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RESEARCH ARTICLE

Influences of effective communication and stakeholders' preferences on successful project delivery: Evidence from the Saudi Arabian construction sector

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ABSTRACT

The current study builds on Social Exchange Theory to examines the impact of communication and consideration of stakeholders' preferences on achieving project scope in the Saudi Arabian construction sector. The research adopted a descriptive approach to investigate the relationship between effective communication practices, stakeholder engagement and achievement of project scope. A pre-tested questionnaire was successfully collected from 256 senior engineers in the private construction sector in Saudi Arabia. The findings showed that effective communication between stakeholders positively and significantly influences project delivery. Furthermore, changing project's scope based on stakeholders' involvement and preferences is also a key predictor of successful project delivery. The results confirm that social exchange should consider technical economic analysis as it is critical for managing communication and stakeholders' preferences to achieve project scope. The study offers valuable insights for practitioners and policymakers regarding effective communication management. The results confirmed the value of thorough assessment of the communication climate, identification of barriers, and managing communication channels, as well as managing stakeholders' preferences for successful project delivery.

Keywords: Construction project; effective communication; project delivery; project scope; stakeholder preferences; social exchange theory; saudi arabia

1. Introduction

Effective communication is crucial for management systems across all sectors, including construction[1]. Chassiakos et al.[2] indicated that there are various methods of communication that aim to facilitate the dissemination of information and instructions necessary for task completion[3]. In the construction context, stakeholders should establish a robust communication framework to ensure smooth operations and successful project delivery[1]. While phone calls remain a common method, a variety of formal channels, such as executive memos, are also utilized. In the construction sector frequent communication is essential[4]; hence, stakeholders consider multiple methods to enhance project execution. Effective communication not only streamlined processes but also aligns with stakeholder preferences, contributing to successful project assessments[1].

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Since Saudi Arabia continues to develop its construction sector, there is a growing need for comprehensive analysis of communication processes and their impact on project outcomes[1,5]. Yang[6] reported key functions that contribute to construction success include stakeholder management, time management, effective project planning, and appropriate design. The construction sector in Saudi Arabia is experiencing rapid growth, attracting significant investments in infrastructure development[7]. For effective execution of project plans, it is essential to align client requirements with stakeholder policies[8]. Stakeholders play a critical role in overseeing project progress, ensuring that activities contribute positively to project success and minimize adverse effects. Their influence is vital for smooth project execution, as they advocate for initiatives that benefit the local community[1].

Stakeholders in the construction sector may overlook the feasibility of proposed work, leading to challenges in project execution. The unique characteristics of construction projects such as extended timelines, complex methodologies, harsh working conditions, and considerable financial risks require a comprehensive approach for stakeholder engagement and project management. Delays and cost overruns often arise from the inherent risks associated with organizational and technological complexities[9]. Effective delay management is crucial to identifying and documenting the causes of delays as early as possible during construction. Various factors contribute to project delays, including the need for innovation, effective management of resources, and the integration of social and financial considerations into design methodologies. By adopting a systematic approach to communication and collaboration, stakeholders can enhance project execution and ensure that all aspects of the construction process are aligned with established goals[1].

Construction firms are responsible for executing building and infrastructure projects, transforming designs from paper into reality while adhering to costs determined by their clients. The construction industry is complex, involving multiple interrelated components rather than a single entity, as highlighted by Gopang et al.[10]. Key stakeholders in this sector include the project owner and his/her team, contractor and subcontractor, a licensed architect or engineer, and suppliers, who play a vital role in project completion. One prevalent issue in the industry is the occurrence of construction delays, which can lead to substantial financial losses[11].

Stakeholders across various industries play a critical role in influencing the systems that govern project formation. However, communication challenges frequently arise, leading to difficulties in instruction and information dissemination. To address these challenges, it is essential to assess the impact of specific projects on stakeholder decisions in targeted areas of interest and to implement effective communication systems for stakeholder meetings and interactions. This study addresses a gap in research by examining communication factors that affect project timelines. A "concurrent delay" occurs when two or more distinct delays happen simultaneously. While unanticipated delays resulting from circumstances beyond a contractor's control may be considered excusable, they still pose challenges for project management. Delays can be categorized as external, caused by third parties, or internal, resulting from stakeholder actions[12]. To mitigate the risk of delays this study examines the role of effective communication among stakeholders aiming to enhance project delivery and reduce disruptions. The research objectives are to identify the value of communication among stakeholders in construction projects; analyze communication strategies that can increase project success rates in a developing country like Saudi Arabia. Identifying issues contributing to delays in various construction projects and ascertaining methods is important to mitigate communication challenges among stakeholders and achieve project scope. In addition, the research also considers successful changes in project scope based on stakeholders' preferences. The research adopts the Social Exchange

Theory (SET)[13] to understand how communication and stakeholders' preferences could contribute to successful project delivery? The study answers the following questions:

Q1: What is the impact of communication among stakeholders in construction projects?

Q2: What communication issues are contributing to construction project delivery?

Q3: How stakeholders' preferences could be considered for successful project delivery?

2. Literature review

The literature on communication in construction context[1,8,14,15] has emphasized the importance of communication among stakeholders in defining project scope and achieving its goal. Effective communication is essential for stakeholders to coordinate tasks, address issues, and enhance project performance[16]. However, challenges such as cultural differences, language barriers, and inadequate communication technology can hinder this process[17]. These challenges can be mitigated by adopting technological solutions and improving interpersonal interactions[18,19]. Stakeholders' management, which involves identifying and addressing stakeholders' requirements, significantly influences decision-making and project scope[6,20]. Effective communication ensures stakeholders' preferences aligning with project objectives, thereby minimizing scope creep and enhancing their overall satisfaction[21-24]. Consequently, managing communication among all stakeholders is crucial for the timely delivery of construction projects within the agreed scope. According to Xue et al.[25], the achievement of construction projects relies on collaboration between various stakeholders involved in decision-making.

Stakeholder analysis of megaprojects and public-private partnership (PPP) projects has been enhanced through case studies and network analysis. These approaches have informed the stakeholder communication process and have implications for project management systems. A critical part of this analysis involves the construction factor significance, which differentiates various stakeholder assessment methodologies. Srinivasan and Dhivya[26] provide empirical evidence of how project management scopes influence construction applications. The effective structuring of projects relies on robust support mechanisms, emphasizing the importance of a structural review throughout the project lifecycle.

According to Ismaeil and Sobaih[1], effective business management requires strategic methodologies to support growth and operational processes. The appropriate strategies should be applied to development structures, utilizing technological approaches for data extraction and assessment. Stakeholder prioritization is crucial for organizational effectiveness. Moreover, Al-Surf et al.[27] highlighted the benefits of a stakeholder approach in green building projects. It emphasizes the importance of strategic planning and the application of various projects to assess stakeholder involvement. The analysis confirms that effective strategies can enhance project success, particularly in the context of LEED certification.

Safapour et al.[28] highlighted the critical role of communication technology in stakeholder analysis and strategic project management. The same research underscores the need for systematic reviews of communication methods to enhance project outcomes. Effective communication can significantly influence project success, particularly in navigating the complexities of stakeholder interactions. The study of Safapour et al.[28], concluded that bureaucratic frameworks can complicate communication but are essential for strategic implementation. The same authors emphasized the importance of strong organizational strategies and effective risk management during project planning and execution. Without a qualified project management team, poor coordination and miscommunication can arise, leading to inefficiencies and delays. Thus, the success of construction projects hinges on clear communication, well-defined roles, and the timely exchange of information among all stakeholders involved. Additionally, Suleiman[29] emphasized the

importance of citizen participation in the development of smart cities through various structural applications. The study of Suleiman[28] giving an answer for how frameworks like BREEAM, CASBEE, and LEED can guide sustainable project outcomes while pointing out the need for engaging citizens as vital contributors to technological advancements and urban development. Furthermore, Suleiman[29] reported that there are different systems through the application of the assessment that might be used for the structural aspects, with the proper connection and the proper communication the application could be used for the development and improvement through the assessment of the systems and the possibility of the structure that could be used for the appropriate completion for the different manners.

