Received: July 2024
Accepted: September 2024
DOI: 10.7862/rz.2024.mmr.15

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OPERATIONAL VARIABLES INFLUENCING TEAM EFFECTIVENESS, CULTURE, AND LEADERSHIP IN THE NIGERIAN OIL AND GAS PROJECT ENVIRONMENT

This paper examines the important factors influencing team effectiveness, culture, and leadership in the oil and gas project environment. The study focuses on four controlling variables: cross-culture, organizational culture, path-goal leadership, and team effectiveness. Cross-cultural dynamics greatly affect team dynamics, decision-making, conflict resolution, and project delivery. Organizational culture stresses collective learning and its impact on team members' mindsets. Path-goal leadership clarifies goals and provides support. Effective project teams collaborate, have strong leadership, and integrate individual viewpoints. The study provides valuable insights for Nigerian oil and gas industry project leaders to improve project outcomes aligned with organizational goals. Structural equation modelling (SEM) techniques are employed for data analysis, with the sample size determined based on SEM guidelines. PLS-SEM and CB-SEM approaches are compared, with CB-SEM achieving a higher coefficient of determination. The research suggests that achievement-oriented leadership behaviour and collaborative team processes are essential factors in defining key performance indicators (KPI) for project success.

Keywords: oil and gas, organisational culture, team effectiveness, project leadership, project environment variables.

1. INTRODUCTION

Several operational variables impact team effectiveness, culture, and leadership in the oil and gas project environment. These variables significantly influence the success of projects in the oil and gas industry. Therefore, it is important for project leaders to identify and pay attention to improving these dimensions to create a productive and team-cohesive project environment. In this paper, we have identified cross-culture, organizational culture, path-goal leadership, and team effectiveness as project-controlling variables.

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Culture can be understood as the collective programming of the mind that distinguishes the members of one group or category of people from others (Hofstede, 2011). It includes a wide range of shared beliefs, values, customs, traditions, symbols, and behaviours that are learned and passed down from generation to generation within a specific community or society. Research has demonstrated that cross-cultural differences are observed within project teams (Kirkman, Shapiro, 2001). Cross-cultural dynamics within a project team can significantly influence team dynamics, decision-making processes, conflict resolution, and overall project delivery. The influence of cross-culture within a project environment can be noticed from the presence of varied communication norms, such as directness or indirectness, high context or low context communication, and the use of non-verbal cues, which can affect the clarity and effectiveness of team communication.

Also, cross-cultural teamwork varies between collectivist and individualistic approaches. Although the presence of diverse perspectives can enhance creative problem-solving, but may also lead to conflicts, lack of cohesion, and challenges in reaching consensus if not effectively managed. The literature identifies several dimensions that are commonly associated with cross-cultural theory (Dorfman et al., 2012; Hofstede, 2011). However, four of these dimensions have been investigated in this study because they encompass the key aspects and factors relevant to the understanding of cross-cultural differences within project teams. These dimensions include power distance, uncertainty avoidance, individualism versus collectivism, and long-term versus short-term orientation.

In accordance with the explanation of culture posited above, organisational culture is explained as the collective learning within a group, encompassing a wide range of psychological elements, including behaviours, emotions, and cognitive processes (Schein, 2010). It highlights the influence of group interactions, experiences, and shared knowledge on the psychological functioning of its members of a project team. There is the need for team members to understand the process of recognizing, perceiving, or creating meaningful patterns or structures from the information or experiences at their disposal in the organisation.

Again, cultural integration within the team to develop a coherent worldview, reconciling contradictions, and able to connect different perspectives or domains of professional knowledge within the organisation. We have considered the dimensions of the Denison model of organizational culture theory, which suggests that a strong and positive organizational culture, is characterized by high scores in all four dimensions, leading to better performance, growth, innovation, and organizational learning (Denison, 1990). It offers a structure for organizations to evaluate their cultural strengths and weaknesses and identifying areas that require improvement. The four dimensions investigated include mission, adaptability, consistency, and involvement.

Effectiveness of project leadership depends on various factors such as the project's nature, team composition, organizational culture, and individual preferences. Effective leaders often employ a range of leadership styles and techniques based on the specific needs and circumstances of their projects and team members. The four main leadership behaviours that have been identified with project delivery are transformational leadership (Grill et al., 2019; Keegan, Den Hartog, 2004), transactional leadership (Aga, 2016; Grill et al., 2019), path-goal (P-G) leadership (Umuteme, 2024; Umuteme, Adegbite, 2022) and authentic leadership (Lau, 2017; Lloyd-Walker, Walker, 2011; Toor, Ofori, 2008). However, we have adopted the path-goal leadership behaviour because of the advantages it offers in clarifying the path to achieving the common goals and providing support to project team members. Path-goal leadership is believed to improve the psychological

well-being of team members due to the leader's motivating influence, which drives team members towards achieving high performance and experiencing overall job satisfaction (Umuteme, Adegbite, 2022). The four dimensions of P-G leadership theory investigated include directive, achievement-oriented, supportive, and participative leadership styles.

