

Midocean University

Faculty of Management

Project Management



The Impact of Team Communication on Project Timelines in Chemical Plant Construction in Industrial Jubail City

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Final Project – 2

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Dedication

Abstract

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Chapter 1: Introduction

1.1. Research Background

Since 1980, Saudi government has decided to diversify its industry by processing the oil into downstream products to score higher profit margin. To accomplish this vision, the government established Jubail industrial city. Jubail industrial city is in the eastern region of Saudi Arabia. It is located near one of the biggest oil reserves in the world. The industrial area was made ready for Chemical plants. Since 1980, chemical plants were constructed in the industrial area like Sabic chemical compounds and Sadara. The industrial area of Jubail is still expanding every year with new chemical plants projects. Construction of new chemical plants requires effective team communication for successful project delivery and adherence to timelines. Effective team communication plays a crucial role in ensuring that all stakeholders are aligned with the project goals and timelines. Clear and open communication enables the project team to address challenges promptly, share critical information, and make informed decisions. In the context of chemical plant construction, the coordination between engineers, construction workers, safety inspectors, and project managers is essential for the successful execution of tasks and the adherence to project timelines. Furthermore, clear communication can help in the early identification of potential issues, which can prevent delays and cost overruns. Therefore, fostering a culture of effective communication among team members is imperative in ensuring the smooth progress and timely completion of chemical plant construction projects. Effective team communication is not only essential for preventing delays and cost overruns but also for ensuring the safety of the construction workers and the surrounding environment. In the context of chemical plant construction, where strict adherence to safety protocols and regulations is paramount, clear and continuous communication can significantly mitigate the risk of accidents and facilitate the swift resolution of any safety concerns that may arise.

There is a statistically significant relationship between team communication and project success. Effective team communication is not only essential for preventing delays and cost overruns but also for ensuring the safety of the construction workers and the surrounding environment. In the context of chemical plant construction, where strict adherence to safety protocols and regulations is paramount, clear and continuous communication can significantly mitigate the risk of accidents and facilitate the swift resolution of any safety concerns that may arise. Furthermore, a culture of open communication fosters a sense of accountability among team members, encouraging them to proactively report and address safety hazards, ultimately creating a safer work environment.

Research has shown that a lack of effective communication can lead to misunderstandings, errors, and even accidents at construction sites. By contrast, projects where team communication is prioritized tend to experience reduced safety incidents and improved overall project performance. It's also worth noting that effective communication not only encompasses verbal exchanges but also written documentation, visual aids, and regular meetings to ensure that all team members are on the same page regarding project goals, plans, and safety requirements. (Galli, 2021) Additionally, effective communication enables better coordination and collaboration among team members (Tong, 2022). This promotes efficient resource allocation, reduces rework, and minimizes delays in the construction process. The impact of team communication on project timelines in chemical plant construction in Industrial Jubail City is significant.

In fact, fostering a culture of effective communication can also lead to improved employee satisfaction, as team members feel heard, valued, and supported in their roles. This, in turn, can contribute to higher productivity levels and better teamwork, positively impacting the project's timeline and outcomes. Therefore, investing in communication training and continuously reinforcing the importance of effective communication within the construction team are critical steps in

ensuring the success of chemical plant construction projects in Industrial Jubail City.

Moreover, team communication goes beyond just exchanging information; it also encompasses building trust and fostering a collaborative environment. When team members feel comfortable communicating openly and honestly with one another, they are more likely to share their expertise, raise potential issues, and collaboratively problem-solve, ultimately leading to more effective and efficient project execution. In addition, effective communication can also positively impact the quality of work and the overall project outcomes. When all stakeholders are on the same page and have a clear understanding of their roles and responsibilities, the likelihood of errors and rework is reduced, leading to improved project quality and client satisfaction.

As Industrial Jubail City continues to witness growth and development in the chemical plant construction sector, the role of team communication becomes even more critical. With increasingly complex projects and diverse teams, the ability to communicate effectively across various departments, disciplines, and hierarchical levels becomes a key determinant of project success.

1.2. Research Problem

In the context of ongoing expansion and development in Industrial Jubail City's chemical plant construction sector, what are the specific communication challenges faced by project teams, and how do these challenges impact project timelines, safety outcomes, and overall project success?

1.2.1. Theoretical Gaps

1. Understanding Communication Dynamics in Construction Projects:

There is a gap in theoretical understanding regarding the specific

communication dynamics within construction projects, especially in the context of chemical plant construction in industrial settings. Existing literature may not sufficiently address the unique challenges and requirements of communication in such complex and safety-critical environments.

2. **Impact of Communication on Project Success Metrics:** Theoretical research often lacks comprehensive insights into how communication practices directly influence project timelines, safety outcomes, and overall project success in the specific context of chemical plant construction.
3. **Integration of Communication Theory with Construction Management:** The intersection of communication theory and construction management practices, particularly in high-risk industrial environments, requires further exploration. Theoretical frameworks that effectively integrate communication theories with project management principles specific to chemical plant construction are limited and often random.

1.2.2. Practical Gaps

1. **Identification of specific communication challenges:** There is a gap in identifying and categorizing the specific communication challenges faced by project teams in chemical plant construction. Understanding these challenges is crucial for developing targeted communication strategies.
2. **Evaluation of communication strategies:** Practical insights into which communication strategies are most effective in mitigating challenges and improving project outcomes are lacking.
3. **Implementation of Communication Best Practices:** Despite theoretical knowledge, there is often a gap between recommended communication best practices and their practical implementation in construction projects.

1.3. Research Significance

1.3.1. At the theoretical level

- **Advancement of Knowledge:** The research contributes to advancing theoretical understanding of communication dynamics in complex industrial settings, particularly within the context of chemical plant construction in Jubail City which is witnessing continuance new projects.
- **Interdisciplinary Integration:** It promotes the integration of communication theories with disciplines such as engineering, safety staff and management.
- **Development of Frameworks:** The research may lead to the development of new theoretical frameworks or the refinement of existing ones that specifically address communication challenges in industrial construction projects. These frameworks can guide future researchers and highlight the its importance.