According to Taofeeq et al.,[30], the construction industry is crucial to Saudi Arabia's economic growth. However, managing projects within this complex, multi-party environment poses significant challenges. Taofeeq et al.,[30] highlighted the importance of stakeholders in achieving sustainable construction goals. The same author stressed the importance of enhancing communication across the industry to significantly influence project development, aligning with stakeholder preferences and priorities. Recent study[1] on Saudi Arabian construction sector confirmed the need for effective communication among all stakeholders to mitigate associated risk and ensure proper delivery of project. This research draws on SET[13] to explore how communication and stakeholders' preferences could be effectively adopted to ensure successful project delivery. Based up on the SET framework and the above discussed research, the hypotheses under investigation in this study are as follows:

H1: Effective communication with the stakeholders would improve project delivery.

H1a: Undertaking communication assessments with the stakeholders would improve project delivery.

H1b: Addressing communication barrier with the stakeholders would improve project delivery.

H1c: Communication channels' presence with the stakeholders would improve project delivery.

H2: Changes of Scope based on the stakeholder's preferences would improve project delivery.

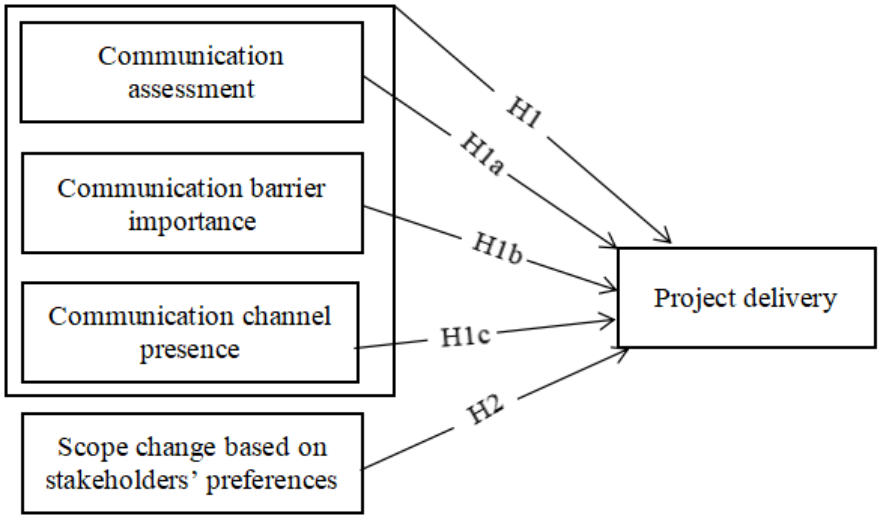

Figure 1. The research conceptual framework.

3. Methods

3.1. Data collection tool

The data was gathered via a survey method. The survey instrument consists of two sections: demographic data and research survey questions related to communication assessment, communication

barriers, communication channel and stakeholders' performance. All research items were pre-tested and drawn from previous studies[1,14,15]. The research used the Likert-scale of five items, capturing nuanced perceptions and attitudes. Prior to data collection, a pilot test with 20 volunteers was conducted to identify and address potential issues in the survey instrument. This process ensures clarity, relevance, and comprehensibility, contributing to the validity and reliability of the tool within the energy sector in Saudi Arabia.

3.2. Sample

The research respondents were employed in construction firms in Riyadh and Eastern Province, Saudi Arabia. There were 256 respondents participated in the survey. Most of the respondents were convenience sample participants working as project manager, project engineers, and project consultants. This sample size is consistent with the study of Jacisa[15], which has a sample size of 150 and the study of Affare[14], which has a sample size of 133.

3.3. Data analysis

Questionnaire data was analyzed quantitatively using SPSS v27. The statistical analysis was four-staged: 1) descriptive statistics; 2) reliability testing using Cronbach's Alpha and Pearson correlations; 3) hypothesis testing and variable association exploration via stepwise multiple regression. Questionnaire reliability was assessed with Cronbach's Alpha (**Table 1**). **Table 1** shows the Alpha values for scale across two dimensions: Communication on Construction Projects and Stakeholders' Interest on Construction Projects. Communication sub-dimensions showed high (0.898-0.935) to good (0.835) internal consistency, with an overall Alpha of 0.914 (62 items). Stakeholder Interest sub-dimensions had moderate to high consistency (0.710-0.888), with an overall Alpha of 0.958 (72 items). The total questionnaire (134 items) demonstrated excellent reliability (Alpha = 0.962). Full Research items are presented in Appendix 1. The descriptive results are presented in Appendix 2.

Table 1. Cronbach's alpha reliability measure.

Main Dimensions	Sub dimensions	N of Items	Cronbach's Alpha
Communication in Construction Projects	Communication Assessment	17	0.898
	Communication Barrier Importance	17	0.935
	Communication Channels Presence	28	0.835
Overall, First Dimension		62	0.914
Stakeholders' interest in Construction Projects	Project Initiating and Planning	7	0.796
	Typical Key Stakeholders	8	0.710
	Project Involvement Impact	5	0.777
	External Factors	9	0.859
	Related Actions	9	0.878
	Engagement-Related Methods	8	0.782
	Factors Relates to Conflict Resolution	8	0.846
	Possible outputs	13	0.888
	Strategy Types	5	0.749
Overall, Second Dimension		72	0.958
Overall		134	0.962

4. Results

4.1. Demographics of participants

Table 2 summarizes participant demographics (n=256). Gender was predominantly female (93%) with fewer males (7%). Most of the age group were 30-40 years (62.5%), followed by 21-29 years (18.8%), 41-49 years (10.2%), and 50+ years (8.6%). Most participants held bachelor's degrees (61.7%), followed by master's degrees (36.7%), with few PhDs (1.6%). Project team size was primarily over 200 employees (54.7%), with smaller proportions in projects with less than 20 employees (18.8%), 20-50 employees (14.1%), and 50-200 employees (12.5%). Job titles included Project Engineer (43.8%), Project Manager (29.7%), Cost Engineer (17.0%), Principal Consultant (3.1%), and Scheduler Engineer (3.3%). Experience levels were distributed as follows: <5 years (23.4%), 5-10 years (46.9%), 10-15 years (9.4%), and 16+ years (20.3%).

Table 2. Demographics of participants

Gender		**Age**		**Respondents**	
male	93%	21-29	18.8%	Project Engineer	43.8%
female	7%	30-40	62.5%	Project Manager	29.7%
		41-49	10.2%	Cost Engineer	17.0%
		50 Year and Above	8.5%	Principal consultant	6.2%
				Scheduler Engineer	3.3 %
Number of Employees in Project		**Experience Years**		**Education**	
Less than 20	18.8%	Less Than 5 Years	23.4%	Bachelor	61.7%
20-50	14.1%	5-10 Years	46.9%	Master	36.7%
50-200	12.5%	10-15 Years	9.4%	PhD	1.6%
More than 200	54.6%	16 Years and Above	20.3%		

4.2. The relationship between study variables

The findings confirmed a significant positive correlation between communication dimensions and their items, indicating strong reliability. Communication assessment correlations ranged from 0.553 to 0.801, Communication barrier importance from 0.559 to 0.790, and communication channels presence from 0.202 to 0.586 (See Appendix 3, **Table 1**). Pearson correlations demonstrate strong reliability between stakeholder interest dimensions and their items (Appendix 3, **Table 2**). Project initiating and planning, typical key stakeholders, and project involvement impact all showed significant positive correlations, with ranges of 0.641-0.72, 0.229-0.720, and 0.490-0.788, respectively. These strong relationships suggest consistent measurement of stakeholder interest facets. Positive Pearson correlations are confirmed among stakeholder interest dimensions and their items: external factors (0.597-0.814), related actions (0.622-0.792), and engagement-related methods (0.548-0.670) (Appendix 3, **Table 3**). Positive significant relationship between factors related to conflict resolution (0.680-0.767), possible outputs (0.504-0.726), and strategy types (0.587-0.829) (Appendix 3, **Table 4**).