A team is comprised of individuals who come together to collaborate and work towards a common goal or objective (Katzenbach, Smith, 1993; Katzenbach, Smith, 2001). Team-centered working refers to the practice of organizing work and tasks in a collaborative manner, where employees work together as a team rather than in isolated functions. Thus, organizations can unlock the collective potential of their employees and achieve greater success in today's dynamic project environment by harnessing diverse skills, encouraging ownership and accountability, facilitating continuous learning, building stronger team-bond relationships, adaptation to complex project challenges, and promoting a project team culture of continuous empowerment. Teams are specifically tailored to meet the requirements of the organization, which means they are designed with consideration for factors such as the duration of the team's existence, the flexibility of replacing team members, and a variety of tasks and roles that the team undertakes (Torrington et al., 2005).

Effective project teams require a project leader who is strong and has a clear focus, along with the ability to share leadership responsibilities by delegating tasks when necessary (Atesmen, 2015; Kloppenborg, 2015). Thus, high performing teams are characterized by the harmonious integration of the viewpoints of individual team members, encouraging group dynamics, and organizational support. Several models of team effectiveness exist, but we have adopted the Hackman's model and the related project measurable variables in our paper. The variables of the team effectiveness theory adopted include productive output, which emphasizes stakeholders' satisfaction; socializing process, which enables team members to enhance their competencies; and group experience, which enables individual members to learn through the sharing of knowledge in the team.

The purpose of this paper is to identify the order in which the dimensions of cross-culture, organizational culture, path-goal leadership, and team effectiveness influences the project environment. This type of study can offer valuable insights to project leaders regarding the dynamics of the project and provide guidance on enhancing performance. Furthermore, the outcome of this study can enable project leaders to navigate the broader organizational environment and align the project with organizational goals, ultimately leading to improved project outcomes. The business landscape of study is the Nigerian oil and gas industry. The oil and gas industry consists of three sectors: upstream, midstream, and downstream. These viable economic sectors determine how organizations in the supply chain framework operate (Herkenhoff, 2018). In Nigeria, the oil and gas industry is a thriving multimillion-dollar sector with significant oil and gas reserves. The project environment is defined in this paper as the reflective loadings of the dimensions of cross-culture, P-G leadership and team effectiveness. Consequently, the specific objectives of this paper include:

i. To examine the role of path-goal leadership in enhancing project performance in the Nigerian oil and gas industry. This objective aims to assess how different leadership styles and behaviours of the P-G leadership theory influence project outcomes within the Nigerian oil and gas industry. By understanding the impact of P-G leadership on motivating and guiding project teams, project leaders can adopt effective leadership practices that align with the project goals and enhance performance.

ii. To explore the influence of organizational culture on team effectiveness in the Nigerian oil and gas industry. It seeks to investigate how the prevailing organizational culture affects team effectiveness. By identifying the key aspects of organizational culture that contribute to high team effectiveness, project leaders can leverage this knowledge to shape a culture that promotes collaboration, innovation, and overall project success.
iii. To analyze the influence of cross-cultural dimensions on the project environment in the Nigerian oil and gas industry from the perspective of participative leadership.
iv. To assess the alignment between project goals and broader organizational goals in the Nigerian oil and gas industry. It focuses on understanding how well projects within the Nigerian oil and gas industry align with the strategic objectives of the organizations they belong to. By evaluating the extent of adaptation, project leaders can identify areas of potential improvement and make specific adjustments to ensure that the project's objectives are consistent with the broader organizational goals.
v. To rank the dimensions in terms of their loadings, hence providing explanation on the variables influencing the dynamics of the project environment.

This paper is structured as follows: the literature review focuses on prior theoretical and empirical studies to explore the connection between theory and practice. The third section provides background information on the study and describes the methodology employed. The analysis and findings of the research are then presented, followed by discussions and implications of the results. The paper concludes by summarizing the key points and, offering recommendations future research directions, and acknowledging any limitations.

2. LITERATURE REVIEW

The purpose of the literature review in this paper is to evaluate the current understanding of the connection between the four concepts examined, and they individually or collectively influence the dynamics of a project environment. It explores previous empirical studies and how they are connected to the research topics under consideration. We provide a working definition of a project environment as the specific context or setting in which a project takes place. It encompasses various elements, such as the project space, the people involved, and the interactions among different measured variables considered in this paper. In this context, the project environment involves the interplay and coexistence of cross-culture, leadership, organizational culture, and team effectiveness with the aim of enhancing project delivery (Umuteme, 2024).