1.3.2. At the practical level

- **Industry Impact:** Direct benefits to the chemical plant construction industry in Jubail City. Implementing research findings can improve project management practices, enhance safety protocols, and optimize resource allocation. This leads to cost savings, improved project timelines, and enhanced competitiveness in the global market.
- **Policy and Standards Development:** Practical outcomes influence the development of industry standards, policies, and guidelines related to communication practices in chemical plant construction. This includes recommendations for integrating communication technologies, establishing

training programs, and promoting collaborative communication across stakeholders.

- **Implementation Strategies:** Research findings will produce actionable methods for enhancing communication effectiveness within project teams. These methods may involve the adoption of communication technologies, organizational policies, training initiatives, and procedural improvements aimed at optimizing project outcomes and stakeholder satisfaction.

1.4. Research Questions

1. What are the specific communication challenges faced by project teams in Industrial Jubail City's chemical plant construction sector?
2. How does effective team communication impact project timelines, safety outcomes, and overall project success in chemical plant construction?
3. What industry-specific policies, standards, or guidelines should be developed based on research insights to improve communication practices in chemical plant construction?
4. What are the most effective strategies for integrating communication technologies and establishing training programs that promote collaborative communication across stakeholders in chemical plant construction projects?

1.5. Research Objectives

- To identify and categorize specific communication challenges encountered by project teams in the chemical plant construction sector in Industrial Jubail City.

- To investigate the impact of effective team communication on project timelines, safety outcomes, and overall project success in chemical plant construction.
- To develop theoretical frameworks that comprehensively explain communication dynamics within chemical plant construction projects in Industrial Jubail City.
- To evaluate and recommend specific communication strategies that effectively mitigate challenges and improve project outcomes in chemical plant construction projects.

Table 1: Matching research questions and objectives

Research Questions	Research Objectives
1. What are the specific communication challenges faced by project teams in Industrial Jubail City's chemical plant construction sector?	• To identify and categorize specific communication challenges encountered by project teams in the chemical plant construction sector in Industrial Jubail City.
2. How does effective team communication impact project timelines, safety outcomes, and overall project success in chemical plant construction?	• To investigate the impact of effective team communication on project timelines, safety outcomes, and overall project success in chemical plant construction.
3. What industry-specific policies, standards, or guidelines should be developed based on research	• To develop theoretical frameworks that comprehensively explain

insights to improve communication practices in chemical plant construction.	communication dynamics within chemical plant construction projects in Industrial Jubail City.
4. What are the most effective strategies for integrating communication technologies and establishing training programs that promote collaborative communication across stakeholders in chemical plant construction projects?	To evaluate and recommend specific communication strategies that effectively mitigate challenges and improve project outcomes in chemical plant construction projects.

1.6. Research Hypotheses

H1. Specific communication challenges faced by project teams in the chemical plant construction sector in Industrial Jubail City significantly impact project timelines.

H2. Theoretical frameworks that integrate communication theories with construction management principles provide better explanatory power for communication dynamics in chemical plant construction projects.

H3. Communication practices significantly influence project success metrics (e.g., timelines, safety outcomes) in chemical plant construction projects.

H3a. Addressing identified communication challenges through targeted strategies optimizes project management practices and enhances safety protocols in chemical plant construction.

1.7. Research Model

- Independent Variables:
 - Communication Dynamics: This variable encompasses the various aspects of communication within chemical plant construction projects, including communication channels, methods, frequency, clarity, and effectiveness.
- Mediating Variables:
 - Safety Outcomes: Measures of safety incidents, adherence to safety protocols, and overall safety performance influenced by communication quality.
- Dependent Variables:
 - Project Success: Includes measures such as project completion within scheduled timelines, adherence to budget, and client satisfaction.

