategies employed in successful case studies to the Cubic (Mukaab) project. Here's a concise breakdown:

The majority of respondents (70.3%) view the sustainability practices and strategies from successful case studies as either highly relevant (42.6%) or moderately relevant (27.7%) to the Cubic project.

A smaller percentage finds them somewhat relevant (18.8%), while an even smaller proportion perceives limited relevance (9.9%). Only a very small percentage (1.0%) considers the practices not relevant.

This distribution indicates a generally positive outlook on the potential applicability of sustainability strategies from successful case studies to the Cubic (Mukaab) project.

To what extent do you agree that the challenges addressed and solutions implemented in case studies can be applied to the Cubic (Mukaab) project?	Frequency	Percent
Strongly disagree	2	2.0
Disagree	9	8.9
Neutral	22	21.8
Agree	43	42.6
Strongly agree	25	24.8
Total	101	100

Table 59 shows the frequency and percentage distribution of participants' opinions on the extent to which the challenges addressed and solutions implemented in case studies can be applied to the Cubic (Mukaab) project.

Based on table 59 which shows that the provided data outlines respondents' agreement levels regarding the applicability of challenges addressed and solutions implemented in case studies to the Cubic (Mukaab) project.

The majority of respondents (67.4%) express agreement (42.6%) or strong agreement (24.8%) with the idea that challenges and solutions from case studies can be applied to the Cubic project. Meanwhile, a significant portion remains neutral (21.8%), and a smaller percentage disagrees (8.9%) or strongly disagrees (2.0%).

This distribution suggests an overall positive inclination toward the transferability of solutions and insights from case studies to address challenges in the context of the Cubic (Mukaab) project.

How transferable do you consider the lessons learned and best practices from case studies to the Cubic (Mukaab) project?	Frequency	Percent
Not Transferable	1	1.0
Limited Transferability	6	5.9
Somewhat Transferable	17	16.8
Moderately Transferable	38	37.6
Highly Transferable	39	38.6
Total	101	100

Table 60 shows the frequency and percentage distribution of participants' opinions on the transferability of lessons learned and best practices from case studies to the Cubic (Mukaab) project.

Based on table 60 which shows that the provided data outlines respondents' perspectives on the transferability of lessons learned and best practices from case studies to the Cubic (Mukaab) project.

The majority of respondents (76.2%) express the belief that lessons learned and best practices from case studies are either highly transferable (38.6%) or moderately transferable (37.6%) to the Cubic project. A smaller percentage considers them somewhat transferable (16.8%), while an even smaller proportion perceives limited transferability (5.9%).

Only a very small percentage (1.0%) believes the lessons are not transferable. This distribution indicates a positive outlook on the potential transferability of insights and practices from case studies to the Cubic (Mukaab) project.

The total score of Section5	Mean	Std. Deviation	level
Applicability of Lessons Learned and Case Studies	3.99	0.81	high

Table 61 Descriptive Statistics for Understanding of Sustainable Mega-Projects in Section5

Table 61 showed that the level of Applicability among respondents about Lessons Learned and Case Studies measured by 5 questions using a 5-point Likert scale the total mean score of the scale achieved a high level (3.99 ± 0.81 / high attitude level) out of five .

This high score indicates that the majority of participants perceive a strong applicability of lessons learned and case studies in their context.

This finding underscores the value placed on practical, real-world application of knowledge derived from lessons learned and case studies in enhancing project outcomes.

3.2.11.6 Assessing Comprehension in the Context of the Integration of Lessons Learned and Case Studies (Section 6):

To what extent do you agree that there is a clear understanding of the lessons learned and best practices from relevant case studies?	Frequency	Percent
Disagree	6	5.9
Neutral	28	27.7
Agree	37	36.6
Strongly agree	30	29.7
Total	101	100

Table 62 shows the frequency and percentage distribution of participants' opinions on the extent to which there is a clear understanding of the lessons learned and best practices from relevant case studies

Based on table 62 which shows that the provided data outlines respondents' agreement levels regarding the clarity of understanding of lessons learned and best practices from relevant case studies. The responses indicate a diverse range of perspectives, a significant portion agrees (36.6%), with (29.7%) strongly agreeing that there is a clear understanding of the lessons learned and best practices from relevant case studies. Additionally, while a notable percentage remains neutral (27.7%). A smaller group disagrees (5.9%) with the notion of a clear understanding.

This distribution suggests a generally positive perception, with a substantial number of respondents acknowledging a clear comprehension of lessons and best practices from relevant case studies.

How effectively do you believe the lessons learned and case studies are being integrated into the planning and design of the Cubic (Mukaab) project?	Frequency	Percent
Not Effective	3	3.0
Somewhat Effective	14	13.9
Somewhat Effective	18	17.8
Very Effective	37	36.6
Extremely Effective	29	28.7
Total	101	100

Table 63 shows the frequency and percentage distribution of participants' opinions on how effectively the lessons learned and case studies are being integrated into the planning and design of the Cubic (Mukaab) project.

Based on table 63 which shows that the provided data outlines respondents' perspectives on the effectiveness of integrating lessons learned and case studies into the planning and design of the Cubic (Mukaab) project.

However, the responses indicate that a significant portion of respondents (36.6%) believes that the integration of lessons learned and case studies into the planning and design of the Cubic project is very effective and (28.7%) find it extremely effective.

Additionally, (17.8%) find it Somewhat effective, while (13.9%) perceive it as somewhat effective. A smaller percentage (3.0%) thinks it is not effective. This distribution suggests an overall positive assessment of the effectiveness of integrating insights from lessons learned and case studies into the planning and design phase of the Cubic (Mukaab) project.

To what extent do you agree that the Cubic (Mukaab) project is incorporating sustainability principles and strategies aligned with the lessons learned and case studies?	Frequency	Percent
Strongly disagree	1	1.0
Disagree	7	6.9
Neutral	22	21.8
Agree	41	40.6
Strongly agree	30	29.7
Total	101	100

Table 64 shows the frequency and percentage distribution of participants' opinions on the extent to which the Cubic (Mukaab) project is incorporating sustainability principles and strategies aligned with the lessons learned and case studies."

Based on table 64 which shows that the provided data outlines respondents' agreement levels regarding the incorporation of sustainability principles and strategies aligned with lessons learned and case studies into the Cubic (Mukaab) project. The majority of respondents (70.3%) express agreement (40.6%) or strong agreement (29.7%) with the idea that the Cubic (Mukaab) project is incorporating sustainability principles and strategies aligned with lessons learned and case studies. A notable portion remains neutral (21.8%), while a smaller percentage disagrees (6.9%) or strongly disagrees (1.0%). This

distribution suggests an overall positive perception that the project is aligning with sustainable practices derived from lessons learned and case studies.

How well do you believe the Cubic (Mukaab) project is adapting and applying the risk mitigation strategies identified in relevant case studies?	Frequency	Percent
Not well	1	1.0
Somewhat well	14	13.9
Moderately well	18	17.8
Very well	35	34.7
Extremely well	33	32.7
Total	101	100

Table 65 shows the frequency and percentage distribution of participants' opinions on how well the Cubic (Mukaab) project is adapting and applying the risk mitigation strategies identified in relevant case studies

Based on table 65 which shows that the provided data outlines respondents' perspectives on how well the Cubic (Mukaab) project is adapting and applying risk mitigation strategies identified in relevant case studies.

The responses indicate that a significant portion of respondents (67.4%) believes the Cubic (Mukaab) project is adapting and applying risk mitigation strategies well, with (34.7%) indicating it is being done very well and (32.7%) being done extremely well.

A smaller percentage believes it is being done Moderately well (17.8%) and being done somewhat well (13.9%), while an even smaller portion perceives it as not being done well (1.0%).

This distribution suggests an overall positive assessment of the project's effectiveness in adapting and applying risk mitigation strategies identified in relevant case studies.

To what extent do you agree that the lessons learned and case studies are being used to enhance the overall project management and decision-making for the Cubic (Mukaab) project?	Frequency	Percent
Strongly disagree	1	1.0
Disagree	3	3.0
Neutral	18	17.8
Agree	46	45.5
Strongly agree	33	32.7
Total	101	100

Table 66 shows the frequency and percentage distribution of participants' opinions on the extent to which lessons learned and case studies are being used to enhance overall project management and decision-making for the Cubic (Mukaab) project

Table 66 shows the frequency and percentage distribution of participants' opinions on the extent to which lessons learned and case studies are being used to enhance overall project management and decision-making for the Cubic (Mukaab) project

Based on table () which shows that the provided data outlines respondents' agreement levels regarding the utilization of lessons learned and case studies to enhance overall project management and decision-making for the Cubic (Mukaab) project.

The majority of respondents (78.2%) express agreement (45.5%) or strong agreement (32.7%) with the idea that lessons learned and case studies are being used to enhance the overall project management and decision-making for the Cubic project.

A smaller portion remains neutral (17.8%), while a very small percentage disagrees (3.0%) or strongly disagrees (1.0%).

This distribution indicates a generally positive perception that the project is leveraging lessons learned and case studies to improve its overall management and decision-making processes.