4.3. Testing hypotheses

The results of ANOVA (**Table 3**) show a significant role in communication in project delivery ($F=105.583$, $p=0.000$). The regression model indicates that a one-unit increase in communication leads to a 0.591-unit increase in project delivery ($p=0.000$). Thus, H1 "communication improves project delivery" is accepted. Communication assessment explains 26.1% of the variance in project delivery ($R^2=0.261$, adjusted $R^2=0.258$), with a standard error of 0.30466.

Table 3. Impacts of communication on construction projects on project delivery.

ANOVA					
Model 1	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig**
Regression	9.37	1	9.37	105.583	0.000
Residual	22.541	254	0.089		
Total	31.911	255			
Coefficients					
	Unstandardized Coefficients		**Standardized Coefficients**		
Model 1	B	Std. Error	B	t	Sig
Constant	2.436	0.196		12.414	0.000
Communication on Construction Projects	0.591	0.058	0.542	10.275	0.000
Model Summary					
R	R Square	Adjusted R Square	Std. Error of the Estimate		
0.511	0.261	0.258	0.30466		

Table 4 presents ANOVA and regression examining the impact of communication assessment with stakeholders on project delivery. The ANOVA results demonstrate a statistically significant effect (F=89.8, p<0.000), indicating that communication assessment shows a portion of the variance in project delivery scores. The regression coefficient for communication assessment is 0.449, meaning that for every one-unit increase in the communication assessment score, the project delivery score increases by 0.449 units. This positive relationship is statistically significant (p<0.000), supporting H1.a. The model summary shows that communication assessment explains 11.9% of the variance in project delivery (R^2=0.119; adjusted R^2=0.116). The standard error of the estimate is 0.33264.

Table 4. Impacts of communication assessment with stakeholders on project delivery.

ANOVA					
Model 2	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig**
Regression	8.335	1	8.335	89.8	0.000
Residual	23.576	254	0.093		
Total	31.911	255			
Coefficients					
	Unstandardized Coefficients		**Standardized Coefficients**		
Model 2	B	Std. Error	B	t	Sig
Constant	2.406	0.216		11.15	0.000
Communication Assessment	0.449	0.047	0.511	9.476	0.000
Model Summary					
R	R Square	Adjusted R Square	Std. Error of the Estimate		
0.345	0.119	0.116	0.33264		

Table 5 present regression model, assessing the relationship between communication barrier importance and project delivery, is significant (F=34.396, p=0.000). A one-unit increase in perceived importance of communication barriers is associated with a 0.17-unit increase in project delivery (t=5.865, p=0.000),

supporting H1.b. Communication barrier importance explains 16.2% of the variance in project delivery (R^2=0.162, adjusted R^2=0.159), with a standard error of 0.32442.

Table 5. Impacts of communication barrier importance on project delivery.

ANOVA					
Model 3	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig**
Regression	3.806	1	3.806	34.396	0.000
Residual	28.105	254	0.111		
Total	31.911	255			
Coefficients					
	Unstandardized Coefficients		**Standardized Coefficients**		
Model 3	B	Std. Error	B	t	Sig
Constant	3.783	0.115		33.016	0.000
Communication Barrier Importance	0.17	0.029	0.345	5.865	0.000
Model Summary					
R	R Square	Adjusted R Square	Std. Error of the Estimate		
0.345	0.403	0.162	0.159		

Table 6 ANOVA demonstrates a significant link between communication channel presence and project delivery. The regression model shows a significant F-statistic of 49.199 (p=0.000), indicating that the presence of communication channels significantly impacts project delivery. **Table 6** presents the regression for the impact of communication channel presence on project delivery. The coefficient for communication channel presence is 0.782 (standard error = 0.112), meaning a one-unit increase in channel presence is associated with a 0.782-unit increase in project delivery. The standardized coefficient is 0.403. The significant t-value of 7.014 (p=0.000) confirms the positive impact of the communication channel's presence, supporting H1.c. The model summary indicates a moderately strong positive correlation (R=0.658) and shows that communication channel presence explains 43.3% of the variance in project delivery (R^2=0.433, adjusted R^2=0.43), with a standard error of 0.26696.

Table 6. Impacts of communication channels presence with stakeholders on project delivery.

ANOVA						
Model 4	**Sum of Squares**	**df**		**Mean Square**	**F**	**Sig**
Regression	5.178	1		5.178	49.199	0.000
Residual	26.733	254		0.105		
Total	31.911	255				
Coefficients						
		Unstandardized Coefficients		**Standardized Coefficients**		
Model 4		B	Std. Error	B	t	Sig
Constant		3.065	0.198		15.514	0.000
Communication Channels Presence		0.782	0.112	0.403	7.014	0.000
Model Summary						
R	R Square		Adjusted R Square	Std. Error of the Estimate		
0.658	0.433		0.43	0.26696		

Table 7 presents the ANOVA and regression results for the impact of changing stakeholder preferences on project delivery. The ANOVA results show a highly significant effect (F=193.752, p<0.0001), indicating that changes in stakeholder preferences regarding project scope significantly predict project delivery outcomes. The regression coefficient for changing stakeholder preferences is 0.573 (standard error=0.041), meaning that for every one-unit increase in the measure of changing stakeholder preferences, project delivery is predicted to increase by 0.573 units. This relationship is statistically significant (t=13.919, p=0.000), leading to the acceptance of H2 (which stated that scope change improves project delivery). The model summary shows a moderately strong positive correlation (R=0.658) and indicates that changing stakeholder preferences explain 43.3% of the variance.

Table 7. Impacts of scope changing of the stakeholder's preferences on project delivery.

ANOVA					
Model 5	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig**
Regression	13.808	1	13.808	193.752	0.000
Residual	18.102	254	0.071		
Total	31.911	255			
Coefficients					
	Unstandardized Coefficients		Standardized Coefficients		
Model 5	B	Std. Error	B	t	Sig
Constant	1.789	0.191		9.348	0.000
Scope changing of the stakeholder's preferences	0.573	0.041	0.658	13.919	0.000
Model Summary					
R	R Square	Adjusted R Square	Std. Error of the Estimate		

5. Discussion

This study adds to studies on communication management in construction context and confirms the crucial role of communication in successful delivery of construction projects. The results supported all the research hypotheses and showed that effective communication practices, including thorough assessment of the communication climate, identification of barriers, and managing communication channels, are essential for achieving project goals. Specifically, effective communication of construction projects was found to be a predictor of project delivery. The results of H1 confirmed that the impacts of communication on construction projects on project delivery are statistically positive and significant. This result agrees with the study of Ling et al,[31] and the results of Mesa et al,[32]. Additionally, the results confirmed that the impact of communication assessment with stakeholders on project delivery is positive and significant, that insights into the improvement of project delivery. This finding is in line with Harjono et al.[33]. The barrier importance communication with stakeholders has also a significant positive effect on project delivery. This result concurs with findings of study made by Tipili et al,[34] and Fathalizadeh et al.,[35]. The impact of communication channels' presence with stakeholders on project delivery is positive and significant agreeing with Oke and Idiagbon[36]. The scope changing of the stakeholder's preferences with stakeholders on project delivery is positive and significant. This finding is consistent with Oke and Idiagbon[36] and Olander and Landin[37].

The results confirmed that focusing on communication assessment, barrier analysis, and ensuring appropriate communication channels foster synchronized operations and coordinated team activities, highlighting communication's central role in project management. Furthermore, the study underscores the importance of stakeholder interest across various project aspects, from initiation and planning to conflict resolution and strategic management. Addressing stakeholder identification, involvement impacts, external factors, related actions, engagement methods, and desired outcomes requires comprehensive stakeholder management strategies. Given the inherent challenges and potential conflicts associated with stakeholder participation, effective communication management is critical for fostering a positive environment, promoting stakeholder buy-in, and ensuring timely conflict resolution, ultimately increasing the likelihood of successful project outcomes. These findings reinforce the interconnectedness of communication, stakeholder management, and overall project success in the construction industry.