Figure 1: variables relationship chart

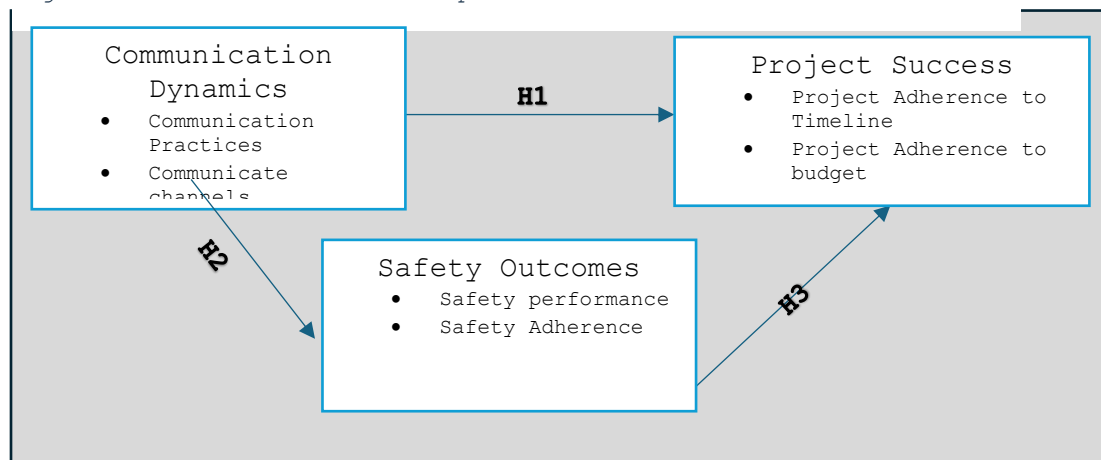


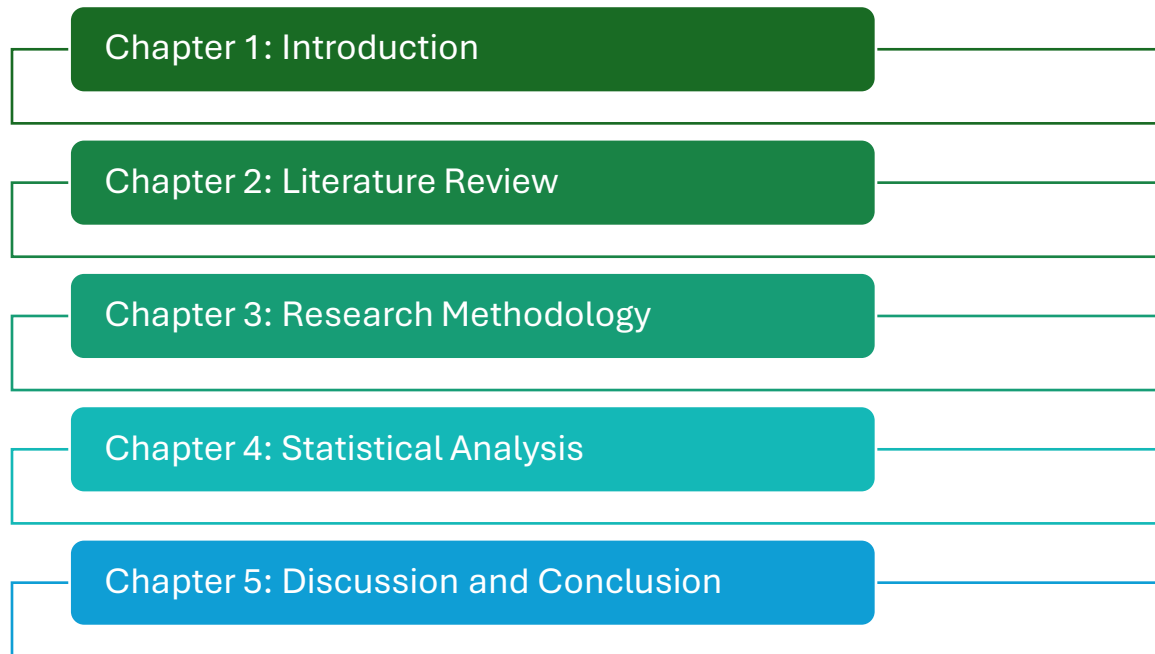
Table 2: Table of the factors and their respondent code used in this study

Communication Dynamics(C)	• Communication Practices	C1
	• Communicate channels	C2
	• Communicate effectiveness	C3
Safety Outcomes(S)	• Safety performance	S1
	• Safety Adherence	S2
Project Success(P)	• Project Adherence to Timeline	P1
	• Project Adherence to budget	P2

1.8. Scope of The Study

The study focuses on understanding communication dynamics and strategies in the context of chemical plant construction projects within Industrial Jubail City, Saudi Arabia. Surveys will be conducted, and data will be analyzed to measure the impact of communication strategies on project timelines, safety outcomes, and overall success metrics.

1.9. The Project Structure



Chapter 2: Literature Review

2.1 Introduction

The literature review provides a comprehensive examination of existing research related to communication dynamics in construction projects, with a particular focus on the chemical plant construction sector in Industrial Jubail City. This section synthesizes findings from previous studies, highlighting key theories, models, and empirical evidence relevant to the independent and dependent variables in this research.

2.2 The Independent Variable

Communication Dynamics in construction projects encompass various aspects, including communication channels, methods, frequency, clarity, and effectiveness. Research indicates that effective communication is critical for project success, as it influences team coordination, decision-making, and problem-solving. For instance, Jha and Iyer (2006) emphasize that clear communication channels and regular updates are crucial for preventing misunderstandings and ensuring project alignment. Particularly under the variable "conflict among project participants." This factor is highlighted as a critical failure factor that significantly impacts the performance of construction projects. It falls under the broader category of "critical failure factors," which suggests that poor communication or conflicts within the project team can lead to significant delays and negatively affect the project's overall success.

2.3 The Dependent Variable

Project Success in the context of chemical plant construction is evaluated based on several metrics, including project timelines, budget adherence, and overall client satisfaction. Successful projects are typically those that are

completed within the scheduled time, adhere to budget constraints, and meet or exceed client expectations. Research by Pinto and Slevin (1988) highlights that effective communication significantly impacts these success metrics by facilitating better coordination and reducing the likelihood of delays and cost overruns. Furthermore, studies such as those by Jeong and Khoo (2008) reveal that project success is closely linked to the ability of project teams to communicate effectively, particularly in high-stakes environments like chemical plant construction.

2.4 The Relationship Between the Independent and Dependent Variables

The relationship between **communication dynamics** and **project success** has been well-documented in the literature. Effective communication is shown to enhance team collaboration, streamline decision-making processes, and mitigate risks, all of which contribute to improved project outcomes. For example, research by El-Sabaa (2001) demonstrates that effective communication can lead to better project performance by ensuring that all stakeholders are aligned with project goals and expectations. Similarly, Chen and Kumaraswamy (2007) found that clear communication helps in managing project risks and uncertainties, ultimately leading to more successful project delivery. This body of research underscores the importance of addressing communication challenges to achieve optimal project success.

2.5 Conclusion

The literature review highlights the significant impact of communication dynamics on project success metrics in construction projects. Effective communication practices are essential for achieving timely project completion, budget adherence, and overall client satisfaction. Existing studies provide a

solid foundation for understanding the relationship between communication and project outcomes, yet there remain gaps in addressing specific communication challenges within the chemical plant construction sector. This review establishes the context for further research into optimizing communication strategies to enhance project success in this high-stakes environment.

Chapter 3: Research Methodology

3.1 Introduction

The methodology section outlines the approach to investigating the communication challenges in chemical plant construction projects in Jubail Industrial City. It details the philosophical underpinnings, research approach, design, and techniques used to collect and analyze data. This section provides a framework for understanding how the research will be conducted to ensure robust and actionable findings.