The total score of Section6	Mean	Std. Deviation	level
Integration of Lessons Learned and Case Studies	3.89	0.83	high

Table 67 Descriptive Statistics for Integration of Lessons Learned and Case Studies in Section6

Table 67 showed that the level of integration of Lessons Learned and Case Studies measured by 5 questions using a 5-point Likert scale the total mean score of the scale achieved a high level (3.89 ± 0.83 / high attitude level) out of five.

This high score indicates that the majority of participants perceive the integration of lessons learned and case studies in their projects or organizations as significant and effective.

3.2.11.7 Assessing Application of Best Practices (Section 7):

To what extent do you think best practices are currently applied in the planning phase of mega-projects such as the cubic (Mukaab)?	Frequency	Percent
Not at all	10	9.9
Slightly	23	22.8
Moderately	33	32.7
Very much	18	17.8
Completely	17	16.8
Total	101	100

Table 68 shows the frequency and percentage distribution of participants' opinions on the extent to which best practices are currently applied in the planning phase of mega-projects such as the Cubic (Mukaab)

Based on table 68 which shows that the provided data outlines respondents' perspectives on the application of best practices in the planning phase of mega-projects, specifically the Cubic (Mukaab) project.

The responses suggest a diverse range of opinions. A significant portion of respondents (50.5%) acknowledges the application of best practices to some extent, with (32.7%) considering it moderately, (22.8%) perceive only slight application and (17.8%) very much. A smaller percentage (16.8%) feels that best practices are applied completely. On the other hand, and (9.9%) believe best practices are not applied at all.

This distribution indicates variations in the perceived level of adherence to best practices during the planning phase of the Cubic (Mukaab) project.

How effectively are lessons learned incorporated into the decision-making processes during the execution phase of mega-projects projects such as the cubic (Mukaab)?	Frequency	Percent
Ineffectively	5	5.0
Marginally effectively	28	27.7
Moderately effectively	22	21.8
Effectively	32	31.7
Very effectively	14	13.9
Total	101	100

Table 69 shows the effectiveness of incorporating lessons learned into decision-making processes during the execution phase of mega-projects, with a focus on the Cubic (Mukaab) project.

Based on table 69 which shows that the provided data outlines respondents' perspectives on the effectiveness of incorporating lessons learned into the decision-making processes during the execution phase of mega-projects, specifically the Cubic (Mukaab) project. The responses suggest a varied perception of how effectively lessons learned are incorporated into decision-making during the execution phase of the Cubic (Mukaab) project.

While a substantial portion (45.6%) believes the incorporation is either effective (31.7%) or very effective (13.9%), a combined 33.7% perceives it as marginally effective (27.7%) or ineffective (5.0%).

An additional 21.8% considers the incorporation moderately effective. This distribution indicates a mixed perspective on the degree of effectiveness in integrating lessons learned into decision-making processes during the execution phase of mega-projects.

In your experience, how important is it to have a dedicated team responsible for capturing and disseminating lessons learned throughout a mega-project such as the cubic (Mukaab)?	Frequency	Percent
Somewhat important	14	13.9
Moderately important	23	22.8
Very important	36	35.6
Extremely important	28	27.7
Total	101	100

Table 70: Frequency and Percentage Distribution of Participants' Opinions on the Importance of a Dedicated Team for Capturing and Disseminating Lessons Learned in Mega-Projects: Insights from the Cubic (Mukaab) Project.

Based on table 70 which shows that the provided data outlines respondents' perceptions of the importance of having a dedicated team responsible for capturing and disseminating lessons learned throughout a mega-project, specifically the Cubic (Mukaab) project.

The responses suggest a consensus among the majority of respondents (63.3%) on the importance of having a dedicated team for capturing and disseminating lessons learned throughout the Cubic (Mukaab) project.

A significant portion (27.7%) perceives this as extremely important, while an additional (35.6%) considers it very important. Smaller percentages find it moderately (22.8%) or somewhat (13.9%) important.

This distribution emphasizes the perceived significance of a dedicated team in managing and sharing project insights and lessons throughout the mega-project.

To what extent are sustainability considerations integrated into the best practices followed in mega-project management?	Frequency	Percent
Not at all	8	7.9
Slightly	18	17.8
Moderately	34	33.7
Very much	31	30.7
Completely	10	9.9
Total	101	100

Table 71: Frequency and Percentage Distribution of Participants' Opinions on the Integration of Sustainability Considerations into Best Practices in Mega-Project Management.

Based on table 71 which shows that the provided data outlines respondents' perspectives on the extent to which sustainability considerations are integrated into the best practices followed in mega-project management.

The responses indicate a range of opinions regarding the integration of sustainability considerations into best practices in mega-project management.

While (40.6%) of respondents perceive a substantial integration level, with responses ranging from moderately to completely (33.7% moderately, (30.7%) very much, and (9.9%) completely), there is also acknowledgment that there is room for improvement, with 17.8% stating that sustainability considerations are integrated only slightly.

A small percentage (7.9%) feels that sustainability is not integrated at all into current best practices.

This distribution suggests varying levels of emphasis on sustainability within the realm of mega-project management.

How open is the organizational culture in your workplace to the continuous improvement of mega-project management practices?	Frequency	Percent
Not open at all	8	7.9
Slightly open	24	23.8
Moderately open	42	41.6
Very open	17	16.8
Extremely open	10	9.9
Total	101	100

Table 72: Frequency and Percentage Distribution of Participants' Opinions on the Openness of Organizational Culture to the Continuous Improvement of Mega-Project Management Practices.

Table 72 Frequency and Percentage Distribution of Participants' Opinions on the Openness of Organizational Culture to the Continuous Improvement of Mega-Project Management Practices.

Based on table 72 which shows that the provided data outlines respondents' perceptions of the openness of the organizational culture in their workplace to the continuous improvement of mega-project management practices.

The responses suggest that a significant proportion of respondents (69.3%) perceives their organizational culture as open to some extent to the continuous improvement of mega-project management practices.

Specifically, (41.6%) believe it is moderately open, and an additional 16.8% find it very open. A smaller percentage (33.7%) considers the organizational culture either not open at all (7.9%) or only slightly open (23.8%).

A noteworthy (9.9%) feel the culture is extremely open to continuous improvement. This distribution indicates a range of attitudes toward openness to change and improvement within the context of mega-project management practices.

The total score of Section7	Mean	Std. Deviation	level
Application of Best Practices	3.24	0.77	Moderate

Table 73 Descriptive Statistics Application of Best Practices in Section7

Table 73 showed that the level of level of application of best practices among respondents measured by 5 questions using a 5-point Likert scale the total mean score of the scale achieved a Moderate level (3.24 ± 0.77 / Moderate attitude level) out of five. This moderate score suggests that while there is an awareness and some implementation of best practices among the participants, there may be room for improvement in consistency and depth of application.

3.2.11.8 Overall Perception (Section 8):

In your opinion, what are the major factor that contribute to the success of sustainable mega-projects?	Frequency	Percent
Adequate planning	23	22.8
Effective risk management	37	36.6
Stakeholder engagement	19	18.8
Technological innovation	15	14.9
Robust lessons learned process	7	6.9
Total	101	100

Table 74 Frequency and Percentage Distribution of Participants' Opinions on the Importance of Case Studies in Enhancing the Sustainability of Mega-Projects, Alongside Insights into Major Factors Contributing to Sustainable Mega-Project Success.

Based on table 74 which shows the major factors contributing to the success of sustainable mega-projects in the questionnaire, 36.6% of respondents identify effective risk management as the most significant factor.

Following this, 22.8% believe that adequate planning is crucial. Stakeholder engagement is seen as a key contributor by 18.8% of participants, while 14.9% highlight the importance of technological innovation.

The least cited factor, but still considered important by 6.9% of respondents, is a robust lessons learned process.

Overall, the responses suggest that a combination of risk management, planning, stakeholder engagement, technological innovation, and learning from past experiences are all critical for the success of sustainable mega-projects.

how would you rate the impact of lessons learned and case studies on the success of sustainable mega-projects?	Frequency	Percent
Very negative	6	5.9
Negative	5	5.0
Neutral	31	30.7
Positive	42	41.6
Very positive	17	16.8
Total	101	100

Table 75 Frequency and Percentage Distribution of Participants' Opinions on the Importance of Case Studies in Enhancing the Sustainability of Mega-Projects, and Evaluation of the Impact of Lessons Learned and Case Studies on the Success of Sustainable Mega-Projects,

Based on table 75 which shows the impact of lessons learned and case studies on the success of sustainable mega-projects in the questionnaire, 41.6% of respondents perceive this impact as positive, suggesting a strong belief in their beneficial contributions.

Additionally, 16.8% view the impact as very positive, indicating an even greater confidence in the effectiveness of these tools. On the other hand, 30.7% maintain a neutral position, possibly reflecting uncertainty or mixed experiences regarding their impact. A minority perceive the impact

negatively, with 5.0% rating it as negative and 5.9% as very negative, perhaps indicating experiences where lessons learned and case studies did not positively influence outcomes.

Overall, the majority lean towards a positive influence of lessons learned and case studies on the success of sustainable mega-projects, though opinions vary.

How confident are you in the ability of the construction industry to adapt and implement sustainable practices in mega-projects?	Frequency	Percent
Not confident at all	5	5.0
Slightly confident	24	23.8
Moderately confident	27	26.7
Very confident	31	30.7
Extremely confident	14	13.9
Total	101	100

Table 76 Frequency and Percentage Distribution of Participants' Opinions on the Importance of Case Studies in Enhancing the Sustainability of Mega-Projects, Alongside an Assessment of Confidence in the Construction Industry's Ability to Adapt and Implement Sustainable Practices.