6. Implications of study

The study has implications for scholars, project managers and project teams. For scholars, the results support the assumption made by Balu[13] in SET that effective communication in construction projects should focus on economic aspect not psychological ones as this contributes to project scope. Additionally, when considering scope change the focus should also be on economic impact from all stakeholders' perspective. This means that social exchange during communication should emphasize technical economic analysis more than other aspects. Project managers should make proper effort for creating detailed forms of communication structures and tactics. These plans should detail the various communication paths, response to individual roles, and interaction from the beginning of a project to the very end. They should make better understanding of cultural differences and improve multicultural communication strategies. They should understand the cultural diversity that exists among stakeholders by reminding oneself and others to work with increased productivity in mind and tolerance in practice. Project plans should be comprehensively reviewed by an independent analyst according to feedback from the stakeholders to be sure the project will meet its needs.

The project teams should foster an appropriate culture that facilitates regular and effective communication. To ensure continuous engagement of stakeholders, they should consider feedback, responding to complaints or concerns and reporting changes in project movement and resolution promptly. It is advisable to implement measures to overcome the barriers to communication in project management operations to improve communication effectiveness to ensure project success. Project team should use interactive strategies such as employee suggestion programs, team-building activities, and regular meetings to foster stakeholder engagement and collaboration. This increases project transparency, reduces misunderstandings, and improves stakeholder satisfaction.

Despite the current study followed a rigor research method, the study has some limitations due to its reliance on self-reporting tool as well as the context of Saudi Arabia. Therefore, the results of the study could be further examined with wider context using longitudinal study supported with record data from various research projects.

7. Conclusion

From the results, it can conclude that miscommunication among stakeholders in construction projects can result in negative outcomes like delays and resource waste, a problem compounded in rapidly developing nations like Saudi Arabia. The results confirmed that positive stakeholder communication, built one socio-economic exchange, significantly improves project delivery. Similarly, positive interaction with stakeholders positively impacts project delivery. The perceived importance of communication barriers also significantly

influences project delivery. Effective communication strategies significantly improve project delivery, with each unit increase in communication channel availability leading to a 0.782-unit increase in project delivery. Changes in stakeholder preferences regarding project scope also positively influence project delivery. This study identifies several key communication barriers perceived by construction stakeholders, including highly important issues like conflicting cultural values, ineffective reporting systems, and language barriers. Lack of leadership, unclear goals, and lack of trust are also considered important communication obstacles. Culturally tailored communication plans, emphasizing clarity, cross-cultural understanding, and consistent dialogue, are essential for addressing these challenges. Resolving communication issues, whether due to cultural differences or ineffective organizational systems, is crucial for mitigating delays and fostering inter-departmental collaboration, ultimately contributing to national development. Communication channels in the construction industry use different communication channels. Channels such as customer satisfaction surveys, project performance profiles and site review sessions are very common.

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Author Contributions

Conceptualization, A.A., and A.E.E.S.; methodology, A.A., and A.E.E.S.; software, A.A.,.; validation, A.A.A.; formal analysis, A.A.,; investigation A.A.,; resources, A.E.E.S.; data curation, A.A., and A.E.E.S.; writing—original draft preparation, A.A., and A.E.E.S.; writing—review and editing, A.A., and A.E.E.S.; supervision, A.E.E.S.; project administration, A.E.E.S.; funding acquisition, A.A., and A.E.E.S. All authors have read and agreed to the published version of the manuscript.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest

The authors declare no conflicts of interest.

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Appendix 1: The research items

Questions relating to project communication on construction projects

(Please tick the approximate cell).

Relative importance: 1 – Not important, 2 – Quite/low important, 3– Moderately Important, 4 – Important, 5 - Very important

Frequency of occurrence: 3 - High, 2 – Medium, 1- Low

	General Overview of Communication on Project	**Relative Importance**					**Frequency**		
		1	**2**	**3**	**4**	**5**	**1**	**2**	**3**
1	Project communication management is vital to the success of constructional projects	☐	☐	☐	☐	☐	☐	☐	☐
2	Communication plans and strategies must be determined /established at the outset	☐	☐	☐	☐	☐	☐	☐	☐
3	Culturally sensitive and appropriate communication is necessary	☐	☐	☐	☐	☐	☐	☐	☐
4	Project managers should have excellent communication skills	☐	☐	☐	☐	☐	☐	☐	☐
5	Two-way communications must be encouraged	☐	☐	☐	☐	☐	☐	☐	☐
6	On-going communication between project proponents and its stakeholders	☐	☐	☐	☐	☐	☐	☐	☐
7	Effective communication reflecting openness and tolerance of cultural differences	☐	☐	☐	☐	☐	☐	☐	☐
8	Clear communication clarifying roles of stakeholders	☐	☐	☐	☐	☐	☐	☐	☐
9	Open communication is required to provide management with some control	☐	☐	☐	☐	☐	☐	☐	☐
10	Meetings help overcome communication barriers and increase performance level	☐	☐	☐	☐	☐	☐	☐	☐
11	Project proponents and stakeholders communicate throughout the project	☐	☐	☐	☐	☐	☐	☐	☐
12	Communication plan reviewed regularly, and adjusted if need be	☐	☐	☐	☐	☐	☐	☐	☐
13	Project type and duration has a bearing on communication strategy and structure	☐	☐	☐	☐	☐	☐	☐	☐
14	Appropriate communication media for specific purposes/audiences are necessary	☐	☐	☐	☐	☐	☐	☐	☐
15	Effective communication strategies are needed to minimize potential disputes and misunderstandings	☐	☐	☐	☐	☐	☐	☐	☐
16	Understanding the language(s) and practices of local culture enhances communication	☐	☐	☐	☐	☐	☐	☐	☐
17	Communication gives project stakeholders the opportunity to comment or cast a vote	☐	☐	☐	☐	☐	☐	☐	☐

Questions relating to communication barriers on construction projects

Relative importance: 1 – Not important, 2 – Quite/low important, 3–Moderately Important, 4 –Important, 5 - Very important

	Communication barrier	**Relative Importance**				
		1	**2**	**3**	**4**	**5**
1	Political/community interference	☐	☐	☐	☐	☐
2	Poor listeners	☐	☐	☐	☐	☐
3	Poor leadership	☐	☐	☐	☐	☐
4	Unclear objectives	☐	☐	☐	☐	☐
5	Conflicting cultural values	☐	☐	☐	☐	☐
6	Unclear channels of communication	☐	☐	☐	☐	☐
7	Ineffective reporting system	☐	☐	☐	☐	☐
8	Limited resources	☐	☐	☐	☐	☐
9	Information filtering	☐	☐	☐	☐	☐
10	Conflicting business/industry ethics	☐	☐	☐	☐	☐
11	Lack necessary skills	☐	☐	☐	☐	☐
12	Lack of trust	☐	☐	☐	☐	☐
13	Religious issues	☐	☐	☐	☐	☐
14	Stereotyping	☐	☐	☐	☐	☐
15	Lack of concern	☐	☐	☐	☐	☐
16	Language difficulties	☐	☐	☐	☐	☐
17	Age difference	☐	☐	☐	☐	☐

Questions relating to communication channels on construction projects

From your experience, please tick the appropriate cell by indicating “Yes” or “No” to whether any of the communication channels below is present at any of the project you are currently involved in.