The presence of cross-cultural diversity in the workplace can have positive effects on job satisfaction, employee motivation, and team effectiveness (Forsyth, 2007; Forsyth, 2010; Salas et al., 2015). This suggests that the presence of cross-cultural dimensions can drive performance and improve the overall effectiveness of teams. Other researchers also agree that cross-cultural dimensions have an impact on team effectiveness (Bitsani, 2013; Dorfman et al., 2012; Hofstede, 2011). Therefore, it is essential to examine the relationship between cross-cultural dimensions prevalent in projects and team effectiveness in the Nigerian oil and gas industry. The literature suggests that leadership plays a significant role in enhancing team performance by monitoring and taking action based on team performance (Northouse, 2019). Also, the need to enhance team performance through the integration of both directive and supportive leadership has been advocated in literature (Blanchard et al., 1993, 2013). Additionally, cross-cultural factors can influence the

leadership style adopted. Again, Dorfman et al. (2012) support this idea by stating that cross-cultural challenges can be mitigated if leadership promotes integration and collaboration within the team.

Organizational culture, which encompasses learned beliefs and norms, also plays a vital role in furthering integration and adaptive collaboration among the workforce. It is important to note that culture is dynamic (Hall, 1989), and transferring cultural norms from one project to another, even within the same organization, is not feasible. Cultural assumptions, such as artefacts and symbols, can impact the work environment within an organization (Schein, 2010) and are expected to create a conducive atmosphere for teamwork to flourish. Mumford et al. (2000) suggest that a key responsibility of a leader is to inspire the team to stay committed to fulfilling the mission of the organization. However, as a gap, Mumford et al. did not specify which leadership approach is most effective in driving an organization's "mission". This demands effective leadership, team engagement, and commitment as essential drivers of project success. Earlier, Blake and Mouton (1981) demonstrated that the connection between involvement and the commitment to productivity, which is achievement-oriented leadership, serves as the driving force for accomplishing organizational goals.

The gap in the literature is the absence of a study that combined the above dimensions of the four concepts in explaining the dynamics of the project environment. This study addresses the gap by identifying the leadership strategies best suited to align team commitment with organizational objectives. Figure 1., below illustrates the conceptual/research models that were examined in this study.

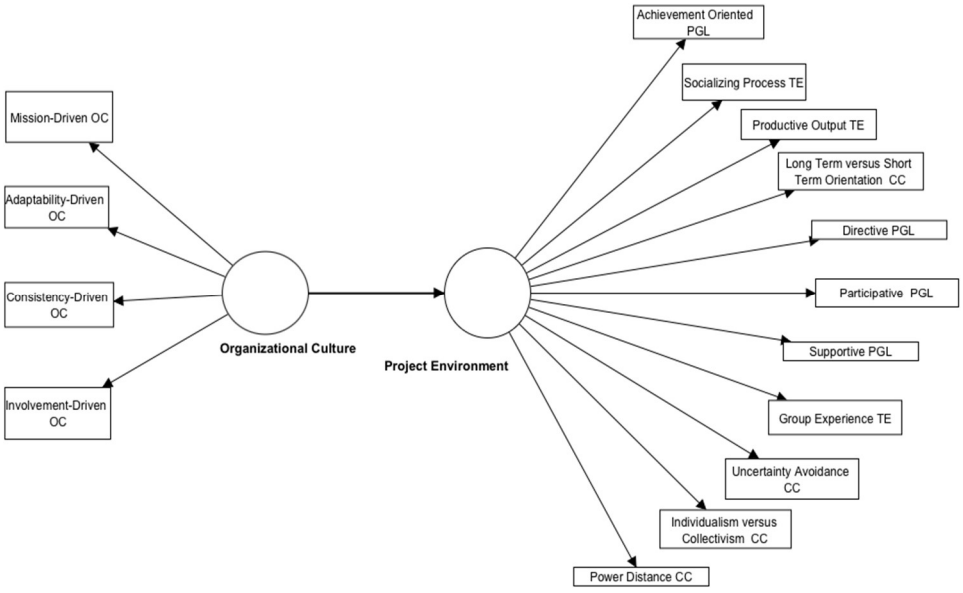

Figure 1. Conceptual/Research Model

Source: Authors' own work.