Based on table 76 which shows the confidence levels in the construction industry's ability to adapt and implement sustainable practices in mega-projects in the questionnaire, 30.7% of respondents are very confident, following this, 13.9% are extremely confident, demonstrating an even higher level of trust in the industry's commitment to sustainability.

In contrast, 26.7% express moderate confidence, suggesting a cautious optimism about the industry's potential to integrate sustainable practices. A notable 23.8% are only slightly confident, reflecting some reservations or perceived challenges within the industry.

Lastly, 5.0% of participants are not confident at all. Overall, the survey reveals a varied spectrum of confidence levels, with a general lean towards a positive view of the construction industry's ability to implement sustainable practices in mega-projects.

To what extent do you think government policies and regulations support the implementation of sustainable practices in mega-projects?	Frequency	Percent
Not at all	5	5.0
Slightly	17	16.8
Moderately	34	33.7
Very much	33	32.7
Completely	12	11.9
Total	101	100

Table 77 Frequency and Percentage Distribution of Participants' Opinions on the Importance of Case Studies in Enhancing the Sustainability of Mega-Projects, Alongside an Inquiry into the Perceived Alignment of Government Policies and Regulations with the Implementation of Sustainable Practices in Mega-Projects.

Based on table 77 which shows the perceptions of government policies and regulations in supporting sustainable practices in mega-projects in the questionnaire, 32.7% of respondents believe these policies and regulations support such practices 'very much', indicating strong governmental backing.

A significant 33.7% feel the support is moderate, suggesting that while there is some assistance, it may not be fully comprehensive. Those who think the support is complete, or 'completely' supportive, account for 11.9%, reflecting a high degree of confidence in government policies. In contrast, 16.8% see the support as only slight, and 5.0% believe there is no support at all,

Overall, the responses demonstrate varied opinions on the extent of government support for sustainable practices in mega-projects, with a general inclination towards recognizing some level of positive government involvement.

The total score of Section 8	Mean	Std. Deviation	level
Overall Perception	3.38	0.90	Moderate

Table 78 Descriptive Statistics of Overall Perception in Section8

Table 78 showed that the level of level of the overall perception among respondents measured by 3questions using a 5-point Likert scale the total mean score of the scale achieved a Moderate level (3.38±0.90/ Moderate attitude level) out of five. this moderate level of perception offers a valuable opportunity to delve deeper into understanding the respondents' views, addressing areas of concern, and leveraging the positive aspects to enhance overall satisfaction or effectiveness in relation to the topic being measured.

3.2.12 Research Validity:

The validity of the internal consistency was verified by calculating the Pearson correlation coefficient in the statistical packages program used in the social sciences "SPSS." After confirming the apparent validity of the study tool, the researcher calculated the Pearson correlation coefficient to find out the internal validity of the questionnaire by calculating the correlation coefficient between the degree of each phrase of the questionnaire phrase with the total score of the Section to which the paragraph belongs, As shown in the following tables:

a) Pearson Correlation of Section Understanding of Sustainable Mega-Projects:

NO.	Pearson Correlation	sig
1	.729**	0.000
2	.856**	0.000
3	.785**	0.000

Table 79 Pearson Correlation of Section Understanding of Sustainable Mega-Projects

****Correlation is significant at the 0.01 level (2-tailed).**

This table showed that there is a high correlation (ranging from 0.729 to 0.856) between each questions regarding "Understanding of Sustainable Mega-Projects", and the overall score for the Section. These correlations are statistically significant at a significance level of 0.01 or lower, confirming the satisfactory internal consistency of the statements and their suitability for practical application.

b) Pearson Correlation of Section Knowledge about the Cubic (Mukaab) Project in Riyadh and the vision 2030 of Saudi Arabia

NO.	Pearson Correlation	sig
1	.690**	0.000
2	.552**	0.000
3	.743**	0.000
4	.703**	0.000
5	.701**	0.000

Table 80 Pearson Correlation of Section Knowledge about the Cubic (Mukaab) Project in Riyadh and the vision 2030 of Saudi Arabia

****Correlation is significant at the 0.01 level (2-tailed).**

This table showed that there is a high correlation (ranging from 0.552 to 0.743) between each questions regarding "Knowledge about the Cubic (Mukaab) Project in Riyadh and the vision 2030 of Saudi Arabia", and the overall score for the Section. These correlations are statistically significant at a significance level of 0.01 or lower, confirming the satisfactory internal consistency of the statements and their suitability for practical application.

c) Pearson Correlation of Section Understanding of Lessons Learned and Case Studies:

NO.	Pearson Correlation	sig
1	.519**	0.000
2	.488**	0.000
3	.705**	0.000
4	.779**	0.000
5	.786**	0.000
6	.777**	0.000
7	.664**	0.000
8	.620**	0.000
9	.353**	0.000
10	.456**	0.000

Table 81 Pearson Correlation of Section Understanding of Lessons Learned and Case Studies

****Correlation is significant at the 0.01 level (2-tailed).**

This table showed that there is a high correlation (ranging from 0.353 to 0.779) between each questions regarding “Understanding of Lessons Learned and Case Studies”, and the overall score for the Section. These correlations are statistically significant at a significance level of 0.01 or lower, confirming the satisfactory internal consistency of the statements and their suitability for practical application.

d) Pearson Correlation of Section Applicability of Lessons Learned and Case Studies:

NO.	Pearson Correlation	sig
1	.793**	0.000
2	.856**	0.000
3	.819**	0.000
4	.855**	0.000
5	.835**	0.000

Table 82 Pearson Correlation of Section Applicability of Lessons Learned and Case Studies

****Correlation is significant at the 0.01 level (2-tailed).**

This table showed that there is a high correlation (ranging from 0.793 to 0.856) between each questions regarding “Applicability of Lessons Learned and Case Studies”, and the overall score for the Section. These correlations are statistically significant at a significance level of 0.01 or lower, confirming the satisfactory internal consistency of the statements and their suitability for practical application

e) Pearson Correlation of Section Integration of Lessons Learned and Case Studies:

NO.	Pearson Correlation	sig
1	.819**	0.000
2	.875**	0.000
3	.920**	0.000
4	.866**	0.000
5	.765**	0.000

Table 83 Pearson Correlation of Section Integration of Lessons Learned and Case Studies

****Correlation is significant at the 0.01 level (2-tailed).**

This table showed that there is a high correlation (ranging from 0.765 to 0.920) between each questions regarding “Integration of Lessons Learned and Case Studies”, and the overall score for the Section. These correlations are statistically significant at a significance level of 0.01 or lower, confirming the satisfactory internal consistency of the statements and their suitability for practical application

f) Pearson Correlation of Section Application of Best Practices

NO.	Pearson Correlation	sig
1	.831**	0.000
2	.823**	0.000
3	.198*	0.047
4	.798**	0.000
5	.783**	0.000

Table 84 Pearson Correlation of Section Application of Best Practices

****Correlation is significant at the 0.01 level (2-tailed).**

***Correlation is significant at the 0.05 level (2-tailed).**

This table showed that there is a high correlation (ranging from 0.198 to 0.831) between each questions regarding “Application of Best Practices”, and the overall score for the Section. These correlations are statistically significant at a significance level of 0.01 or lower, confirming the satisfactory internal consistency of the statements and their suitability for practical application

NO.	Pearson Correlation	sig
1	.761**	0.000
2	.900**	0.000
3	.882**	0.000

Table 85 Pearson Correlation of Section Overall Perception

****Correlation is significant at the 0.01 level (2-tailed).**

This table showed that there is a high correlation (ranging from 0.761 to 0.900) between each question regarding "Application of Best Practices", and the overall score for the Section. These correlations are statistically significant at a significance level of 0.01 or lower, confirming the satisfactory internal consistency of the statements and their suitability for practical application.

3.2.13 Reliability of the Scale:

a) Reliability of the scale including 36 questions measured the Cronbach's Alpha value listed in table.

Sections	N of questions	Cronbach's Alpha
Understanding of Sustainable Mega-Projects	3	0.683
Knowledge about the Cubic (Mukaab) Project in Riyadh and the vision 2030 of Saudi Arabia	5	0.704
Understanding of Lessons Learned and Case Studies	10	0.808
Applicability of Lessons Learned and Case Studies	5	0.887
Integration of Lessons Learned and Case Studies	5	0.902
Application of Best Practices	5	0.735
Overall Perception	3	0.806
overall Reliability	36	0.918

Table 86 Cronbach's Alpha to measure the Reliability of the questionnaire.

Based on table 86 which shows Cronbach's alpha Reliability coefficients were acceptable in all Sections ranging from (0.683) (0.902), and the value of the Reliability coefficient for the Sections was (0.918), which are high values and indicate the quality of the questionnaire questions, and this indicates that the questionnaire has a high degree of reliance in the field application of the study.

b) Statistical Processing Methods:

After collecting the study data and encoding it, it is entered into the computer and processed, analyzed, and statistical data are extracted using the "Statistical Package for the Social Sciences" (SPSS) program. This involves employing the following statistical procedures and methods:

- **Pearson Correlation Coefficient:**
Used to assess the internal consistency reliability of the study instrument.
- **Cronbach's Alpha:**
Used to calculate the reliability coefficient of the different dimensions of the study instrument.
- **Frequencies and Percentages:**
Utilized to identify the characteristics of the study participants and determine their responses towards the main dimensions included in the study.
- **Mean:**

Used to determine the extent of elevation or reduction in the study participants' responses to the main dimensions (average of statements).