	Communication Channel	**Yes**	**No**
1	Employee suggestion scheme	☐	☐
2	Customer satisfaction survey	☐	☐
3	Social gatherings	☐	☐
4	Project Business case	☐	☐
5	Annual report	☐	☐
6	Site Review meetings	☐	☐
7	Meeting suppliers/ customers	☐	☐
8	Web site	☐	☐
9	Noticeboard	☐	☐
10	Newsletter	☐	☐
11	General meetings	☐	☐
12	Employment contract/ code of conduct/job description	☐	☐

	Communication Channel	**Yes**	**No**
13	Employee manual	☐	☐
14	Disciplinary and grievance code	☐	☐
15	Customer complaint system	☐	☐
16	Public relations	☐	☐
17	Formal communication – email, letter, telephone, fax	☐	☐
18	Canteen/ coffee room	☐	☐
19	Teamwork	☐	☐
20	Quality circles	☐	☐
21	Appraisal	☐	☐
22	Job design/ rotation	☐	☐
23	Compensation design	☐	☐
24	Induction training	☐	☐
25	Maintenance training	☐	☐
26	Development training	☐	☐
27	Management by walking about	☐	☐
28	Face to face discussions	☐	☐

(*Continued*)

Questions relating to stakeholders' interest on construction projects

Relative importance: 1 – Strongly disagree, 2 – Disagree, 3– Neutral, 4 – Agree, 5 - Strongly agree

No	**Project Initiating and Planning (Definition)**	**5 (Strongly agree)**	**4 (Agree)**	**3 (Neutral)**	**2 (Disagree)**	**1 (Strongly disagree)**
1	Excellent project feasibility study	☐	☐	☐	☐	☐
2	Clearly stated project objectives	☐	☐	☐	☐	☐
3	Good project location	☐	☐	☐	☐	☐
4	Detailed design	☐	☐	☐	☐	☐
5	Resisting project scope changes	☐	☐	☐	☐	☐
6	Clearly stated stakeholder's needs	☐	☐	☐	☐	☐
7	Project Planning and Control	☐	☐	☐	☐	☐

Based on your experience, how important are each of the following in ensuring Early Stakeholder Identification and successful stakeholder management?

No	**Early Identification and register**	**5 (Strongly agree)**	**4 (Agree)**	**3 (Neutral)**	**2 (Disagree)**	**1 (Strongly disagree)**
1	Stakeholder identification occurs at the project definition stage	☐	☐	☐	☐	☐
2	Identify stakeholders at the design stage	☐	☐	☐	☐	☐
3	Identify stakeholders at the tender stage	☐	☐	☐	☐	☐
4	Having an expert staff to identify stakeholders	☐	☐	☐	☐	☐
5	Identify stakeholders at every stage	☐	☐	☐	☐	☐

No	Early Identification and register	5 (Strongly agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly disagree)
6	All interested parties are identified before project design sign off	☐	☐	☐	☐	☐
7	Excluding all late stakeholders	☐	☐	☐	☐	☐
8	Reviewing an existing stakeholder list	☐	☐	☐	☐	☐
9	Having a directly designed register	☐	☐	☐	☐	☐

(*Continued*)

Based on your experience, how important is each of the following classification of stakeholders based on their Project Involvement for ensuring stakeholder management is a success?

No	Project Involvement Impact	5 (Strongly agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly disagree)
1	Role in the project	☐	☐	☐	☐	☐
2	Responsibilities in the project	☐	☐	☐	☐	☐
3	Level of participation	☐	☐	☐	☐	☐
4	Level of commitment	☐	☐	☐	☐	☐
5	Level of contribution	☐	☐	☐	☐	☐

Based on your experience and knowledge, rate the following contributions of stakeholders to the success of the project.

No	Contribution of stakeholders to the project	5 (Strongly agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly disagree)
1	Providing Expertise	☐	☐	☐	☐	☐
2	Reducing and Uncovering Risk	☐	☐	☐	☐	☐
3	Increasing Project Success	☐	☐	☐	☐	☐
4	Granting Project Acceptance	☐	☐	☐	☐	☐

Questions relating to factors affecting stakeholder management in the construction projects

From your experience, how important is each of the following external environment-related factors for ensuring stakeholder management a success?

No	External factors	5 (Strongly agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly disagree)
1	Economic issues	☐	☐	☐	☐	☐
2	Cultural practices/influences	☐	☐	☐	☐	☐
3	Legal policies/legislation	☐	☐	☐	☐	☐
4	Ethics of firms/stakeholders	☐	☐	☐	☐	☐
5	Social behavior/practices	☐	☐	☐	☐	☐
6	Political influences/policies	☐	☐	☐	☐	☐
7	Construction industry practices	☐	☐	☐	☐	☐
8	Labor agitations	☐	☐	☐	☐	☐

No	External factors	5 (Strongly agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly disagree)
9	Absence of industry regulatory body	☐	☐	☐	☐	☐

(*Continued*)

The following list of factors relates to implementation, monitoring and feedback actions. Based on your experience/knowledge, what influence does each of these related actions have on successful stakeholder management?

No	Related actions	5 (Strongly agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly disagree)
1	Implementing fully, project feasibility brief	☐	☐	☐	☐	☐
2	Implementing fully, stakeholder needs plan	☐	☐	☐	☐	☐
3	Full implementation of stakeholder management objectives	☐	☐	☐	☐	☐
4	Implementation of stakeholder communication plan	☐	☐	☐	☐	☐
5	Monitoring project objectives achievement	☐	☐	☐	☐	☐
6	Monitoring stage activity and effectiveness	☐	☐	☐	☐	☐
7	Monitoring stage activity and effectiveness	☐	☐	☐	☐	☐
8	Documenting the entire stakeholder process	☐	☐	☐	☐	☐
9	Implementing decisions on feedback	☐	☐	☐	☐	☐

The following list of factors relates to conflict resolution. Based on your experience/knowledge, what influence does each related factor have on successful stakeholder management?

No	Related factors	5 (Strongly agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly disagree)
1	Having the ability to predetermine possible conflicts	☐	☐	☐	☐	☐
2	Having the ability to resolve conflicts	☐	☐	☐	☐	☐
3	Having capacity to determine conflict type	☐	☐	☐	☐	☐
4	Saving capacity to determine conflict type	☐	☐	☐	☐	☐
5	Embarking on early conflict resolution	☐	☐	☐	☐	☐
6	Ensuring fair play during resolution	☐	☐	☐	☐	☐
7	Ensuring transparency between stakeholders	☐	☐	☐	☐	☐
8	Ensuring that conflict resolution process is transparent	☐	☐	☐	☐	☐

Below is a list of possible indicator outputs of successful stakeholder management process. Based on experience or knowledge, what extent can each of the outputs be achieved by adopting sustainable stakeholder management?

No	Possible outputs	5 (Strongly agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly disagree)
1	Reduced project time	☐	☐	☐	☐	☐
2	Improved project quality	☐	☐	☐	☐	☐
3	Achievement of stakeholder satisfaction and needs	☐	☐	☐	☐	☐
4	Improved project delivery	☐	☐	☐	☐	☐

No	Possible outputs	5 (Strongly agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly disagree)
5	Early stakeholder identification	☐	☐	☐	☐	☐
6	Improved stakeholder collaboration	☐	☐	☐	☐	☐
7	Excellent communication	☐	☐	☐	☐	☐
8	Reduced conflicts	☐	☐	☐	☐	☐
9	Continuous key stakeholders support	☐	☐	☐	☐	☐
10	Good relationship and trust	☐	☐	☐	☐	☐
11	Well considered external environmental factors	☐	☐	☐	☐	☐
12	Increase profit for stakeholders	☐	☐	☐	☐	☐
13	Increased project socio-economic benefit/value	☐	☐	☐	☐	☐

(*Continued*)

Below are the response strategies to deal with the stakeholder concerns. Based on experience or knowledge, what extent can each of these strategies can be sustainable stakeholder management?

No	Strategy Types	5 (Strongly agree)	4 (Agree)	3 (Neutral)	2 (Disagree)	1 (Strongly disagree)
1	Adaptation strategy: Obeying the demands and rules that are presented by stakeholders.	☐	☐	☐	☐	☐
2	Avoidance strategy: Loosening attachments to stakeholders and their claims to guard and shield oneself against the claims	☐	☐	☐	☐	☐
3	Compromising strategy: Negotiating with the stakeholders, listening to their claims related to the project and offering possibilities and arenas for dialogues.	☐	☒	☐	☐	☐
4	Dismissal strategy: Ignoring the presented demands of stakeholders. Not considering the stakeholder related pressures	☐	☐	☐	☐	☐
5	Influence strategy: Shaping proactively the values and demands of stakeholders.	☐	☐	☐	☐	☐

Appendix 2: The Descriptive results

Table 1. The mean and standard deviation and ranking of general overview of communication on project.