3. MATERIAL AND METHOD

3.1. Population, Sample, and Instrument

The composition of the study population varies due to the need of changing project team members during the project lifetime. However, in the oil and gas industry, project teams typically consist of 100 or fewer members (Alladi, Iyyunni, 2015; Umuteme, Adegbite, 2023). For this study, a statistical analysis method called structural equation modelling (SEM) is employed, and the sample size is determined according to SEM guidelines. The model under investigation includes 15 variables that are measured. Thus, following the recommendation in the literature (Barclay et al., 1995) to employ a sample size ten (10) times the number of variables, a minimum of 150 participants is required. However, the study recruited 210 participants because of the specific requirement for a minimum of 200 participants for CB-SEM, achieving a 100% response rate for the survey instrument. The sample size of 202 is determined using G*Power software (Faul et al., 2007) to minimize Type-I error with an alpha level of 0.05 and ensure a research power of 80% for exploratory studies, as suggested by the literature (Cohen, 1988). The sampling procedure utilized a cross-sectional approach with a judgmental sampling method (Sekaran, Bougie, 2016), selecting only those team members who possessed the necessary information.

A structured survey questionnaire utilizing a 5-point Likert scale was created for data collection purposes and physically distributed to project team members within specific project teams located in the eastern region of Nigeria. The study sample consists of participants from project teams affiliated with four international oil and gas organizations operating in Nigeria. However, to maintain confidentiality as agreed upon during the survey, the specific project identities are not disclosed. The survey questions were designed based on the operational definitions of the measured variables for each construct, as inferred in the study (Umuteme, 2024). As an illustration, the survey included the following sample questions to assess the team's attitude towards the presence of cross-cultural variables:

i. Inequality permeates throughout the entire leadership hierarchy.
ii. There is the need for clearly defining the roles and structure within the team during the duration of the project.
iii. There is a strong inclination of team members towards adaptability and acceptance of change during the duration of the project.

Each question is accompanied by a 5-point Likert scale, with the following measurement options: (1) Never, (2) Rarely, (3) Sometimes, (4) Usually, (5) Always.

3.2. Data Analysis

In this study, Structural Equation Modelling (SEM) was employed for data analysis to enhance the understanding of the relationships among the variables in the project environment. Both the partial least squares (PLS) SEM and covariance-based SEM modelling approaches were utilized to compare the outcomes of their simulations, as suggested in the literature (Hair et al., 2017). The covariance-based modelling approach serves as an alternative to PLS SEM. However, in this study, which focuses on models consisting solely of reflective factors, the covariance-based SEM approach is considered most suitable (Sarstedt et al., 2016). It is important to note that the objective of this study is not to generalize the results, but rather to provide insight into the existing

relationships that can further contribute to understanding project performance audit outcomes. It should be acknowledged that these results may vary from one project to another.

The simulations in this study were conducted using SmartPLS® software version 4. Initially, the raw data was entered into SPSS and screened to identify any outliers. Subsequently, each construct was developed in the SmartPLS® software, with the measured variables serving as indicators. To determine the path coefficients and statistical significance level, a bootstrapping simulation was performed with 1000 subsamples. The reliability and validity checks followed the procedures outlined in relevant literature (Hair et al., 2019; Henseler et al., 2015; Ringle, Sarstedt, 2016; Sarstedt et al., 2020).

Model fit was achieved using the Standardized Root Mean Square Residual (SRMR). The SRMR is a measure of fit that provides an absolute assessment. It represents the average discrepancy between the observed correlation and the correlation predicted by the model. Since the SRMR is an absolute measure, a value of zero indicates a perfect fit. We employed the maximum likelihood (ML) approach recommended in the literature (Hu, Bentler, 1999) in order to determine a relatively good fit between the hypothesized model and the observed data. The ML-based SRMR is particularly sensitive to models that have inaccurately specified factor covariances or latent structures. At the same time, the RMSEA (Root Mean Square Error of Approximation) is the most sensitive index when it comes to models that have inaccurately specified factor loadings.

The findings in the literature (Hu & Bentler, 1999) indicate that using a combination of cut-off values from specific ranges for the ML-based SRMR and an additional fit index (such as RMSEA) may yield better results compared to using a single-index presentation strategy. Additionally, the findings show that the use of combinational rules with RMSEA > 0.06 and SRMR > 0.09 (or 0.10) led to the lowest overall sums of Type I and Type II error rates, making them more favourable for evaluating the model. The software did not calculate RMSEA for PLS-SEM due to its limitations and incompatibility with the PLS-SEM approach. PLS-SEM is a variance-based method that aims to estimate relationships between latent variables and explain variance in dependent variables. Unlike covariance-based SEM, PLS-SEM does not assume any specific distribution for observed variables and does not estimate covariance matrices. Instead, it prioritizes the predictive nature of the model.

In this study, PLS-SEM achieved an SRMR of 0.09, while CB-SEM achieved an SRMR of 0.068 and RMSEA of 0.064. The results indicate that the simulations fulfilled the criteria specified for SRMR and RMSEA mentioned earlier, indicating a successful attainment of a good fit. We evaluated the coherence within the constructs by employing the composite reliability measure, as it is more suitable for the study objective. Unlike Cronbach alpha, which assumes equal reliability of all indicators, our model acknowledges that loadings for each measured variable can vary across different projects. The aim of the study is not to achieve generalizability, but to prioritize and rank the project environment's impact on each operational variable. In exploratory research such as this, composite reliability values between 0.60 and 0.70 are considered acceptable, while in more advanced stages of research, values ranging from 0.70 to 0.90 are deemed satisfactory (Hair et al., 2011; Nunnally, Bernstein, 1994). Similarly, the model simulation results indicate that PLS-SEM (0.70) and CB-SEM (0.8) achieved a composite reliability >=0.70 for both constructs.