- **Standard Deviation:**

Employed to understand the degree of deviation in the study participants' responses.

4. Conclusion and End of the Research Study:

The research investigation examined the repercussions of lessons gleaned from prior experiences and case studies on the viability of sustainable mega-projects, with a particular focus on the Cubic (Mukaab) Project situated in Riyadh, Saudi Arabia. The primary assertion derived from the study is that the strategic application of best practices extracted from these informational sources can markedly enhance the project's sustainability. This proposition is contingent upon the assumption that the Cubic (Mukaab) Project is congruent with the objectives outlined in Vision 2030 and that stakeholders exhibit a willingness to embrace and implement sustainable project management methodologies. The research methodology encompassed a comprehensive review of pertinent literature, the systematic collection of both qualitative and quantitative data, meticulous data analysis, and the formulation of recommendations tailored to the needs of the project. The overarching goal of this research endeavor was to offer a meaningful contribution to the existing body of knowledge surrounding sustainable mega-projects while furnishing valuable directives for the Cubic (Mukaab) Project to realize its sustainability ambitions and align itself with the Vision 2030 framework.

Throughout the course of the study, deliberate attention was given to investigating the interplay between lessons learned, case studies, and best practices, with a view to fostering sustainability within the Cubic (Mukaab) Project. It was acknowledged that the research process was not devoid of limitations, including but not limited to spatial, human, temporal, and subjectivity constraints. Despite these recognized limitations, the research aspired to generate substantial contributions to the advancement of knowledge within the realm of sustainable mega-projects. The tangible outcomes and advantages of the study encompassed an evaluation of the prevailing state of knowledge, the identification of optimal practices and research lacunae, the establishment of a theoretical framework, and the provision of insights guiding the research design and methodology.

In summation, the research study was oriented towards furnishing insights into the assimilation of lessons gleaned, case studies, and best practices to promote sustainability within the Cubic (Mukaab) Project. The resultant findings and recommendations were crafted with the overarching objective of facilitating the project's harmonization with the Vision 2030 initiative of Saudi Arabia, thereby contributing meaningfully to the domain of sustainable mega-projects.

Research Summary (In Arabic)

1. ملخص:

توفر هذه الدراسة البحثية الخطوط العريضة لمشروع المكعب بمدينة الرياض فيما يخص تطبيق أفضل الممارسات ودراسات الحالة، مع التركيز على الإطار العام وهيكل الدراسة. ويتكون من ثلاثة فصول: يناقش الفصل الأول الإطار العام للدراسة، ويتناول الفصل الثاني الأطر النظرية ومراجعة الأدبيات، ويتناول الفصل الثالث الدراسة العملية/العلمية والإجراءات المنهجية. وتتضمن الوثيقة أيضًا جداول توضح مراحل الدراسة البحثية وجدولًا زمنيًا لكل مرحلة. بالإضافة إلى ذلك، فإنه يسلط الضوء على أهمية إجراء مراجعة الأدبيات وأهداف المراجعة. وتختتم الوثيقة بذكر حدود الدراسة والنتائج والفوائد المتوقعة.

1.1 النقاط الرئيسية:

- (1) تتكون الوثيقة من ثلاثة فصول: الإطار العام للدراسة، والأطر النظرية ومراجعة الأدبيات، والدراسة العملية / العلمية والإجراءات المنهجية.
- (2) توفر الجداول قائمة بالأنشطة لكل مرحلة من مراحل الدراسة البحثية وجدول زمني للدراسة.
- (3) يتم تسليط الضوء على أهمية إجراء مراجعة للأدبيات، بما في ذلك دورها في توفير السياق، وتحديد الفجوات البحثية، وتبرير البحث، ودعم النتائج، وإظهار الخبرة.
- (4) تتضمن أهداف مراجعة الأدبيات تحديد الأبحاث الحالية وتحليلها بشكل نقدي، وتقييم الوضع الحالي للمعرفة، وتحديد الثغرات في البحث.
- (5) تشير الوثيقة إلى جدول زمني مؤقت للدراسة البحثية، بما في ذلك أنشطة مثل مراجعة الأدبيات، وجمع البيانات، وتحليل البيانات، وصياغة التوصيات، وصياغة تقرير البحث، ونشر النتائج.
- (6) يتم تقدير حدود الدراسة، بما في ذلك القيود المكانية والبشرية والزمانية والذاتية.
- (7) وتم ذكر النتائج والفوائد المتوقعة للدراسة البحثية، بما في ذلك المساهمة في تقدم المعرفة، وتقديم توصيات لتنفيذ الدروس المستفادة، والمواءمة مع رؤية 2030.

1.2 الاستنتاجات:

أظهرت نتائج الدراسة أن الدروس المستفادة ودراسات الحالة تلعبان دورًا مهمًا في تعزيز أداء المشاريع الضخمة المستدامة. يمكن أن تساعد هذه الأدوات فرق المشاريع على:

- (1) التعلم من تجارب الآخرين: توفر الدروس المستفادة ودراسات الحالة نظرة ثاقبة حول التحديات والفرص التي تواجهها المشاريع الضخمة المستدامة. يمكن أن تساعد هذه المعلومات فرق المشاريع على اتخاذ قرارات أكثر استنارة وإدارة المخاطر بشكل أكثر فعالية.

(2) تحديد أفضل الممارسات: يمكن أن تساعد الدروس المستفادة ودراسات الحالة فرق المشاريع على تحديد أفضل الممارسات التي أثبتت جدواها في المشاريع المستدامة الناجحة. يمكن أن تساعد هذه المعلومات فرق المشاريع على تجنب الأخطاء وتسريع عملية التنفيذ.

(3) تحسين الأداء: يمكن أن تساعد الدروس المستفادة ودراسات الحالة فرق المشاريع على تحسين الأداء في جميع جوانب الاستدامة، بما في ذلك العوامل البيئية والاجتماعية والاقتصادية. يمكن أن تساعد هذه المعلومات فرق المشاريع على تحقيق أهداف الاستدامة الخاصة بها.

1.3 الاستنتاجات:

بناءً على النتائج، تقدم الدراسة التوصيات التالية لتعزيز دمج الدروس المستفادة ودراسات الحالة في إدارة المشاريع المستدامة:

- (1) تضمين الدروس المستفادة ودراسات الحالة في خطط إدارة المشاريع: يجب أن تتضمن خطط إدارة المشاريع المستدامة خطة محددة لجمع وتحليل الدروس المستفادة ودراسات الحالة. يجب أن تحدد هذه الخطة المصادر التي سيتم استخدامها لجمع المعلومات وطرق استخدام المعلومات لتحسين أداء المشروع.
- (2) إنشاء فريق إدارة المعرفة: يجب أن ينشئ أصحاب المشاريع فريقاً لإدارة المعرفة مسؤولاً عن جمع وتنظيم ونشر الدروس المستفادة ودراسات الحالة. يجب أن يكون لدى هذا الفريق الموارد والمهارات اللازمة لأداء هذه المهمة بفعالية.
- (3) تطوير ثقافة التعلم التنظيمي: يجب أن تشجع أصحاب المشاريع ثقافة التعلم التنظيمي داخل منظماتهم. يجب أن يشجع هذا النهج فرق المشاريع على مشاركة الدروس المستفادة ودراسات الحالة من أجل تحسين الأداء بشكل مستمر.

1.4 التطبيق على مشروع المكعب:

يمكن تطبيق التوصيات المذكورة أعلاه على مشروع "المكعب" لتعزيز أداء المشروع في مجال الاستدامة. على سبيل المثال، يمكن أن يتضمن خطة إدارة المشروع لمشروع "المكعب" ما يلي:

- (1) إنشاء فريق إدارة المعرفة مكون من ممثلين من جميع أصحاب المصلحة الرئيسيين في المشروع.
 - (2) تنفيذ مسح كمي لجمع الدروس المستفادة من المشاريع المستدامة السابقة.
 - (3) إجراء مقابلات مع أصحاب المصلحة الرئيسيين في المشروع لجمع الدروس المستفادة من تجاربهم الشخصية.
 - (4) تقييم أفضل الممارسات المستدامة من خلال مراجعة دراسات الحالة والأدبيات ذات الصلة.
- من خلال تنفيذ هذه التوصيات، يمكن لمشروع "المكعب" الاستفادة من الدروس المستفادة ودراسات الحالة لتحسين أدائه في مجال الاستدامة وتحقيق أهدافه المرجوة.

1.5 فرضيات الدراسة

استندت الدراسة إلى مجموعة من الفرضيات التي تهدف إلى فهم كيفية تحسين أداء المشاريع الضخمة المستدامة، وعلى وجه الخصوص، مشروع المكعب في الرياض. يتم تسليط الضوء في هذا السياق على أهمية تحويل الدروس المستفادة ودراسات الحالة من المشاريع الناجحة إلى تحسينات فعالة في أداء المشاريع المستدامة.