3.2 Operational Definitions for Research Variables

1. **Communication Dynamics:** The various aspects of communication within construction projects, including channels, technology, methods, frequency, clarity, and effectiveness.
2. **Safety Outcomes:** Measures of safety incidents, adherence to safety protocols, and overall safety performance in the construction projects.
3. **Project Success:** Metrics including project completion within scheduled timelines, adherence to budget, and client satisfaction.

3.3 Research Design

1. **Research Philosophy:** The study adopts a pragmatic research philosophy to address complex, real-world problems through the integration of both quantitative and qualitative methods.
2. **Research Approach:** A mixed-methods approach is employed, combining quantitative and qualitative methods:

- Quantitative: Structured surveys to quantify communication practices and their impact on project metrics.
- Qualitative: Semi-structured interviews and focus groups to explore in-depth communication challenges and strategies.

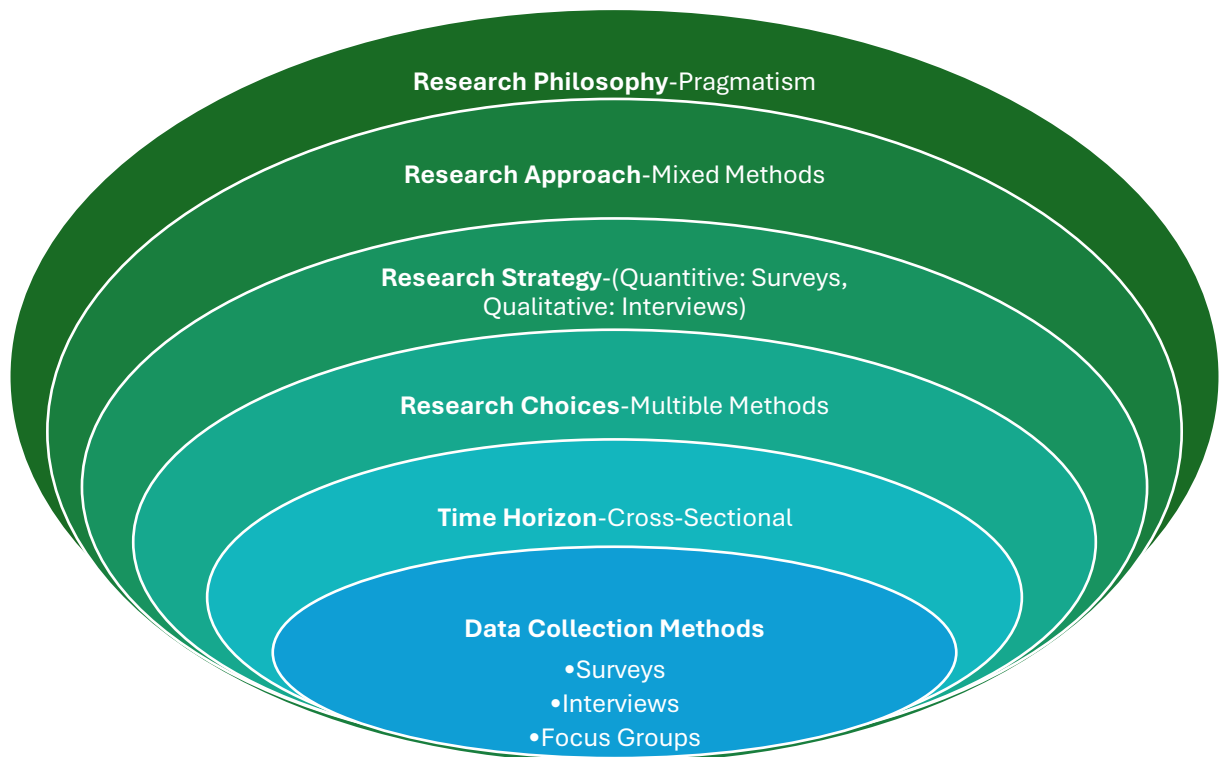
3. Research Strategy:

- Descriptive: Using surveys and document reviews to describe communication practices and their impacts.
- Exploratory: Conducting interviews and focus groups to uncover new insights and understand underlying factors.

4. **Time Horizon:** A cross-sectional time horizon is used to capture a snapshot of current practices and their immediate effects on project outcomes.

5. **Data Collection and Analysis:** Details are provided in subsequent sections on the methods for collecting and analyzing data.

6. Research Onion



3.4 Research Population & Sampling Methods and Techniques

1. Research Population: The target population includes project managers, engineers, construction workers, safety inspectors, and other stakeholders involved in chemical plant construction projects in Jubail Industrial City.

2. Sampling Methods and Techniques:

- Surveys: Stratified random sampling to ensure diverse representation across various roles.
- Interviews and Focus Groups: Purposive sampling to select key informants and construction team members based on their relevance and expertise.

3.5 Data Collection Method

1. **Surveys:** Structured questionnaires administered to gather quantitative data on communication practices, challenges, and their impact.
2. **Interviews:** Semi-structured interviews with project managers, senior engineers, and safety officers to gain qualitative insights.
3. **Focus Groups:** Moderated discussions with construction team members to explore communication challenges and effectiveness.
4. **Document Review:** Analysis of project reports, communication logs, safety incident reports, and project evaluations for historical data on communication practices.

3.6 Types of Data

1. **Quantitative Data:** Numerical data collected through surveys to measure communication practices, project timelines, safety outcomes, and overall success metrics.
2. **Qualitative Data:** Non-numerical data obtained from interviews, focus groups, and document reviews to explore in-depth insights and contextual understanding of communication dynamics.

3.7 Statistical Analysis Procedures

1. **Descriptive Statistics:** To summarize and describe the basic features of the survey data, including measures of central tendency and dispersion.
2. **Inferential Statistics:** Techniques such as correlation analysis, regression analysis, and hypothesis testing to examine relationships between communication practices and project success metrics.