An additional metric used to compare the predictability of both PLS-SEM and CB-SEM was the R-Squared value, also known as the coefficient of determination. R-squared is a statistical measure that represents the proportion of the variance in the dependent variable (the outcome or response variable) that is explained by the independent variables (predictor or explanatory variables) in a regression model. The *p*-values are compared with the research alpha level of 0.05 to determine statistical significance. The results of the SEM simulations are presented next.

4. RESULTS

4.1. Participants Profile

This research attained an impressive response rate of 100% with a sample size of 202 participants. The distribution of age groups is as follows: 30–35 years (26.7%), 36–40 years (50.0%), 41–45 years (6.0%), 46–50 years (11.9%), and above 50 years (5.4%). Out of the total, there are 29 females (14.4%) and 173 males (85.6%). According to the data, 194 participants (96.0%) hold bachelor's degrees or higher national diplomas. All participants are Nigerian citizens.

4.2. Descriptive Statistics

The results suggest that the responses range from sometimes to usually, with participative leadership having the highest mean value of 4.52 ±0.63. This underscores the importance of a participative leadership approach in projects. However, under the causal effect of organizational culture using SEM, the study will investigate if participative leadership is still the top-ranking leadership behaviour. For the two bi-polar variables, including individualism/collectivism and long-term/short-term orientation, the outcome favoured collectivism and long-term orientation, respectively. From the mean values in Table 1, the five top-ranking operational variables in the project environment from the mean in descending order include Participative leadership (4.52±0.63), Achievement-oriented leadership (4.20±0.73), Mission (4.10±0.78); Supportive leadership (4.03±0.69) and Group experience (3.97±0.90). Hence, from the standard deviation ranges, we can notice that the results for these five variables are within 3 to 5. The top-rating variables are dimensions of leadership, organizational culture, and team effectiveness. This suggests that cross-culture have minimal control of the project environment. Hence, there is a need to investigate the influence of the principle of adaptation and the likely effects as we discuss the results further.

Table 1. Mean and Standard Deviation of Measured Variables

	Power Distance CC	**Uncer-tainty Avoi-dance CC**	**Indivi-dualism versus Collec-tivism CC**	**Long Term versus Short Term Orienta-tion CC**	**Direc-tive PGL**	**Suppor-tive PGL**	**Partici-pative PGL**	**Achieve-ment Oriented PGL**	**Produc-tive Output TE**	**Sociali-zing Process TE**	**Group Expe-rience TE**	**Mission -Driven OC**	**Adapta-bility-Driven OC**	**Involve-ment-Driven OC**	**Consis-tency-Driven OC**
Valid	202	202	202	202	202	202	202	202	202	202	202	202	202	202	202
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	3.80	3.75	3.04	3.79	3.71	4.03	4.52	4.20	3.79	3.09	3.97	4.10	3.71	3.57	3.94
Std. De-viation	0.97	1.12	1.02	0.80	0.81	0.69	0.63	0.73	0.86	0.75	0.90	0.78	0.86	0.96	0.90

Sources: Researcher's Field Survey.

4.3. Correlation Analysis

Correlation analysis enables the estimation of the population correlation and tests the null hypothesis that the population correlation between variable pairs is zero. This analysis examines all potential combinations of the measured variables within a 95% confidence interval (CI). The Pearson's rho correlation coefficient was adopted based on the assumptions that the measured bivariate relationships are linear. The *p-values* corresponding to each pairwise relationship was displayed. Significant correlations are denoted as follows: *p < 0.05 if the correlation is significant at a significance level of alpha = 0.05; **p <0.01 if the correlation is significant at a significance level of alpha = 0.01; and ***p < 0.001 if the correlation is significant at a significance level of alpha = 0.001. Table 1, present the correlation matrix for all measured variables.