No.	Items	Freq/%	Not important	Quite/low important	Moderately Important	Important	Very important	Mean	SD	Rank
1	Project communication management is vital to the success of construction projects. Communication plans and strategies must be determined /established at the outset	Freq	0	0	2	32	222	4.86	0.37	2
		%	0	0	0.8	12.5	86.7			
2	Culturally sensitive and appropriate communication is necessary. Project managers should have excellent communication skills	Freq	0	0	4	52	200	4.77	0.46	3
		%	0	0	1.6	20.3	78.1			
3	Two-way communication must be encouraged. On-going communication between project proponents and its stakeholders	Freq	0	4	38	82	132	4.34	0.78	12
		%	0	1.6	14.8	32	51.6			
4	Effective communication reflects openness and tolerance of cultural differences. Clear communication clarifying roles of stakeholders	Freq	0	0	2	24	230	4.89	0.34	1
		%	0	0	0.8	9.4	89.8			

No.	Items	Freq/%	Not important	Quite/low important	Moderately Important	Important	Very important	Mean	SD	Rank
5	Open communication is required to provide management with some control. Meetings help overcome communication barriers and increase performance level	Freq	0	0	10	54	192	4.71	0.53	4
		%	0	0	3.9	21.1	75			
6	Project proponents and stakeholders communicate throughout the project. Communication plan reviewed regularly, and adjusted if need be	Freq	0	2	10	70	174	4.63	0.6	6
		%	0	0.8	3.9	27.3	68			
7	Project type and duration have a bearing on communication strategy and structure. Appropriate communication media for specific purposes/ audiences are necessary	Freq	0	6	22	94	134	4.39	0.74	11
		%	0	2.3	8.6	36.7	52.3			
8	Effective communication strategies are needed to minimize potential disputes and misunderstandings. Understanding the language(s) and practices of local culture enhances communication	Freq	0	2	10	58	186	4.67	0.59	5
		%	0	0.8	3.9	22.7	72.7			
9	Communication gives project stakeholders the opportunity to comment or cast a vote. Project communication management is vital to the success of constructional projects	Freq	0	4	30	84	138	4.39	0.75	11
		%	0	1.6	11.7	32.8	53.9			
10	Communication plans and strategies must be determined /established at the outset. Culturally sensitive and appropriate communication is necessary	Freq	0	2	28	82	144	4.44	0.72	9
		%	0	0.8	10.9	32	56.3			
11	Project managers should have excellent communication skills. Two-way communication must be encouraged	Freq	0	4	22	96	134	4.41	0.71	10
		%	0	1.5625	8.59375	37.5	52.34375			
12	On-going communication between project proponents and its stakeholders. Effective communication reflecting openness and tolerance of cultural differences	Freq	0	6	32	90	128	4.33	0.78	13
		%	0	2.3	12.5	35.2	50			
13	Clear communication clarifying roles of stakeholders. Open communication is required to provide management with some control	Freq	0	6	28	106	116	4.3	0.76	14
		%	0	2.3	10.9	41.4	45.3			
14	Meetings help overcome communication barriers and increase performance level. Project proponents and stakeholders communicate throughout the project	Freq	0	4	24	84	144	4.44	0.73	9
		%	0	1.6	9.4	32.8	56.3			
15	Communication plan reviewed regularly and adjusted if need be. Project type and duration has a bearing on communication strategy and structure	Freq	0	0	14	70	172	4.62	0.59	7
		%	0	0	5.46875	27.34375	67.1875			
16	Appropriate communication media for specific purposes/ audiences are necessary Effective communication strategies are needed to minimize potential disputes and misunderstandings	Freq	0	4	20	84	148	4.47	0.71	8
		%	0	1.6	7.8	32.8	57.8			
17	Understanding the language(s) and practices of local culture enhances communication	Freq	0	2	22	94	138	4.44	0.68	9
		%	0	0.8	8.6	36.7	53.9			
	Overall							4.53	0.4	-

Table 1. (*Continued*)

Table 2. The mean and standard deviation and ranking of communication barrier importance.

No.	Items	Freq/%	Not important	Quite/low important	Moderately Important	Important	Very important	Mean	SD	Rank
1	Political/community interference	Freq	8	16	68	84	80	3.83	1.04	11
	Poor listeners	%	3.1	6.3	26.6	32.8	31.3			
2	Poor leadership	Freq	10	4	36	110	96	4.09	0.96	5
	Unclear objectives	%	3.90625	1.5625	14.0625	42.96875	37.5			
3	Conflicting cultural values	Freq	10	2	14	86	144	4.38	0.93	2
	Unclear channels of communication	%	3.9	0.8	5.5	33.6	56.3			
4	Ineffective reporting system	Freq	6	6	18	60	166	4.46	0.90	1
	Limited resources	%	2.3	2.3	7	23.4	64.8			
5	Information filtering	Freq	14	26	56	100	60	3.65	1.11	13
	Conflicting business/industry ethics	%	5.5	10.2	21.9	39.1	23.4			
6	Lack of necessary skills	Freq	10	8	30	112	96	4.08	0.98	6
	Lack of trust	%	3.9	3.1	11.7	43.8	37.5			
7	Religious issues	Freq	6	6	36	104	104	4.15	0.91	4
	Stereotyping	%	2.34375	2.34375	14.0625	40.625	40.625			
8	Lack of concern	Freq	8	6	40	104	98	4.09	0.95	5
	Language difficulties	%	3.1	2.3	15.6	40.6	38.3			
9	Age difference	Freq	4	14	54	116	68	3.90	0.91	9
	Political/community interference	%	1.6	5.5	21.1	45.3	26.6			
10	Poor listeners	Freq	10	18	46	106	76	3.86	1.05	10
	Poor leadership	%	3.9	7	18	41.4	29.7			
11	Unclear objectives	Freq	6	2	40	100	108	4.18	0.89	3
	Conflicting cultural values	%	2.3	0.8	15.6	39.1	42.2			
12	Unclear channels of communication	Freq	12	4	44	92	104	4.06	1.03	7
	Ineffective reporting system	%	4.7	1.6	17.2	35.9	40.6			
13	Limited resources	Freq	34	50	72	44	56	3.15	1.33	16
	Information filtering	%	13.3	19.5	28.1	17.2	21.9			
14	Conflicting business/industry ethics	Freq	14	32	76	82	52	3.49	1.11	14
	Lack necessary skills	%	5.5	12.5	29.7	32	20.3			
15	Lack of trust	Freq	8	10	54	96	88	3.96	1.00	8
	Religious issues	%	3.1	3.9	21.1	37.5	34.4			
16	Stereotyping	Freq	12	20	52	106	66	3.76	1.07	12
	Lack of concern	%	4.7	7.8	20.3	41.4	25.8			
17	Language difficulties	Freq	28	48	78	58	44	3.16	1.23	15
		%	10.9	18.8	30.5	22.7	17.2			
	Overall							3.90	0.72	-

Table 3. The mean and standard deviation and ranking of communication channels presence.