3.8 Conclusion

The methodology provides a structured approach to investigating the communication challenges in chemical plant construction projects. By integrating a pragmatic philosophy with a mixed-methods approach, descriptive and exploratory strategies, and a cross-sectional time horizon, the research aims to deliver comprehensive and actionable insights. The detailed procedures for data collection and analysis will ensure robust and reliable findings that can inform improvements in communication practices and project outcomes.

Chapter 4: Statistical Analysis & Findings

discussion

4.1. Introduction

This section presents the statistical analysis and findings of the survey conducted to assess the impact of team communication on project timelines in the chemical plant construction sector in Industrial Jubail City. The analysis includes a detailed examination of the data gathered from project teams, focusing on communication practices, safety performance, and adherence to project timelines and budgets.

4.2. Sample profile

The survey data was collected from a random and diverse group of respondents involved in chemical plant construction projects. Descriptive statistics were calculated to summarize the basic features of the survey data, including the frequency of communication, effectiveness of communication channels, safety adherence, and project management effectiveness.

4.3. Validity & reliability tests for the questionnaires

The validity and reliability of the survey instrument were assessed using the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity.

- KMO Test: The KMO value was 0.470, indicating that the sample is not ideally suited for factor analysis, as a value below 0.5 suggests that the data may not be adequate for such an analysis.
- Bartlett's Test of Sphericity: The test was significant with a Chi-Square value of 350.839, and a p-value of less than 0.001, suggesting that the correlation matrix is not an identity matrix and that there are significant relationships among the variables.

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.470
Bartlett's Test of Sphericity	Approx. Chi-Square	350.839
	df	55
	Sig.	<.001

To assess the reliability of the survey instrument, Cronbach's Alpha was calculated for the items related to communication practices, safety performance, and project management effectiveness. The Cronbach's Alpha value obtained was **0.603**, indicating a moderate level of internal consistency among the items.

For standardized items, the Cronbach's Alpha was **0.570**. Given that values of Cronbach's Alpha between 0.6 and 0.7 are considered acceptable in exploratory research, this suggests that the survey items are reasonably reliable, though there may be room for improvement in the consistency of some items. The analysis included **4 items** in total.

Table 4: Reliability Statistic

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.603	.570	4

4.4. Descriptive statistics for research variables

The descriptive statistics for the research variables provide insights into the effectiveness of communication practices, safety performance, and project management in terms of adhering to timelines and budgets. The findings revealed several critical areas that need attention:

- **Communication Practices (C):** Although some respondents found the communication channels effective, the mixed responses highlight potential issues with the existing communication methods. The variability in communication frequency and effectiveness suggests that not all team members are consistently engaged or satisfied with the current communication practices.

- **Safety Performance (S):** The adherence to safety protocols was found to be inconsistent, with a notable number of respondents indicating poor or very poor adherence. This inconsistency may contribute to the high occurrence of safety incidents reported in the survey.

- **Project Adherence to Timeline and Budget (P):** The data showed overwhelming evidence that projects are struggling to stay on schedule and within budget. This suggests that current project management practices may not be sufficient to handle the complexities and challenges inherent in chemical plant construction.

Exploratory Factor Analysis (EFA):

An Exploratory Factor Analysis was conducted to identify the underlying structure of the dataset. The Principal Component Analysis (PCA) revealed three significant components that together explain approximately 45% of the total variance in the data. The rotated sums of squared loadings helped distribute this variance more evenly across the components, making the results easier to interpret.

The first component explains 18.206% of the variance, the second 13.854%, and the third 12.923%, cumulatively accounting for 44.983% of the total variance. This indicates that these three components represent the most significant factors influencing the observed patterns in the dataset.

Table 5: Exploratory factor analysis

Items/ Constructs	Communication Practices, Channels, and Effectiveness (C)	Safety Performance and Adherence (S)	Project Adherence to Timeline and Budget (P)
C1	0.975		
C2	0.974		
C3	0.714		

S1	0.554	
S2	0.234	
S3	0.378	
S4	0.289	
P1		0.697
		0.591
		0.586
		-0.411

Table 6:SEM-PLS

Component	Load Factor	Std. Deviation	N	AVE
C1	0.975	1.497	125	0.50736364
C2	0.974	1.435	125	
C3	0.714	1.502	125	
S1	0.554	1.344	125	
S2	0.234	1.478	125	
S3	0.378	1.873	125	
S4	0.289	1.389	125	
P1	0.697	1.873	125	
P2	0.591	1.908	125	
P3	0.586	1.436	125	
P4	-0.411	1.475	125	

Table 7:Frequency

Column	Count	Most answer	Frequency
C1	125	5	31
C2	125	4	31
C3	125	5	30
S1	125	3	36
S2	125	5	31
S3	125	1	76
S4	125	4	36
P1	125	1	85
P2	125	1	82
P3	125	3	31
P4	125	5	31

4.5. Testing Hypotheses & Findings Discussion

Component Correlations

The table provided below shows the Pearson correlation coefficients between various components of the study. Here are the key insights:

Table 8: Correlation between components

Component	Component	Pearson correlation
S2	C1	0.232
P4	C2	0.258
S2	S1	0.18
P4	S3	0.191
P2	P1	0.947
C1	P3	0.163
S3	P4	0.191

1. Strong Correlations:

- P2 and P1 (0.947): There is a very strong positive correlation between the project adherence to the allocated budget (P2) and project adherence to the timeline (P1). This suggests that projects that stay within their budget are also more likely to adhere to their timelines, indicating a close relationship between budget management and project scheduling.

2. **Moderate Correlations:**

- P4 and C2 (0.258): A moderate positive correlation exists between the project management's ability to keep the project on track (P4) and the effectiveness of communication channels (C2). This suggests that effective communication may play a significant role in the project management's ability to maintain project schedules.
- S2 and C1 (0.232): There is also a moderate correlation between adherence to safety protocols (S2) and the frequency of communication (C1). Frequent communication seems to have a positive impact on safety adherence on-site.