The results suggest that the correlational relationship between all the dimensions of leadership and organizational culture are significant. Cross-culture had no significant relationship with any other measured variables except between power distance and individualism/collectivism. From the correlation table (Table 2), the highest rating correlational Pearson coefficients are presented as follows:

i. Achievement-oriented dimension of P-G leadership were significantly correlated with the dimensions of team effectiveness and organizational culture at $p<0.001$, and with three dimensions of cross-culture at $p<0.05$, except power distance. However, the correlation with individualism/collectivism was negative. Since the question relating to this measure tended towards collectivism, there is the tendency of an individualist's behaviour favouring achievement-oriented leadership in projects. This can refer to expert and highly specialized roles within the team. Power distance is positively and significantly correlated with only collectivism, which is understood because the presence of large power distance encourages team bonding through interdependent task-driven association among team members.
ii. Participative leadership was positively and significantly correlated with only the uncertainty avoidance dimension of cross-culture and mission-driven organizational culture at $p<0.001$ and socializing process of team effectiveness and involvement-driven organizational culture at $p<0.01$.
iii. Supportive leadership was positively and significantly correlated with long-term orientation cross-culture, productive output of team effectiveness, and adaptability-driven organizational culture at $p<0.01$.
iv. Directive leadership was positively and significantly correlated with long-term orientation cross-culture, socializing process of team effectiveness, and mission-driven, adaptability-driven and consistency-driven organizational culture at $p<0.01$, and involvement-driven organizational culture at $p<0.05$.
v. All the measured dimensions of organisational culture positively correlated with long-term/short-term orientation CC, directive PGL, achievement-oriented PGL, and socializing effectiveness TE. Suggesting that these are the controlling variables of the project environment in the oil and gas industry.
vi. Supportive leadership was positively and significantly correlated with long-term orientation cross-culture, productive output of team effectiveness, and adaptability-driven organizational culture at $p<0.01$.

Table 2. Correlation among Measured Variables

Variable	Power Distance CC	Uncertainty Avoidance CC	Individualism versus Collectivism CC	Long Term versus Short Term Orientation CC	Directive PGL	Supportive PGL	Participative PGL	Achievement Oriented PGL	Productive Output TE	Socializing Process TE	Group Experience TE	Mission-Driven OC	Adaptability-Driven OC	Involvement-Driven OC	Consistency-Driven OC
1. Power Distance CC	—														
2. Uncertainty Avoidance CC	0.11	—													
3. Individualism versus Collectivism CC	0.33 ***	0.07	—												
4. Long Term versus Short Term Orientation CC	-0.11	0.02	-0.17 *	—											
5. Directive PGL	0.04	0.11	0.08	0.24 ***	—										
6. Supportive PGL	-0.12	0.13	0.02	0.20 **	0.07	—									
7. Participative PGL	-0.08	0.25 ***	-0.09	0.06	0.17 *	0.19 **	—								
8. Achievement Oriented PGL	-0.06	0.16 *	-0.16 *	0.15 *	0.29 ***	0.06	0.18 *	—							

Table 2 (cont.). Correlation among Measured Variables

Variable	Power Distance CC		Uncer-tainty Avoidan-ce CC		Individu-alism versus Collecti-vism CC		Long Term versus Short Term Orientation CC		Directive PGL		Suppor-tive PGL		Partici-pative PGL		Achie-vement Oriented PGL		Produc-tive Output TE		Sociali-zing Process TE		Group Expe-rience TE		Mission-Driven OC		Adaptabi-lity-Dri-ven OC		Involv-ement--Driven OC		Consis-tency--Driven OC	
9. Productive Output TE	-0.13		-0.02		-0.17	*	0.23	***	0.11		0.19	**	0.07		0.41	***	—													
10. Socializing Process TE	-0.10		0.18	**	-0.07		0.24	***	0.27	***	0.11		0.19	**	0.27	***	0.28	***	—											
11. Group Experience TE	0.01		0.04		-0.03		0.12		0.10		0.01		-0.04		0.24	***	0.17	*	0.14		—									
12. Mission--Driven OC	-0.09		0.14	*	-0.12		0.27	***	0.28	***	0.08		0.25	***	0.30	***	0.10		0.33	***	0.00		—							
13. Adaptabi-lity-Driven OC	0.03		0.10		-0.12		0.35	***	0.27	***	0.18	**	0.12		0.25	***	0.23	**	0.39	***	0.12		0.45	***	—					
14. Involvement--Driven OC	-0.09		0.05		-0.21	**	0.26	***	0.17	*	0.12		0.20	**	0.25	***	0.35	***	0.28	***	0.08		0.37	***	0.31	***	—			
15. Consistency--Driven OC	-0.08		0.06		-0.11		0.21	**	0.32	***	0.04		0.12		0.36	***	0.28	***	0.27	***	0.19	**	0.37	***	0.30	***	0.40	***	—	

* $p < .05$, ** $p < .01$, *** $p < .001$

Source: Researcher's Field Survey.

vii. Directive leadership was positively and significantly correlated with long-term orientation cross-culture, socializing process of team effectiveness, and mission-driven, adaptability-driven and consistency-driven organizational culture at $p<0.01$, and involvement-driven organizational culture at $p<0.05$.

viii. All the measured dimensions of organisational culture positively correlated with long-term/short-term orientation CC, directive PGL, achievement-oriented PGL, and socializing effectiveness TE. Suggesting that these are the controlling variables of the project environment in the oil and gas industry.