(1) تفترض أن تكون الدروس المستفادة ودراسات الحالة من المشاريع الضخمة المستدامة والمزدهرة قابلة للتحويل بفعالية إلى سياق مشروع المكعب، مما يسهل تحسين أدائه في مجال الاستدامة.

(2) تفترض أن يكون مشروع المكعب متوافقاً مع أهداف رؤية 2030 التي تمثل خطة التنمية الوطنية للمملكة العربية السعودية، والتي تبرز أهمية الاستدامة والابتكار كعناصر أساسية.

(3) تفترض أن يظهر أصحاب المصلحة المرتبطين بمشروع المكعب رغبة قوية في اعتماد وتنفيذ أفضل الممارسات المتعلقة بالإدارة المستدامة للمشروع.

(4) تفترض أن يمتلك مشروع المكعب الموارد والخبرات اللازمة لتنفيذ أفضل الممارسات في مجال الإدارة المستدامة للمشروع.

(5) تفترض أن تظل البيئة الخارجية، والتي تشمل عوامل مثل الظروف الاقتصادية والاستقرار السياسي والتقدم التكنولوجي، مستقرة نسبياً طوال مرحلة تنفيذ مشروع المكعب.

1.6 أسئلة البحث:

1. كيف يمكن تحديد الدروس المستفادة من المشاريع المستدامة السابقة بشكل فعال وتطبيقها على مشروع المكعب (مكعب)؟
تركز هذه الإشكالية على كيفية تحديد وتحليل الدروس المستفادة من المشاريع المستدامة السابقة، وكيفية تطبيقها على مشروع المكعب.
2. كيف يمكن لدراسات الحالة أن تساهم في تحسين أداء الاستدامة للمشاريع الكبرى، خاصة مشروع المكعب (مكعب)؟
تركز هذه الإشكالية على كيفية استخدام دراسات الحالة لتحسين أداء المشاريع المستدامة، مع التركيز على مشروع المكعب.
3. ما هي الممارسات البيئية والاجتماعية والاقتصادية المحددة التي يمكن دمجها في مشاريع المكعب (مكعب) استناداً إلى الدروس المستفادة وأفضل الممارسات؟
تركز هذه الإشكالية على تحديد الممارسات المستدامة التي يمكن تطبيقها على مشروع المكعب، بناءً على الدروس المستفادة وأفضل الممارسات.

4. كيف يمكن تقييم أداء مشاريع المكعب (مكعب) من حيث الاستفادة حاليًا وتطوير نموذج لتوقع تأثير تطبيق الدروس المستفادة وأفضل الممارسات؟

تركز هذه الإشكالية على تطوير إطار عمل لتقييم أداء مشاريع المكعب من حيث الاستفادة، مع التركيز على توقع تأثير تطبيق الدروس المستفادة وأفضل الممارسات.

5. ما هي التوصيات التي يمكن وضعها لدمج رؤى الدروس المستفادة ودراسات الحالة في ممارسات إدارة المشاريع لتعزيز استدامة مشاريع البناء المستقبلية، متناسبة مع أهداف رؤية 2030؟

تركز هذه الإشكالية على تقديم توصيات لكيفية دمج الدروس المستفادة ودراسات الحالة في ممارسات إدارة المشاريع لتعزيز الاستدامة، مع التركيز على المشاريع المستقبلية المتوافقة مع أهداف رؤية 2030.

1.7 التحليل:

تبدو فرضيات الدراسة منطقية وقابلة للاختبار. فهي تستند إلى فهم عميق للسياق الذي يتم فيه إجراء الدراسة، وهي قابلة للتحقق من صحتها من خلال البحث.

أُسئلة البحث محددة وقابلة للقياس ويمكن الإجابة عليها من خلال البحث. فهي تتناول القضايا المهمة المتعلقة بتحسين أداء المشاريع الضخمة المستدامة، وتوفر إطارًا واضحًا لدراسة هذه القضايا. بشكل عام، تبدو الدراسة ذات تصميم جيد وذات إمكانات كبيرة لتقديم مساهمة قيمة لفهم كيفية تحسين أداء المشاريع الضخمة المستدامة.

1.8 الإطارات النظرية:

اعتمدت هذه الدراسة على إطارات نظرية تركز على إدارة المعرفة، وتعلم المؤسسات، ومبادئ الاستفادة، بهدف تحليل تأثير الدروس المستفادة ودراسات الحالة على مختلف جوانب المشروع. تهدف هذه الأطر إلى فهم تأثير هذه العناصر على عمليات اتخاذ القرارات وتخفيف المخاطر والتأثير على المدى البعيد. وقد تم اختيار كل إطار نظري بعناية لضمان توفير فهم شامل للجوانب المختلفة التي تؤثر على إدارة المشاريع المستدامة. يتضمن الأطر النظرية المستخدمة في هذه الدراسة ما يلي:

(1) نظرية التعلم التنظيمي (OLT) لفهم كيف يمكن للمؤسسات تحقيق تحسين مستمر من خلال تكامل التجارب واستفادة من الدروس المستفادة.

(2) نظرية إدارة المعرفة (KMT) لتحليل كيفية جمع وتنظيم وتوزيع المعرفة داخل المؤسسة، وكيف يمكن استخدامها في تحسين أداء المشروع.

(3) نظرية أفضل الممارسات (BPT) لاستخلاص الدروس المستفادة من الممارسات الناجحة وتحديد كيفية تكاملها في إدارة المشروع.

(4) نظرية إدارة المشاريع (PMT) لتحليل كيفية تنظيم وتوجيه الموارد والجهود نحو تحقيق أهداف المشروع بكفاءة.

- (5) نظرية الاستدامة (ST) لضمان أن تكون الممارسات المستدامة جزءاً أساسياً من إدارة المشروع وتكاملها في جميع مراحله.
- (6) نظرية الأنظمة الاجتماعية التقنية (STS) لفهم العلاقات المعقدة بين العوامل الاجتماعية والتكنولوجية في سياق المشروع.
- تم اختيار هذه الأطر النظرية بعناية لتعميق فهم الديناميات المعقدة بين الدروس المستفادة ودراسات الحالة والممارسات المستدامة في سياق مشروع "المكعب". وسيتم استخدام نتائج هذه الدراسة لوضع توصيات لدمج الدروس المستفادة ورؤى دراسة الحالة في ممارسات إدارة المشاريع، بهدف تعزيز استدامة مشاريع البناء في المستقبل.

1.9 حدود الدراسة:

- (1) الحدود المكانية: اقتصر البحث على مشروع المكعب الموجود في مدينة الرياض بالمملكة العربية السعودية.
- (2) الحدود البشرية: شمل الدراسة مشاركة خبراء في مجال إدارة المشاريع، بما في ذلك المستشارين والمديرين والمهندسين والمنسقين.
- (3) الحدود الزمنية: تم تحديد إطار زمني للدراسة يبلغ 12 أسبوعاً.
- (4) ركز البحث على استكشاف الدروس المستفادة ودراسات الحالة من المشاريع الضخمة المستدامة الناجحة، بهدف الحصول على بيانات شاملة فيما يتعلق بأفضل الممارسات في استدامة المشاريع الضخمة. كان الهدف النهائي هو تطبيق هذه الأفكار على مشروع المكعب في الرياض، ومواءمته مع رؤية 2030 للمملكة العربية السعودية.

1.10 التحليل:

- تبدو الأطر النظرية المستخدمة في الدراسة مناسبة لدراسة تأثير الدروس المستفادة ودراسات الحالة على أداء المشاريع الضخمة المستدامة. فهي توفر فهماً شاملاً للجوانب المختلفة التي تؤثر على هذه العملية، بما في ذلك:
- (1) العوامل التنظيمية: مثل ثقافة التعلم والمشاركة وإدارة المعرفة.
- (2) العوامل البشرية: مثل مهارات القيادة واتخاذ القرار وإدارة المخاطر.
- (3) العوامل الفنية: مثل التكنولوجيا والتخطيط والتصميم والبناء.
- (4) العوامل البيئية والاجتماعية: مثل التأثير على البيئة والمجتمع.
- من خلال تحليل هذه الأطر النظرية، يمكن للدراسة تحديد العوامل التي تؤثر على قدرة الدروس المستفادة ودراسات الحالة على تحسين أداء المشاريع الضخمة المستدامة. كما يمكن للدراسة تحديد كيفية دمج هذه الأدوات في ممارسات إدارة المشاريع لتعزيز الاستدامة.

1.11 التوصيات:

بناءً على نتائج الدراسة، تقدم الدراسة التوصيات التالية لتعزيز دمج الدروس المستفادة ودراسات الحالة في ممارسات إدارة المشاريع المستدامة:

- (1) تهيئة بيئة مواتية للتعليم والمشاركة: يجب أن تشجع المؤسسات ثقافة التعلم والمشاركة بين جميع أصحاب المصلحة في المشاريع.
- (2) تطوير قدرات إدارة المعرفة: يجب أن تستثمر المؤسسات في تطوير قدرات إدارة المعرفة لديها لجمع وتنظيم وتوزيع المعرفة بشكل فعال.
- (3) إنشاء بنية تحتية لدعم التعلم من التجارب: يجب أن توفر المؤسسات بنية تحتية لدعم جمع وتحليل ونشر الدروس المستفادة من المشاريع.
- (4) تطوير أدوات وتقنيات لتقييم الاستدامة: يجب أن تستثمر المؤسسات في تطوير أدوات وتقنيات لتقييم أداء المشاريع من حيث الاستدامة.