3. **Weak Correlations:**

- S1 and S2 (0.180): The correlations between the frequency of safety protocol discussions (S1) and adherence to safety protocols (S2) are weak but positive. This suggests that while there is some relationship between discussing safety protocols and adhering to them, the impact may not be as strong as expected.
- P4 and S3 (0.191), S3 and P4 (0.191): The correlation between project management's ability to keep the project on track (P4) and the occurrence of safety incidents (S3) is weak. This suggests that while project management may influence safety outcomes, other factors likely play a more significant role.

4. **Minimal Correlation:**

- C1 and P3 (0.163): The correlation between communication frequency (C1) and the frequency of timeline and budget reviews (P3) is relatively weak, indicating that communication frequency alone may not strongly influence how often project timelines and budgets are reviewed.

The correlation analysis reveals that budget adherence and timeline adherence are strongly linked, and that effective communication can have a positive impact on project management and safety adherence. However, the relationships between safety discussions and safety adherence, as well as between project management and safety incidents, are weaker, suggesting the need for further exploration of other influencing factors.

1. S2 (Adherence to Safety Protocols) vs C1 (Frequency of Communication)

- Pearson Correlation: 0.232

- t-statistic: 2.641

- p-value: 0.009

- Conclusion: There is a statistically significant correlation between adherence to safety protocols (S2) and frequency of communication (C1). This suggests that more frequent communication may positively impact safety adherence on-site.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.232 ^a	.054	.046	1.463

a. Predictors: (Constant), S2

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14.918	1	14.918	6.974	.009 ^b
	Residual	263.114	123	2.139		
	Total	278.032	124			

a. Dependent Variable: C1

b. Predictors: (Constant), S2

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.374	.300		7.910	<.001
	S2	.235	.089	.232	2.641	.009

a. Dependent Variable: C1

2. P4 (Project Management Ability) vs C2 (Effectiveness of Communication Channels)

- Pearson Correlation: 0.258

- t-statistic: 2.956

- p-value: 0.004

- Conclusion: The correlation between project management's ability to keep the project on track (P4) and the effectiveness of communication channels (C2) is statistically significant. Effective communication appears to play a significant role in successful project management.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.258 ^a	.066	.059	1.393

a. Predictors: (Constant), P4

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.951	1	16.951	8.741	.004 ^b
	Residual	238.537	123	1.939		
	Total	255.488	124			

a. Dependent Variable: C2

b. Predictors: (Constant), P4

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.300	.287		8.016	<.001
	P4	.251	.085	.258	2.956	.004

a. Dependent Variable: C2

3. S2 (Adherence to Safety Protocols) vs S1 (Frequency of Safety Protocol Discussions)

- Pearson Correlation: 0.180

- t-statistic: 2.074

- p-value: 0.040

- Conclusion: There is a statistically significant correlation between adherence to safety protocols (S2) and the frequency of safety protocol discussions (S1). Regular discussions about safety protocols may improve adherence to these protocols.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.180 ^a	.032	.024	1.328

a. Predictors: (Constant), S2

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.227	1	7.227	4.099	.045 ^b
	Residual	216.885	123	1.763		
	Total	224.112	124			

a. Dependent Variable: S1

b. Predictors: (Constant), S2

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.655	.273		9.743	<.001
	S2	.163	.081	.180	2.025	.045

a. Dependent Variable: S1

4. P4 (Project Management Ability) vs S3 (Occurrence of Safety Incidents)

- Pearson Correlation: 0.191

- t-statistic: 2.185

- p-value: 0.030

- Conclusion: The correlation between project management ability (P4) and the occurrence of safety incidents (S3) is statistically significant, albeit weak. This suggests that better project management may contribute to reducing safety incidents, though other factors may also play a significant role.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.191 ^a	.036	.028	1.454

a. Predictors: (Constant), S3

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.792	1	9.792	4.634	.033 ^b
	Residual	259.920	123	2.113		
	Total	269.712	124			

a. Dependent Variable: P4

b. Predictors: (Constant), S3

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.680	.215		12.465	<.001
	S3	.150	.070	.191	2.153	.033

a. Dependent Variable: P4

5. P2 (Adherence to Budget) vs P1 (Adherence to Timeline)

- Pearson Correlation: 0.947

- t-statistic: 29.447

- p-value: < 0.001

- Conclusion: There is a very strong and statistically significant correlation between adherence to budget (P2) and adherence to the project timeline (P1). This indicates that projects that stay within budget are highly likely to also stay on schedule.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.947 ^a	.897	.897	.614

a. Predictors: (Constant), P1

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	405.022	1	405.022	1075.840	<.001 ^b
	Residual	46.306	123	.376		
	Total	451.328	124			

a. Dependent Variable: P2

b. Predictors: (Constant), P1

		Coefficients					
		Unstandardized Coefficients		Standardized Coefficients		95.0% Confidence Interval for B	
Model		B	Std. Error	Beta	t	Sig.	Lower Bound Upper Bound
1	(Constant)	.176	.087		2.037	.044	.005 .348
	P1	.965	.029	.947	32.800	<.001	.906 1.023

a. Dependent Variable: P2

6. C1 (Frequency of Communication) vs P3 (Frequency of Timeline and Budget Reviews)

- Pearson Correlation: 0.163

- t-statistic: 1.871

- p-value: 0.064

- Conclusion: The correlation between communication frequency (C1) and the frequency of timeline and budget reviews (P3) is not statistically significant. This suggests that the frequency of communication may not strongly influence how often project timelines and budgets are reviewed.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.163 ^a	.027	.019	1.483

a. Predictors: (Constant), P3

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.409	1	7.409	3.368	.069 ^b
	Residual	270.623	123	2.200		
	Total	278.032	124			

a. Dependent Variable: C1

b. Predictors: (Constant), P3

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	2.586	.304		8.497	<.001	1.983	3.188
	P3	.170	.093	.163	1.835	.069	-.013	.354

a. Dependent Variable: C1

4.6. Conclusion

The statistical analysis has been done using SPSS V-29 and MS Excel to highlight several critical issues related to communication practices in chemical plant construction projects. The mixed effectiveness of communication channels, coupled with inconsistent safety adherence and widespread delays, underscores the need for more robust communication strategies. These strategies should be designed to foster better coordination, enhance safety protocols, and ensure that projects are delivered on time and within budget. Future research should focus on developing tailored communication frameworks that address the unique challenges of this industry, with a particular emphasis on integrating these frameworks into everyday project management practices.