4.4. Structural Equation Modelling

The data analysis in this study utilized SmartPLS®, a software for structural equation modelling (SEM) analysis, as described in the literature (Ringle, Sarstedt, 2016). The significance of outer loadings and path coefficients is indicated by the p-values, shown in brackets, with values equal to or less than 0.05 considered significant. In instances where two opposing concepts are measured as a single entity, loadings above 0.5 indicate a preference towards the first concept and vice versa. To determine the level of certainty, outer loadings exceeding 0.5 suggest a high degree of certainty towards the measured variable and vice versa. Reflective formulations treat the loadings for each dimension as distinct entities, following the approach outlined in the literature (Kline, 2012). Consequently, the measured dimensions of P-G leadership, cross-culture, and team effectiveness are considered unique as they reflect variables of the project environment. Also, the dimensions of organizational culture are reflective and collectively contribute to the causal regression effect on the project environment. Simulation results for PLS-SEM (Figure 2.) and CB-SEM Figure 3.) are provided below.

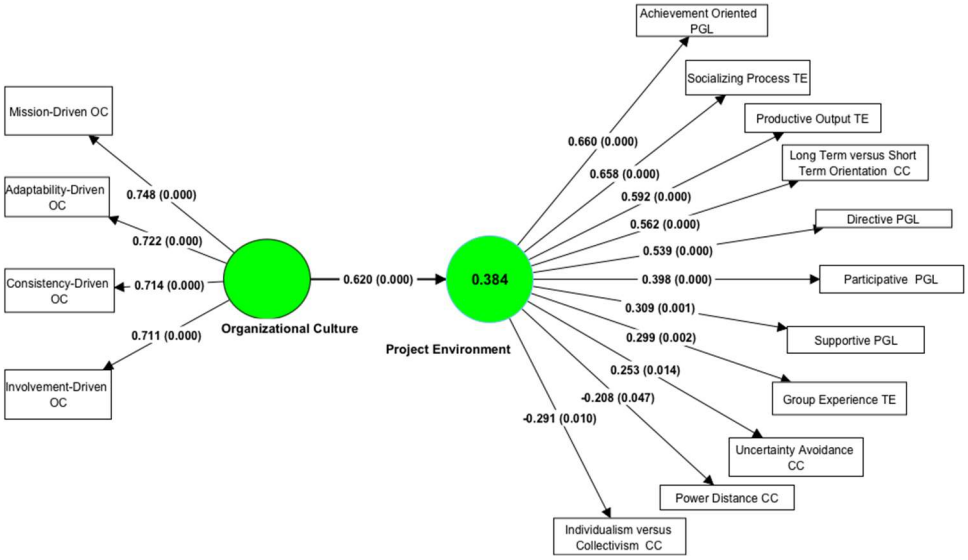

Figure 2. Simulation Results for PLS-SEM: The value in the bracket is the p-value

Source: Authors' own work.

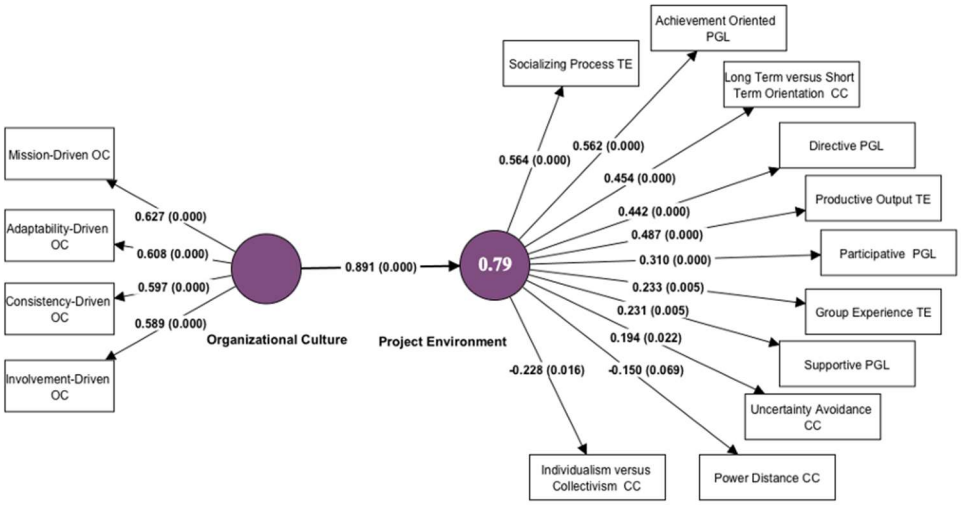

Figure 3. Simulation Results for CB-SEM: The values in brackets are the p-value

Source: Authors' own work.