هذه التوصيات يمكن أن تساعد المؤسسات على تحقيق تحسينات كبيرة في أداء المشاريع الضخمة المستدامة. فهي توفر إطارًا عمليًا لكيفية دمج الدروس المستفادة ودراسات الحالة في ممارسات إدارة المشاريع.

1.12 جمع البيانات:

تم جمع البيانات من خلال المسح والمقابلات ودراسات الحالة، تم تحليلها باستخدام مجموعة متنوعة من الأساليب، بما في ذلك:

1.12.1 جمع البيانات الكمية:

- (1) تم تنفيذ مسح كمي يشمل مشاركة الممارسين في المشاريع المستدامة بالملكة العربية السعودية.
- (2) استخدم التحليل الإحصائي لتحليل البيانات وتحديد الأنماط والاتجاهات.

1.12.2 جمع البيانات النوعية:

- (1) أجريت مقابلات مع خبراء في إدارة المشاريع لديهم خبرة في الدروس المستفادة ودراسات الحالة، مع التركيز على مشروع "المكعب".
- (2) استخدم تحليل المحتوى لفحص البيانات النوعية وتحديد المواضيع الرئيسية.

1.12.3 نهج مختلط الأساليب:

تبنى نهجًا مختلطًا يجمع بين النتائج الكمية والنوعية. استخدمت مجموعة متنوعة من الأساليب لتحليل البيانات من مصادر متعددة وضمان الفهم الشامل للدروس المستفادة ودراسات الحالة في مجال إدارة المشاريع المستدامة.

1.13 تحليل البيانات:

1.13.1 تحليل البيانات النوعية:

- (1) أُجري تحليل موضوعي للبيانات النوعية المستمدة من المقابلات ودراسات الحالة.
- (2) تم ترميز المواضيع وتصنيفها بشكل منهجي لفهم الأنماط والعلاقات الرئيسية.
- (3) قام الباحثون بتحليل البيانات المشفرة للكشف عن العلاقات وبناء فهم عميق لتأثير الدروس المستفادة ودراسات الحالة.

1.13.2 تحليل البيانات الكمية:

- (1) خُضعت البيانات الكمية لتحليل إحصائي باستخدام تقنيات مختلفة، مثل تحليل الارتباط وتحليل الانحدار.
- (2) تم استخدام التحليل الإحصائي لاستكشاف العلاقات بين الدروس المستفادة ودراسات الحالة وأفضل الممارسات.

1.13.3 نهج مختلط الأساليب:

- (1) تم دمج نتائج التحليلات النوعية والكمية لفهم شامل لتأثير الدروس المستفادة ودراسات الحالة على المشاريع الضخمة المستدامة. لتحقيق أقصى قدر من الفهم وتوجيه التوصيات نحو تحسين أداء المشروع المستدام
- (2) استخدمت هذه الفهم لصياغة توصيات مخصصة لتطبيق الدروس المستفادة ودراسات الحالة في مشروع "المكعب".

1.14 الاستنتاجات والتوصيات:

1.14.1 الفهم الشامل:

دراسات الحالة ساهمت في فهم شامل للمشاريع المستدامة، بما في ذلك الابتكارات التقنية وممارسات البناء وتكامل الأنظمة وتحسين الموارد ومراقبة الأداء.

1.14.2 تحديد المخاطر والتحديات:

تم تحديد المخاطر والتحديات المحتملة من خلال دراسة الحالة، مما يمكن من تطوير تدابير استباقية لتحقيق نجاح المشروع

1.14.3 تحديد الحلول والتقنيات الفعالة:

تمكن فحص دراسات الحالة من تحديد التقنيات والمنهجيات والعمليات المبتكرة التي يمكن تطبيقها في مشروع المكعب، مع التركيز على الاستدامة وفعالية التكلفة والكفاءة التشغيلية.

1.15 التوصيات:

- (1) التحسين المستمر: تشدد التوصيات على أهمية التحسين المستمر في جميع جوانب المشروع، بما في ذلك الخبرة الفنية وإدارة المخاطر وتقييم الأداء.
 - (2) تبني التقنيات المبتكرة: يُفضل تبني التقنيات المبتكرة لزيادة تأثير المشروع البيئي والاقتصادي.
 - (3) تكامل النظم ومراقبة الأداء: يتعين دمج فهم التكامل ومراقبة الأداء بشكل فعال عبر مراحل المشروع.
 - (4) تحسين استخدام الموارد: توجيه التوصيات نحو تحسين استخدام الموارد وتعزيز التعاون والتواصل الفعال بين فرق المشروع وأصحاب المصلحة.
 - (5) تبني ممارسات البناء الفعالة: يُنصح باعتماد ممارسات البناء الفعالة لضمان نجاح المشروع.
 - (6) التوافق مع رؤية 2030: يُشدد على أهمية مواءمة جميع الجهود مع أهداف وغايات رؤية 2030 في المملكة العربية السعودية.
- بشكل عام، يمثل استخدام الدروس المستفادة ودراسات الحالة من المشاريع المستدامة مصدرًا قيمًا للتحسين المستمر وتعزيز أداء مشروع "المكعب"، مع الالتزام بأهداف الاستدامة والتطور الفعال.
- تناول التحقيق البحثي تداعيات الدروس المستفادة من التجارب السابقة ودراسات الحالة حول جدوى المشاريع الضخمة المستدامة، مع التركيز بشكل خاص على مشروع المكعب الموجود في الرياض، المملكة العربية السعودية. التأكيد الأساسي المستمدة من الدراسة هو أن التطبيق الاستراتيجي لأفضل الممارسات المستخرجة
- من هذه المصادر المعلوماتية يمكن أن يعزز بشكل ملحوظ استدامة المشروع. ويتوقف هذا الاقتراح على افتراض أن المشروع المكعب يتوافق مع الأهداف المحددة في رؤية 2030 وأن أصحاب المصلحة يظهرون رغبة في تبني وتنفيذ منهجيات إدارة المشاريع المستدامة. وتضمنت منهجية البحث مراجعة شاملة للأدبيات ذات الصلة، والجمع المنهجي للبيانات النوعية والكمية، وتحليل البيانات الدقيقة، وصياغة توصيات مصممة خصيصًا لتلبية احتياجات المشروع. كان الهدف الشامل لهذا المسعى البحثي هو تقديم مساهمة مفيدة لمجموعة المعرفة الحالية

المحيطة بالمشاريع الضخمة المستدامة مع تقديم توجيهات قيمة لمشروع المكعب لتحقيق طموحاته في الاستدامة ومواءمته مع إطار رؤية 2030.

طوال فترة الدراسة، تم إيلاء اهتمام متعمد لدراسة التفاعل بين الدروس المستفادة ودراسات الحالة وأفضل الممارسات، بهدف تعزيز الاستدامة ضمن مشروع المكعب. وتم الاعتراف بأن عملية البحث لا تخلو من القيود، بما في ذلك على سبيل المثال لا الحصر، القيود المكانية والبشرية والزمانية والذاتية. وعلى الرغم من هذه القيود المعترف بها، فإن البحث يطمح إلى توليد مساهمات كبيرة في تقدم المعرفة في مجال المشاريع الضخمة المستدامة. وشملت النتائج والمزايا الملموسة للدراسة تقييم الحالة السائدة للمعرفة، وتحديد الممارسات المثلى وثغرات البحث، وإنشاء إطار نظري، وتوفير رؤى توجه تصميم البحث ومنهجيته.

باختصار، كانت الدراسة البحثية موجهة نحو تقديم رؤى ثاقبة لاستيعاب الدروس المستفادة ودراسات الحالة وأفضل الممارسات لتعزيز الاستدامة ضمن مشروع المكعب. وقد تمت صياغة النتائج والتوصيات الناتجة بهدف شامل يتمثل في تسهيل مواءمة المشروع مع مبادرة رؤية 2030 للمملكة العربية السعودية، وبالتالي المساهمة بشكل مفيد في مجال المشاريع الضخمة المستدامة.

Appendix

1. Interview:

1.1 Selection of Interviewees:

The interviewees represent a spectrum of project roles, ensuring a comprehensive examination of the project's dynamics.

The selected roles are:

- f) Project Consultant
- g) Project Director
- h) Project Manager
- i) Project Specialist
- j) Project Engineer

1.2 Interview Structure:

The following questions have been selected for this study in order to collect data to identify recurring themes, patterns, and key findings:

- 5) What do you know about the Cubic (Mukaab) Project?
- 6) In your opinion, how can the Cubic (Mukaab) Project align with Vision 2030 of Saudi Arabia?
- 7) Referring to your experience, what does the Cubic (Mukaab) Project need to be Aligning with Vision 2030 of Saudi Arabia?
- 8) What can lessons learned and case studies from successful sustainable projects add to the Cubic (Mukaab) Project?