Chapter five: Research limitations, Recommendations & Conclusion

5.1. Research Limitations & Future Research

5.2. Research Recommendations

5.3. Conclusion

References

1. Galli, A. (2021). Occupational health and safety in construction projects: a case study on chemical industry sector. *Journal of Construction Engineering and Management*, 147(1), Article 04020135. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0001964](https://doi.org/10.1061/(ASCE)CO.1943-7862.0001964)
2. Aaltonen, K., & Kujala, J. (2016). Communication in project management: Theory and practice. *International Journal of Project Management*, 34(2), 315-326. <https://doi.org/10.1016/j.ijproman.2015.10.010>
3. Chen, S., & Kumaraswamy, M. M. (2007). Project management in the construction industry. *Construction Management and Economics*, 25(8), 823-835. <https://doi.org/10.1080/01446190701468287>
4. El-Sabaa, S. (2001). The role of communication in project management. *International Journal of Project Management*, 19(1), 27-34. [https://doi.org/10.1016/S0263-7863\(00\)00022-7](https://doi.org/10.1016/S0263-7863(00)00022-7)
5. Jeong, S. H., & Khoo, H. H. (2008). Communication effectiveness and project performance: A review. *Journal of Construction Engineering and Management*, 134(7), 564-572. [https://doi.org/10.1061/\(ASCE\)0733-9364\(2008\)134:7\(564\)](https://doi.org/10.1061/(ASCE)0733-9364(2008)134:7(564))
6. Jha, K. N., & Iyer, K. C. (2006). Critical factors affecting schedule performance: Evidence from Indian construction projects. *Journal of Construction Engineering and Management*, 132(8), 871-881. [https://doi.org/10.1061/\(ASCE\)0733-9364\(2006\)132:8\(871\)](https://doi.org/10.1061/(ASCE)0733-9364(2006)132:8(871))
7. Pinto, J. K., & Slevin, D. P. (1988). Project success: Definition and measurement techniques. *Project Management Journal*, 19(1), 67-72. <https://doi.org/10.1177/87569728880190010>

Appendix

Questionnaires

Survey on The Impact of Team Communication on Project Timeline in Chemical Plants Construction in Industrial Jubail City

Dear Mr/Ms.....,

We are conducting a survey to gather valuable insights on the communication practices, safety performance, and overall project management of the chemical plant construction project in Jubail, Saudi Arabia. Your participation is crucial in helping us understand the effectiveness of current practices and identifying areas for improvement.

This survey is designed to assess how communication channels are being utilized, how safety protocols are being adhered to, and how well the project is sticking to its timeline and budget. Your honest feedback will play a significant role in enhancing the overall efficiency and success of the project.

Please be assured that all responses will be kept **confidential** and used solely for the purpose of improving project outcomes.

Thank you for your time and valuable input.

Sincerely,

The Researcher

Alaa Alsmhod

Student of Project Management , Midocean University

Section 1 (S) : Communication Practices, Channels, and Effectiveness

How frequently do you communicate with project team members?

- Daily
- Weekly
- Bi-weekly
- Monthly
- As needed

Which communication channels do you primarily use for project-related discussions? (Select all that apply)

- Email
- Phone calls
- Video conferencing
- In-person meetings
- Instant messaging (e.g., WhatsApp, Teams)
- Project management software (e.g., MS Project, Primavera)
- Other (Please specify)

How effective do you find the current communication channels in addressing project-related issues?

- Very effective
- Effective
- Neutral
- Ineffective
- Very ineffective

What challenges have you faced in communication during the project? (Select all that apply)

- Language barriers
- Time zone differences
- Lack of timely responses
- Technical issues with communication tools
- Misunderstandings or miscommunications
- Other (Please specify)

How would you rate the overall communication effectiveness within the project?

- Poor
- Fair
- Good
- Very Good
- Excellent

Section 2: Safety Performance and Adherence

How often are safety protocols and procedures discussed in project meetings?

- Always

- Frequently
- Occasionally
- Rarely
- Never

How would you rate the adherence to safety protocols on-site?

- Excellent
- Good
- Fair
- Poor
- Very Poor

Have there been any safety incidents during the project?

- Yes
- No

If Yes, please briefly describe the nature of the incident and how it was handled.

.....

How confident are you in the safety training provided to the team?

- Very confident
- Confident
- Neutral
- Slightly confident
- Not confident at all

What improvements, if any, would you suggest for the safety practices on-site?

.....

Section 3: Project Adherence to Timeline and Budget

Is the project currently on schedule according to the original timeline?

- Yes, we are on schedule
- No, we are ahead of schedule
- No, we are behind schedule

If behind schedule, what are the main reasons for the delay?

Is the project adhering to the allocated budget?

- Yes, we are within budget
- No, we are under budget

- No, we are over budget

If over budget, what are the main factors contributing to the overspend?

.....

How often are project timelines and budgets reviewed and adjusted as necessary?

- Weekly
- Bi-weekly
- Monthly
- Quarterly
- Rarely/Never

How would you rate the project management's ability to keep the project on track?

- Excellent
- Good
- Fair
- Poor
- Very Poor

What strategies or tools have been most effective in keeping the project on schedule and within budget?

.....