No.	Items	Freq/%	No	Yes	Rank
1	Employee suggestion scheme	Freq	96	160	25
	Customer satisfaction survey	%	37.5	62.5	
2	Social gatherings	Freq	90	166	23
	Project Business case	%	35.2	64.8	
3	Annual report	Freq	68	188	17
	Site Review meetings	%	26.6	73.4	
4	Meeting suppliers/ customers	Freq	74	182	21
	Web site	%	28.9	71.1	
5	Noticeboard	Freq	28	228	3
	Newsletter	%	10.9	89.1	
6	General meetings	Freq	35	221	6
	Employment contract/ code of conduct/job description	%	13.7	86.3	
7	Employee manual	Freq	51	205	13
	Disciplinary and grievance code	%	19.9	80.1	
8	Customer complaint system	Freq	102	154	26
	Public relations	%	39.8	60.2	
9	Formal communication – email, letter,	Freq	92	164	24

No.	Items	Freq/%	No	Yes	Rank
	telephone, fax	%	35.9	64.1	
	Canteen/ coffee room				
10	Teamwork	Freq	123	133	27
	Quality circles	%	48.0	52.0	
11	Appraisal	Freq	41	215	8
	Job design/ rotation	%	16.0	84.0	
12	Compensation design	Freq	20	236	2
	Induction training	%	7.8	92.2	
13	Maintenance training	Freq	72	184	19
	Development training	%	28.1	71.9	
14	Management by walking about	Freq	46	210	10
		%	18.0	82.0	
15	Employee suggestion scheme	Freq	70	186	18
	Customer satisfaction survey	%	27.3	72.7	
16	Social gatherings	Freq	60	196	14
	Project Business case	%	23.4	76.6	
17	Annual report	Freq	31	225	5
	Site Review meetings	%	12.1	87.9	
18	Meeting suppliers/ customers	Freq	44	212	9
	Web site	%	17.2	82.8	
19	Noticeboard	Freq	20	236	1
	Newsletter	%	7.8	92.2	
20	General meetings	Freq	30	226	4
	Employment contract/ code of conduct/job description	%	11.7	88.3	
21	Employee manual	Freq	64	192	16
	Disciplinary and grievance code	%	25.0	75.0	
22	Customer complaint system	Freq	62	194	15
	Public relations	%	24.2	75.8	
23	Formal communication – email, letter, telephone, fax	Freq	72	184	19
	Canteen/ coffee room	%	28.1	71.9	
24	Teamwork	Freq	48	208	12
	Quality circles	%	18.8	81.3	
25	Appraisal	Freq	76	180	22
	Job design/ rotation	%	29.7	70.3	
26	Compensation design	Freq	46	210	11
	Induction training	%	18.0	82.0	
27	Maintenance training	Freq	102	154	26
	Development training	%	39.8	60.2	
28	Management by walking about	Freq	39	217	7
		%	15.2	84.8	
	Overall	%	11.87	88.13	

Table 3. (*Continued*)

Table 4. The mean and standard deviation and ranking of project initiating and planning

No.	Items	Freq/%	Strongly disagree	Disagree	Natural	Agree	Strongly agree	Mean	SD	Rank
1	Excellent project feasibility study	Freq	2	0	4	44	206	4.77	0.55	2
		%	0.8	0.0	1.6	17.2	80.5			
2	Clearly stated project objectives	Freq	0	0	4	42	210	4.8	0.43	1
		%	0.0	0.0	1.6	17.2	80.5			
3	Good project location	Freq	2	4	30	72	148	4.41	0.82	6
		%	0.8	1.6	11.71875	28.125	57.8125			
4	Detailed design	Freq	0	0	0	66	184	4.7	0.51	5

No.	Items	Freq/%	Strongly disagree	Disagree	Natural	Agree	Strongly agree	Mean	SD	Rank
		%	0.0	0.0	0	28.125	57.8125			
5	Resisting project scope changes	Freq	2	6	34	94	120	4.27	0.84	7
		%	0.8	2.3	13.3	36.7	46.9			
6	Clearly stated stakeholder's needs	Freq	0	0	4	64	188	4.72	0.48	4
		%	0.0	0.0	1.5625	25	73.4375			
7	Project Planning and Control	Freq	0	0	2	62	192	4.74	0.46	3
		%	0.0	0.0	0.8	24.2	75			
	Overall							4.63	0.41	-

Table 4. (*Continued*)

Table 5. The mean and standard deviation and ranking of external factors.

No.	Items	Freq/%	Strongly disagree	Disagree	Natural	Agree	Strongly agree	Mean	SD	Rank
1	Implementing fully, project feasibility brief	Freq	0	2	6	84	164	4.59	0.62	3
		%	0.0	0.8	2.3	32.8	64.1			
2	Implementing fully, stakeholder needs plan	Freq	0	0	8	100	148	4.55	0.56	5
		%	0.0	0.0	3.1	39.1	57.8			
3	Full implementation of stakeholder management objectives	Freq	0	0	8	90	158	4.59	0.55	3
		%	0.0	0.0	3.1	35.2	61.7			
4	Implementation of stakeholder communication plan	Freq	0	0	18	86	152	4.52	0.63	6
		%	0.0	0.0	7	33.6	59.4			
5	Monitoring project objectives achievement	Freq	0	0	8	60	188	4.7	0.52	1
		%	0.0	0.0	3.1	23.4	73.4			
6	Monitoring stage activity and effectiveness	Freq	0	0	8	78	170	4.63	0.54	2
		%	0.0	0.0	3.1	30.5	66.4			
7	Monitoring stage activity and effectiveness	Freq	0	2	14	78	162	4.56	0.64	4
		%	0.0	0.8	5.5	30.5	63.3			
8	Documenting the entire stakeholder process	Freq	0	2	22	100	132	4.41	0.68	7
		%	0.00	0.78	8.59	39.06	51.56			
9	Implementing decisions on feedback	Freq	2	2	18	110	124	4.38	0.72	8
		%	0.8	0.8	7	43	48.4			
	Overall							4.55	0.43	

Table 6. The mean and standard deviation and ranking of engagement-related methods.

No.	Items	Freq/%	Strongly disagree	Disagree	Natural	Agree	Strongly agree	Mean	SD	Rank
1	Adopting proactive communication	Freq	2	0	16	106	132	4.43	0.68	2
		%	0.80	0.00	6.30	41.40	51.60			
2	Using open communication	Freq	2	2	14	80	158	4.52	0.71	1
		%	0.80	0.80	5.50	31.30	61.70			
3	Using emails for correspondence	Freq	2	0	28	92	134	4.39	0.74	3
		%	0.80	0.00	10.90	35.90	52.30			
4	Communicating using the telephone	Freq	2	4	22	98	130	4.37	0.77	4
		%	0.80	1.60	8.60	38.30	50.80			
5	Organizing stakeholder conferences	Freq	0	4	32	100	120	4.24	0.73	7
		%	0.00	1.60	12.50	39.10	46.90			
6	Organizing stakeholder workshops	Freq	0	2	38	112	104	4.31	0.75	6

No.	Items	Freq/%	Strongly disagree	Disagree	Natural	Agree	Strongly agree	Mean	SD	Rank
		%	0.00	0.80	14.80	43.80	40.60			
7	Using social platforms	Freq	6	32	52	74	92	3.84	1.12	8
		%	2.30	12.50	20.30	28.90	35.90			
8	Using planned communication	Freq	0	2	34	100	120	4.32	0.73	5
		%	0.00	0.80	13.30	39.10	46.90			
	Overall							4.3	0.5	-

Table 6. (*Continued*)

Table 7. The mean and standard deviation and ranking of factors relates to conflict resolution.

No.	Items	Freq/%	Strongly disagree	Disagree	Natural	Agree	Strongly agree	Mean	SD	Rank
1	Having the ability to predetermine possible conflicts	Freq	2	4	8	90	152	4.51	0.71	5
		%	0.80	1.60	3.10	35.20	59.40			
2	Having the ability to resolve conflicts	Freq	0	0	10	80	166	4.61	0.56	3
		%	0.00	0.00	3.90	31.30	64.80			
3	Having capacity to determine conflict type	Freq	0	2	28	88	138	4.41	0.71	7
		%	0.00	0.80	10.90	34.40	53.90			
4	Saving capacity to determine conflict type	Freq	0	2	44	96	114	4.26	0.76	8
		%	0.00	0.80	17.20	37.50	44.50			
5	Embarking on early conflict resolution	Freq	0	0	14	64	178	4.64	0.58	1
		%	0.00	0.00	5.50	25.00	69.50			
6	Ensuring fair play during resolution	Freq	0	2	24	94	136	4.42	0.69	6
		%	0.00	0.80	9.40	36.70	53.10			
7	Ensuring transparency between stakeholders	Freq	0	2	18	72	164	4.55	0.66	4
		%	0.00	0.80	7.00	28.10	64.10			
8	Ensuring that conflict resolution process is transparent	Freq	0	0	6	82	168	4.63	0.53	2
		%	0.00	0.00	2.30	32.00	65.60			
	Overall							4.5	0.46	

Table 8. The mean and standard deviation and ranking of possible output.