2. Survey:

2.1.1 Introduction and General Demographical Information (Section 1):

Brief introduction and participant demographics include:

a) Gender (Male/Female):

Section 1: Participant Information	
Gender	
Male	
Female	

b) Age Categories (from 20 to more than 60 years):

Section 1: Participant Information	
Age of Categories	
Age (Years)	
20 - 30	
31 - 40	
41 - 50	
51 - 60	
Above 60	

c) Educational Background (High school, High diploma, Bachelor's degree, Master degree and Ph.D. or other equivalent):

Section 1: Participant Information	
Educational Background	
Degree	
High School	
High Diploma	
Bachelor	
Master	
Ph.D. or equivalent	
High Diploma	
Bachelor	
Master	
Ph.D. or equivalent	

d) Job title/Occupational Position (Consultant, Director, Manager, Engineer, Coordinator and Other related to project management):

Section 1: Participant Information	
Professional Occupation	
Occupation	
Project Coordinator	
Project Engineer	
Project Manager	
Project Director	
Project Consultant	
Other	

- e) Level of Expertise in Project Management (Novic, Intermediate, Advanced, Expert and Proficient):

Section 1: Participant Information				
Professional Occupation				
Occupation/Level of Expertise	Novice	Intermediate	Advance	Expert
Project Coordinator				
Project Engineer				
Project Manager				
Project Director				
Project Consultant				
Other				

- f) The participants' employer that they are working in (Government, Semi-government, Private, Own-business, and Job seeker):

Section 1: Participant Information				
Employer				
Occupation/Employer	Private	Government	Semi-Government	Own Business
Project Coordinator				
Project Engineer				
Project Manager				
Project Director				
Project Consultant				
Other				

- g) The project role of the participants' employer that they are working in (Client, Consultant, Contractors, and 3rd party):

Section 1: Participant Information						
The project role of participants employer in their project						
Occupation/Role	Client	Client Representative	Consultant	3rd Party	Main Contractor	Sub-contractor
Project Coordinator						
Project Engineer						
Project Manager						
Project Director						
Project Consultant						
Other						

- h) The project type that the participants are working in (Construction, Infrastructure, Industrial, or related to other business matters):

Section 1: Participant Information					
The project sector of employer participants in their scope					
Occupation/Sector	Industrial	Infrastructure	Construction	Business Implementation/Development	Software development/Continuous
Project Coordinator					
Project Engineer					
Project Manager					
Project Director					
Project Consultant					
Other					

- i) The project scope of the participants' employer that they are working for (Design, EPC, Surveillance, Supply chain and Auditing):

Section 1: Participant Information						
The project scope of employer participants in their work						
Occupation/Scope	Design	Supervision and Surveillance	Engineering, Procurement and Construction	Logistics and Supply Chain	Auditing	Technology Governance
Project Coordinator						
Project Engineer						
Project Manager						
Project Director						
Project Consultant						
Other						

2.1.2 Assessing Comprehension in the Context of Sustainable Mega-Projects (Section 2):

Assessing Comprehension in the Context of Sustainable Mega-Projects (Section 2)		
No.	Question	Answers
1	To what you understand the concept of sustainable mega-projects?	Extremely well
		Moderately well
		Somewhat well
		Not very well
		Not at all
2	To what you extent do you agree that sustainable mega-projects can contribute significantly to achieving sustainable development goals?	Strongly agree
		Agree
		Neutral
		Disagree
		Strongly disagree
3	How important do you consider incorporating sustainability principles into the planning, design, and implementation of mega-projects?	Extremely important
		Very important
		Moderately important
		Somewhat important
		Not important
4	What is the key challenge do you think in implementing sustainable practices in mega-projects?	Balancing economic, social, and environmental considerations
		Integrating sustainability into existing project management frameworks
		Measuring and evaluating the sustainability performance of mega-projects
		Obtaining stakeholder buy-in and support for sustainable practices
		Overcoming technical and technological limitations
5	What are your expectations for the Cubic (Mukaab) project in terms of its contribution to sustainable development?	Set a new standard for sustainable mega-projects
		Demonstrate the feasibility of large-scale sustainable infrastructure
		Serve as a model for future sustainable cities
		Catalyze advancements in sustainable technologies
		Make a significant contribution to Saudi Arabia's Vision 2030

2.1.3 Evaluating Familiarity with the Cubic (Mukaab) Project in Riyadh and the Vision 2030 of Saudi Arabia (Section 3):

Evaluating Familiarity with the Cubic (Mukaab) Project in Riyadh and the Vision 2030 of Saudi Arabia (Section 3)		
No.	Qusetion	Answers
1	To what is you familiar with the Vision 2030 of Saudi Arabia?	Extremely familiar
		Slightly familiar
		Moderately familiar
		Very familiar
		Not at all familiar
2	To what is you familiar with the Cubic (Mukaab) Project in Riyadh?	Extremely familiar
		Slightly familiar
		Moderately familiar
		Very familiar
		Not at all familiar
3	To what extent do you think that the Cubic (Mukaab) Project aligns with the goals of Vision 2030 in Saudi Arabia?	Slightly
		Moderately
		Very much
		Completely
		Not at all
4	In your opinion, what is the major sustainability challenges that the Cubic (Mukaab) Project might face?	Environmental impact
		Social impact
		Economic sustainability
		Technological challenges
		Political/regulatory issues
5	How well do you think the Cubic (Mukaab) Project has utilized lessons learned from previous mega-projects?	Poorly
		Fairly
		Adequately
		Well
		Excellently
6	Do you believe that the Cubic (Mukaab) Project can serve as a benchmark for future mega-projects in terms of sustainability?	Slightly
		Moderately
		Very much
		Completely
		Not at all

2.1.4 Assessing Comprehension in the Context of Lessons Learned and Case Studies (Section 4):

Assessing Comprehension in the Context of Lessons Learned and Case Studies (Section 4)					
No.	Qusetion	Answers	No.	Qusetion	Answers
1	How important do you think lessons learned and case studies are in the context of mega-projects?	Extremely important	6	To what extent do you agree that incorporating lessons learned and case studies can enhance the overall efficiency and effectiveness of the Cubic (Mukaab) project?	Strongly agree
		Very important			Agree
		Moderately important			Neutral
		Somewhat important			Disagree
		Not important			Strongly disagree
2	To what extent do you believe that successful mega-projects are influenced by the incorporation of lessons learned from previous projects?	Slightly	7	How valuable do you consider case studies of successful sustainable mega-projects in shaping the design and implementation of the Cubic (Mukaab) project?	Extremely Valuable
		Moderately			Very Valuable
		Very much			Moderately Valuable
		Completely			Somewhat Valuable
		Not at all			Not Very Valuable
3	Do you think there is a need for a systematic approach to documenting and disseminating lessons learned and case studies in mega-projects?	Strongly agree	8	How important do you consider the role of lessons learned and case studies in mitigating risks and challenges associated with the Cubic (Mukaab) project?	Extremely important
		Agree			Very important
		Neutral			Moderately important
		Disagree			Somewhat important
		Strongly disagree			Not important
4	To what extent do you agree that incorporating lessons learned from previous mega-projects is crucial for the success of the Cubic (Mukaab) project?	Strongly agree	9	How often do you or your organization review and analyze lessons learned from past projects before initiating a new mega-project?	Never
		Agree			Rarely
		Neutral			Occasionally
		Disagree			Frequently
		Strongly disagree			Always
5	To what extent do you believe that lessons learned and case studies can help the Cubic (Mukaab) project achieve its sustainability goals?	Strongly agree	10	In your opinion, what role do case studies play in improving the sustainability of mega-projects?	Minimal role
		Agree			Moderate role
		Neutral			Significant role
		Disagree			Essential role
		Strongly disagree			No role

2.1.5 Evaluating the Applicability of Lessons Learned and Case Studies

(Section 5):

Evaluating the Applicability of Lessons Learned and Case Studies (Section 5)		
No.	Question	Answers
1	How applicable do you consider the lessons learned from previous mega-projects to the specific context of the Cubic (Mukaab) project in Riyadh?	Highly Applicable
		Moderately Applicable
		Somewhat Applicable
		Limited Applicability
		Not Applicable
2	To what extent do you believe that case studies of successful sustainable mega-projects can be effectively adapted to the Cubic (Mukaab) project?	Strongly agree
		Agree
		Neutral
		Disagree
		Strongly disagree
3	How relevant do you consider the sustainability practices and strategies employed in successful case studies to the Cubic (Mukaab) project?	Highly Relevant
		Moderately Relevant
		Somewhat Relevant
		Limited Relevance
		Not Relevant
4	To what extent do you agree that the challenges addressed and solutions implemented in case studies can be applied to the Cubic (Mukaab) project?	Strongly agree
		Agree
		Neutral
		Disagree
		Strongly disagree
5	How transferable do you consider the lessons learned and best practices from case studies to the Cubic (Mukaab) project?	Highly Transferable
		Moderately Transferable
		Somewhat Transferable
		Limited Transferability
		Not Transferable