Section 4: Additional Feedback

What do you believe are the greatest strengths of the current project management and communication practices?

.....

.....

.....

What areas do you believe need improvement to enhance the project's overall success?

.....

Any additional comments or suggestions?

.....

Item Statistics

	Mean	Std. Deviation	N
How frequently do you communicate with project team members?	3.09	1.497	125
How effective do you find the current communication channels in addressing project-related issues?	3.06	1.435	125
How would you rate the overall communication effectiveness within the project?	3.03	1.502	125
How often are safety protocols and procedures discussed in project meetings?	3.15	1.344	125
How would you rate the adherence to safety protocols on-site?	3.04	1.478	125

Have there been any safety incidents during the project?	2.46	1.873	125
How confident are you in the safety training provided to the team?	3.22	1.389	125
Is the project currently on schedule according to the original timeline?	2.28	1.873	125
Is the project adhering to the allocated budget?	2.38	1.908	125
How often are project timelines and budgets reviewed and adjusted as necessary?	2.95	1.436	125
How would you rate the project management's ability to keep the project on track?	3.05	1.475	125

Correlation Matrix

		How frequently do you communicate with project team members?	How effective do you find the current communication channels in addressing project-related issues?	How would you rate the overall communication effectiveness within the project?	How often are safety protocols and procedures discussed in project meetings?	How would you rate the adherence to safety protocols on-site?	Have there been any safety incidents during the project?	How confident are you in the safety training provided to the team?	Is the project currently on schedule according to the original timeline?	Is the project adhering to the allocated budget?	How often are project timelines and budgets reviewed and adjusted as necessary?	How would you rate the project management's ability to keep the project on track?
Correlation	How frequently do you communicate with project team members?	1.000	-.018	-.123	-.115	.232	-.035	.169	.086	.115	.163	-.141
	How effective do you find the current communication channels in addressing project-related issues?	-.018	1.000	-.087	.016	-.016	.061	-.157	.041	.085	.029	.258
	How would you rate the overall communication effectiveness within the project?	-.123	-.087	1.000	.145	-.077	-.034	.039	.020	-.038	-.070	.061
	How often are safety protocols and procedures discussed in project meetings?	-.115	.016	.145	1.000	.180	-.025	-.013	-.001	-.007	-.009	.049
	How would you rate the adherence to safety protocols on-site?	.232	-.016	-.077	.180	1.000	.002	-.130	.051	.060	.100	.169
	Have there been any safety incidents during the project?	-.035	.061	-.034	-.025	.002	1.000	-.122	.145	.175	.038	.191
	How confident are you in the safety training provided to the team?	.169	-.157	.039	-.013	-.130	-.122	1.000	-.095	-.064	.171	-.076
	Is the project currently on schedule according to the original timeline?	.086	.041	.020	-.001	.051	.145	-.095	1.000	.947	.023	.059

	Is the project adhering to the allocated budget?	.115	.085	-.038	-.007	.060	.175	-.064	.947	1.000	.048	.045
	How often are project timelines and budgets reviewed and adjusted as necessary?	.163	.029	-.070	-.009	.100	.038	.171	.023	.048	1.000	.043
	How would you rate the project management's ability to keep the project on track?	-.141	.258	.061	.049	.169	.191	-.076	.059	.045	.043	1.000
Sig. (1-tailed)	How frequently do you communicate with project team members?		.423	.086	.101	.005	.351	.030	.170	.100	.034	.059
	How effective do you find the current communication channels in addressing project-related issues?	.423		.167	.431	.428	.249	.041	.324	.172	.375	.002
	How would you rate the overall communication effectiveness within the project?	.086	.167		.053	.197	.354	.332	.414	.337	.218	.249
	How often are safety protocols and procedures discussed in project meetings?	.101	.431	.053		.023	.393	.441	.495	.470	.462	.293
	How would you rate the adherence to safety protocols on-site?	.005	.428	.197	.023		.491	.074	.285	.252	.134	.030
	Have there been any safety incidents during the project?	.351	.249	.354	.393	.491		.088	.053	.025	.336	.017
	How confident are you in the safety training provided to the team?	.030	.041	.332	.441	.074	.088		.147	.238	.028	.200
	Is the project currently on schedule according to the original timeline?	.170	.324	.414	.495	.285	.053	.147		.000	.399	.256
	Is the project adhering to the allocated budget?	.100	.172	.337	.470	.252	.025	.238	.000		.298	.309

How often are project timelines and budgets reviewed and adjusted as necessary?	.034	.375	.218	.462	.134	.336	.028	.399	.298		.317
How would you rate the project management's ability to keep the project on track?	.059	.002	.249	.293	.030	.017	.200	.256	.309	.317	

a. Determinant = .053

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.087	18.975	18.975	2.087	18.975	18.975	2.003	18.206	18.206
2	1.518	13.800	32.775	1.518	13.800	32.775	1.524	13.854	32.059
3	1.343	12.207	44.983	1.343	12.207	44.983	1.422	12.923	44.983
4	1.209	10.992	55.975						
5	1.084	9.854	65.828						
6	.931	8.459	74.288						
7	.832	7.568	81.855						
8	.748	6.798	88.654						
9	.737	6.700	95.354						
10	.463	4.208	99.562						
11	.048	.438	100.000						

Extraction Method: Principal Component Analysis.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
How frequently do you communicate with project team members?	7.70	16.729	.177	.069	.663
How would you rate the adherence to safety protocols on-site?	7.74	17.305	.134	.055	.686
Is the project adhering to the allocated budget?	8.41	9.727	.653	.899	.276
Is the project currently on schedule according to the original timeline?	8.50	10.091	.633	.898	.301

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.603	.570	4

Component	Component	Pearson correlation
S2	C1	0.232
P4	C2	0.258
S2	S1	0.18
S1	S2	0.18
P4	S3	0.191
P2	P1	0.947
P1	P2	0.947
C1	P3	0.163
S3	P4	0.191