No.	Items	Freq/%	Strongly disagree	Disagree	Natural	Agree	Strongly agree	Mean	SD	Rank
1	Reduced project time	Freq	0	12	30	86	128	4.29	0.85	13
		%	0.00	4.70	11.70	33.60	50.00			
2	Improved project quality	Freq	0	2	12	72	170	4.6	0.62	5
		%	0.00	0.80	4.70	28.10	66.40			
3	Achievement of stakeholder satisfaction and needs	Freq	0	0	6	82	168	4.63	0.53	4
		%	0.00	0.00	2.30	32.00	65.60			
4	Improved project delivery	Freq	0	0	8	54	194	4.73	0.51	2
		%	0.00	0.00	3.10	21.10	75.80			
5	Early stakeholder identification	Freq	0	2	14	76	164	4.57	0.63	7
		%	0.00	0.80	5.50	29.70	64.10			
		%	0.00	0.00	3.91	36.72	59.38			
7	Excellent communication	Freq	0	0	4	50	202	4.77	0.46	
		%	0.00	0.00	1.60	19.50	78.90			
8	Reduced conflicts	Freq	0	0	16	72	168	4.59	0.61	6
		%	0.00	0.00	6.30	28.10	65.60			
9	Continuous key stakeholders support	Freq	0	0	14	102	138	4.47	0.64	9
		%	0.00	0.00	5.50	39.80	53.90			

No.	Items	Freq/%	Strongly disagree	Disagree	Natural	Agree	Strongly agree	Mean	SD	Rank
10	Good relationship and trust	Freq	0	0	0	76	170	4.63	0.56	4
		%	0.00	0.00	0.00	29.70	66.40			
11	Well, considered external environment factors	Freq	0	2	26	88	140	4.43	0.7	10
		%	0.00	0.80	10.20	34.40	54.70			
12	Increase profit for stakeholders	Freq	2	2	32	98	122	4.31	0.78	12
		%	0.78	0.78	12.50	38.28	47.66			
13	Increased project socio-economic benefit/value	Freq	0	0	28	98	130	4.4	0.68	11
		%	0.00	0.00	10.90	38.30	50.80			
	Overall							4.52	0.41	

Table 8. (*Continued*)

Table 9. The mean and standard deviation and ranking of strategy types.

No.	Items	Freq/%	Strongly disagree	Disagree	Natural	Agree	Strongly agree	Mean	SD	Rank
1	Adaptation strategy: Obeying the demands and rules that are presented by stakeholders.	Freq	0	12	26	114	104	4.21	0.81	3
		%	0.00	4.70	10.20	44.50	40.60			
2	Avoidance strategy: Loosening attachments to stakeholders and their claims to guard and shield oneself against the claims	Freq	4	12	46	112	82	4	0.91	4
		%	1.60	4.70	18.00	43.80	32.00			
3	Compromising strategy: Negotiating with the stakeholders, listening to their claims related to the project and offering possibilities and arenas for dialogues.	Freq	0	4	12	110	130	4.43	0.66	1
		%	0.00	1.60	4.70	43.00	50.80			
4	Dismissal strategy: Ignoring the presented demands of stakeholders. Not considering the stakeholder related pressures	Freq	20	42	32	88	74	3.6	1.27	5
		%	7.80	16.40	12.50	34.40	28.90			
5	Influence strategy: Shaping proactively the values and demands of stakeholders.	Freq	0	2	28	100	126	4.37	0.71	2
		%	0.00	0.80	10.90	39.10	49.20			
	Overall							4.12	0.63	

Appendix 3: The relationship between research variables

Table 1. Pearson correlation of dimensions of communication on construction projects.

Communication Assessment		Communication Barrier Importance		Communication Channels Presence			
No	**Pearson Correlation**	**No.**	**Pearson Correlation**	**No.**	**Pearson Correlation**	**No.**	**Pearson Correlation**
1	0.373**	1	0.588**	1	0.485**	18	0.353**
2	0.447**	2	0.703**	2	0.481**	19	0.423**
3	0.612**	3	0.706**	3	0.446**	20	0.421**
4	0.368**	4	0.661**	4	0.452**	21	0.520**
5	0.612**	5	0.725**	5	0.317**	22	0.460**
6	0.703**	6	0.718**	6	0.257**	23	0.485**
7	0.704**	7	0.734**	7	0.202**	24	0.519**
8	0.689**	8	0.711**	8	0.442**	25	0.565**

Communication Assessment		Communication Barrier Importance		Communication Channels Presence			
No	**Pearson Correlation**	**No.**	**Pearson Correlation**	**No.**	**Pearson Correlation**	**No.**	**Pearson Correlation**
9	0.801**	9	0.765**	9	0.544**	26	0.560**
10	0.552**	10	0.790**	10	0.559**	27	0.548**
11	0.603**	11	0.784**	11	0.267**	28	0.247**
12	0.625**	12	0.643**	12	0.275**		
13	0.664**	13	0.676**	13	0.465**		
14	0.709**	14	0.739**	14	0.586**		
15	0.641**	15	0.736**	15	0.547**		
16	0.586**	16	0.768**	16	0.442**		
17	0.708**	17	0.559**	17	0.334**		

Table 1. (*Continued*)

Table 2. Pearson correlation of dimensions of stakeholders' interest on construction projects.

Project Initiating and Planning (Definition)		Typical Key Stakeholders		Project Involvement Impact	
No	**Pearson Correlation**	**No.**	**Pearson Correlation**	**No.**	**Pearson Correlation**
1	0.669**	1	0.229**	1	0.719**
2	0.717**	2	0.598**	2	0.788**
3	0.722**	3	0.676**	3	0.702**
4	0.686**	4	0.465**	4	0.699**
5	0.712**	5	0.654**	5	0.733**
6	0.641**	6	0.662**		
7	0.691**	7	0.720**		
		8	0.490**		

***: significant at level 0.01 (two tailed)*

Table 3. Pearson correlation of dimensions of stakeholders' interest on construction projects.

External Factors		Related Actions		Engagement-Related Methods
No	**Pearson Correlation**	**No.**	**Pearson Correlation**	**Pearson Correlation**
1	0.623**	1	0.622**	0.624**
2	0.756**	2	0.682**	0.654**
3	0.597**	3	0.689**	0.642**
4	0.667**	4	0.761**	0.548**
5	0.734**	5	0.792**	0.670**
6	0.814**	6	0.657**	0.648**
7	0.601**	7	0.782**	0.659**
8	0.688**	8	0.748**	0.654**

External Factors		**Related Actions**		**Engagement-Related Methods**
No	**Pearson Correlation**	**No.**	**Pearson Correlation**	**Pearson Correlation**
9	0.671**	9	0.701**	

Table 3. (*Continued*)

***: significant at level 0.01 (two tailed)*

Table 4. Pearson correlation of dimensions of stakeholders interest on construction projects.

Factors Relates to Conflict Resolution		**Possible Outputs**		**Strategy Types**	
No	**Pearson Correlation**	**No.**	**Pearson Correlation**	**No.**	**Pearson Correlation**
1	0.693**	1	0.504**	1	0.741**
2	0.767**	2	0.630**	2	0.786**
3	0.689**	3	0.581**	3	0.587**
4	0.680**	4	0.666**	4	0.829**
5	0.688**	5	0.620**	5	0.588**
6	0.719**	6	0.726**		
7	0.701**	7	0.681**		
8	0.661**	8	0.565**		
		9	0.678**		
		10	0.725**		
		11	0.716**		
		12	0.610**		
		13	0.724**		

***: significant at level 0.01 (two tailed)*