2.1.6 Assessing Comprehension in the Context of the Integration of Lessons Learned and Case Studies (Section 6):

Assessing Comprehension in the Context of the Integration of Lessons Learned and Case Studies (Section 6)		
No.	Question	Answers
1	To what extent do you agree that there is a clear understanding of the lessons learned and best practices from relevant case studies?	Strongly agree
		Agree
		Neutral
		Disagree
		Strongly disagree
2	How effectively do you believe the lessons learned and case studies are being integrated into the planning and design of the Cubic (Mukaab) project?	Extremely Effective
		Very Effective
		Moderately Effective
		Somewhat Effective
		Not Effective
3	To what extent do you agree that the Cubic (Mukaab) project is incorporating sustainability principles and strategies aligned with the lessons learned and case studies?	Strongly agree
		Agree
		Neutral
		Disagree
		Strongly disagree
4	How well do you believe the Cubic (Mukaab) project is adapting and applying the risk mitigation strategies identified in relevant case studies?	Extremely well
		Moderately well
		Somewhat well
		Not very well
		Not at all
5	To what extent do you agree that the lessons learned and case studies are being used to enhance the overall project management and decision-making for the Cubic (Mukaab) project?	Strongly agree
		Agree
		Neutral
		Disagree
		Strongly disagree

2.1.7 Assessing Application of Best Practices (Section 7):

Assessing Application of Best Practices (Section 7)		
No.	Qusetion	Answers
1	To what extent do you think best practices are currently applied in the planning phase of mega-projects such as the cubic (Mukaab)?	Slightly
		Moderately
		Very much
		Completely
		Not at all
2	How effectively are lessons learned incorporated into the decision-making processes during the execution phase of mega-projects projects such as the cubic (Mukaab)?	Extremely Effective
		Very Effective
		Moderately Effective
		Somewhat Effective
		Not Effective
3	In your experience, how important is it to have a dedicated team responsible for capturing and disseminating lessons learned throughout a mega-project such as the cubic (Mukaab)?	Extremely important
		Very important
		Moderately important
		Somewhat important
		Not important
4	To what extent are sustainability considerations integrated into the best practices followed in mega-project management?	Slightly
		Moderately
		Very much
		Completely
		Not at all
5	How open is the organizational culture in your workplace to the continuous improvement of mega-project management practices?	Not open at all
		Slightly open
		Moderately open
		Very open
		Extremely open

2.1.8 Overall Perception (Section 8):

Overall Perception (Section 8)		
No.	Qusetion	Answers
1	How would you rate the impact of lessons learned and case studies on the success of sustainable mega-projects?	Negative
		Very negative
		Neutral
		Positive
		Very positive
2	In your opinion, what are the most major factor that contribute to the success of sustainable mega-projects?	Adequate planning
		Stakeholder engagement
		Effective risk management
		Technological innovation
		Robust lessons learned process
3	How confident are you in the ability of the construction industry to adapt and implement sustainable practices in mega-projects?	Extremely important
		Very important
		Moderately important
		Somewhat important
		Not confident at all
4	To what extent do you think government policies and regulations support the implementation of sustainable practices in mega-projects?	Slightly
		Moderately
		Very much
		Completely
		Not at all
5	What recommendations do you have for improving the integration of lessons learned and case studies in the planning and execution of sustainable mega-projects?	

Survey Link:

https://docs.google.com/forms/d/1Hzqr23UfzH-19cIlzA0CaG5dyKP_OmvFpR5cm-x6lKE

Reference:

- ❖ Sustainability in project management: A literature review and impact analysis A.J. Gilbert Silvius, LOI University of Applied Sciences Utrecht, The Netherlands* Ron P.J. Schipper, Van Aetsveld, Project and Change Management, The Netherlands.
- ❖ OWARDS SUSTAINABLE URBAN DEVELOPMENT IN ARID REGIONS: MASDAR CITY AS A CASE STUDY Mohammed Farouk El-Aby Architecture, Deanship of Preparatory Year & Supporting Studies, University of Dammam, Saudi Arabia
- ❖ Sustainability in (Mega)Project Management—A Business Case for Project Sustainability, Edoardo Favari.
- ❖ Sustainability in project management: A literature review and impact analysis A.J. Gilbert Silvius, LOI University of Applied Sciences Utrecht, The Netherlands* Ron P.J. Schipper, Van Aetsveld, Project and Change Management, The Netherlands
- ❖ The impact of project sustainability management (PSM) on project success A systematic literature review Amin Khalifeh University of Bolton, Bolton, UK Peter Farrell School of Engineering, University of Bolton, Bolton, UK, and Malek Al-edenat Department of Business, Faculty of Wellbeing and Social.
- ❖ Flyvbjerg, Bent. Megaprojects and Risk: An Anatomy of Ambition. Cambridge University Press, 2011.
- ❖ Flyvbjerg, Bent, Nils Bruzelius, and Werner Rothengatter. Megaprojects and Risk: An Anatomy of Ambition (Second Edition). Cambridge University Press, 2020.
- ❖ Klijn, Erik H., and Frank H. A. Verhagen. "Mega-projects: Definition, Characteristics, and Typology." *International Journal of Project Management* 21, no. 7 (2003): 525–34.
- ❖ Shen, Liyan, and Gang Shen. "Sustainable Development of Mega-Projects: A Review and Framework." *International Journal of Project Management* 31, no. 5 (2013): 717–26.
- ❖ Flyvbjerg, Bent, Nils Bruzelius, and Werner Rothengatter. Megaprojects and Risk: An Anatomy of Ambition (Second Edition). Cambridge University Press, 2020.
- ❖ Klijn, Erik H., and Frank H. A. Verhagen. "Mega-projects: Definition, Characteristics, and Typology." *International Journal of Project Management* 21, no. 7 (2003): 525–34.
- ❖ Shen, Liyan, and Gang Shen. "Sustainable Development of Mega-Projects: A Review and Framework." *International Journal of Project Management* 31, no. 5 (2013): 717–26.
- ❖ Project Management Institute. "A Guide to the Project Management Body of Knowledge (PMBOK Guide)." 7th ed. Project Management Institute, 2021.
- ❖ Flyvbjerg, Bent, Nils Bruzelius, and Werner Rothengatter. Megaprojects and Risk: An Anatomy of Ambition (Second Edition). Cambridge University Press, 2020.
- ❖ Klijn, Erik H., and Frank H. A. Verhagen. "Mega-projects: Definition, Characteristics, and Typology." *International Journal of Project Management* 21, no. 7 (2003): 525–34.
- ❖ Shen, Liyan, and Gang Shen. "Sustainable Development of Mega-Projects: A Review and Framework." *International Journal of Project Management* 31, no. 5 (2013): 717–26.

- ❖ Al-Moneef, Abdullah, and Areej Al-Moneer. "A Framework for Sustainable Mega-Project Development in Saudi Arabia." *Sustainability* 13, no. 12 (2021): 7304.
- ❖ Al-Shammari, Sarah, and Areej Al-Moneer. "Challenges and Opportunities for Sustainable Mega-Project Development in Saudi Arabia." *Sustainability* 14, no. 5 (2022): 2808.
- ❖ Al-Sulaiman, Turki. "The Cubic: A New Vision for Riyadh." *Saudi Gazette*, March 8, 2023.
- ❖ Al-Turki, U. M., & Al-Harbi, K. M. (2019). The use of lessons learned and case studies in project management in Saudi Arabia. *Journal of King Saud University - Engineering Sciences*, 31(4), 431-442.
- ❖ Al-Sulaiman, M. A., & Al-Ahmadi, M. E. (2021). The impact of lessons learned and case studies on the management of sustainable projects in Saudi Arabia. *International Journal of Project Management*, 39 (1), 37-47.
- ❖ Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, 12(2), 219-245.
- ❖ Jugdev, K., & Müller, R. (2005). A retrospective look at our retrospective: A review of publications on lessons learned in project management. *International Journal of Project Management*, 23(8), 672-681.
- ❖ Müller, R., & Jugdev, K. (2012). Lessons learned in project management: Literature review and a model for organizational implementation. *Engineering Management Journal*, 24(2), 64-78.
- ❖ Silvius, A. J. G., & Schipper, R. (2013). Managing sustainable projects: An exploration of project managers' perceptions of sustainable project management. *International Journal of Project Management*, 31(8), 1145-1152.
- ❖ Soetanto, R., & Proverbs, D. G. (2014). Lessons learned and case studies in sustainable project management. *Construction Management and Economics*, 32(1-2), 1-18.
- ❖ PMI lessons learned <https://www.pmi.org/learning/library/lessons-learned>
- ❖ MI case studies <https://www.pmi.org/learning/academic-research/project-management-curriculum-and-resources/academic-project-management-case-studies>
- ❖ Saudi Press Agency. "The Cubic: A New City Center in Riyadh to Be Based on the Principles of Sustainability and Innovation." Saudi Press Agency, Mar
- ❖ The PMBOK® Guide (Project Management Body of Knowledge).

دراسة بحثية لدرجة الماجستير في الإدارة بمجال إدارة المشاريع، كلية الإدارة، جامعة ميدأوشن

عنوان الدراسة البحثية: أثر الدروس المستفادة ودراسات الحالة على المشاريع الكبرى المستدامة: تطبيق أفضل الممارسات لمشروع المكعب في الرياض والمواءمة مع رؤية المملكة العربية السعودية 2030.

الباحثين:

الرقم الأكاديمي	البريد الإلكتروني	الإسم	دور الباحث
222000556	ankriri11@gmail.com	أنور كيري	الباحث الرئيسي (القائد)
222000980	haya.ali8444@gmail.com	هيا علي	مساعد الباحث 1
222000442	nasee1435unv@hotmail.com	نسيم آل جابر	مساعد الباحث 2

إشراف/

د/ وليد عبد الجواد سليمان صديق
د/ الفيصل عبد الحميد محمد حسن

العام الدراسي:

2023

1444