PLS-SEM achieved a coefficient of determination of 38.4%, and 79% for CB-SEM. The higher coefficient of determination in CB-SEM suggests that the relationships between variables were better captured by the model, because it is more suited for models with reflective constructs, where the observed indicators are assumed to be a reflection of the latent construct. Hence, more appropriate when the goal is to estimate precise relationships between latent constructs. The outcomes of the ranking are presented in Tables 3–6 and explained in the next section.

Table 3. PLS-SEM Ranking of the Dimensions of Organisational Culture

Ranking (Ascending Order)	Determinants of Organizational Culture in a Project Environment: PLS-SEM Simulation	Path Coefficient	Significance (p-value)
1	Mission-Driven OC	0.748	0.000
2	Adaptability-Driven OC	0.722	0.000
3	Consistency-Driven OC	0.714	0.000
4	Involvement-Driven OC	0.711	0.000

Source: Researcher's Field Survey.

Table 4. PLS-SEM Ranking of Project Environment Variables

Ranking (Ascending Order)	Determinants of Project Environment: PLS-SEM Simulation	Path Coefficient	Significance (p-value)
1	Achievement Oriented PGL	0.660	0.000
2	Socializing Process TE	0.658	0.000
3	Productive Output TE	0.592	0.000
4	Long Term versus Short Term Orientation CC	0.539	0.000

Table 4 (cont.). PLS-SEM Ranking of Project Environment Variables

Ranking (Ascending Order)	Determinants of Project Environment: PLS-SEM Simulation	Path Coefficient	Significance (p-value)
5	Directive PGL	0.562	0.000
6	Participative PGL	0.398	0.000
7	Supportive PGL	0.309	0.001
8	Group Experience TE	0.299	0.002
9	Uncertainty Avoidance CC	0.253	0.014
10	Power Distance CC	-0.208	0.047
11	Individualism versus Collectivism CC	-0.291	0.010

Source: Researcher's Field Survey.

Table 5. CB-SEM Ranking of the Dimensions of Organisational Culture

Ranking (Ascending Order)	Determinants of Organizational Culture in a Project Environment: CB-SEM Simulation	Path Coefficient	Significance (p-value)
1	Mission-Driven OC	0.627	0.000
2	Adaptability-Driven OC	0.608	0.000
3	Consistency-Driven OC	0.597	0.000
4	Involvement-Driven OC	0.589	0.000

Source: Researcher's Field Survey.

4.5. Comparison of Simulation Results: PLS-SEM vs. CB-SEM

Both PLS-SEM (**Table 3**.) and CB-SEM (**Table 5**.) outcomes for the predictor latent variable highlight the importance of Mission-Driven, Adaptability-Driven, Consistency-Driven, and Involvement-Driven aspects in shaping Organizational Culture. However, PLS-SEM suggests stronger relationships compared to CB-SEM. The choice between these methods can depend on the specific research context and the nature of the data, with CB-SEM generally preferred for its precision and PLS-SEM for its flexibility in handling complex models and less stringent data assumptions.

The path coefficients in PLS-SEM are generally higher than those in CB-SEM for all four dimensions of Organizational Culture. For example, the path coefficient for Mission-Driven OC is 0.748 in PLS-SEM compared to 0.627 in CB-SEM. Both methodologies agree on the ranking of the path coefficients, with Mission-Driven OC being the highest, followed by Adaptability-Driven OC, Consistency-Driven OC, and Involvement-Driven OC. However, the magnitude of these coefficients differs, with PLS-SEM showing stronger relationships. In both outcomes, all p-values are 0.000, indicating that all path coefficients are statistically significant at the adopted conventional levels.

The findings from Structural Equation Modelling (SEM) analyses, specifically using Partial Least Squares SEM (PLS-SEM) and Covariance-Based SEM (CB-SEM), to assess the influences on the Project Environment. In the PLS-SEM analysis (Table 4.), the strongest positive influences on the Project Environment are attributed to Achievement Oriented PGL (0.660) and Socializing Process TE (0.658), followed closely by Productive Output TE (0.592), Directive PGL (0.562), and Long Term versus Short Term Orientation CC (0.539). Moderate positive influences are found for Participative PGL (0.398),

Supportive PGL (0.309), and Group Experience TE (0.253). Negative influences are noted from Individualism versus Collectivism CC (-0.291) and Power Distance CC (-0.208). Additionally, Organizational Culture has a significant positive impact on the Project Environment with a path coefficient of 0.620 (0.000).

In contrast, the CB-SEM analysis (Table 6.) highlightss that the strongest positive influences from the Project Environment are on Socializing Process TE (0.564) and Achievement Oriented PGL (0.562). These are followed by Productive Output TE (0.487), Long Term versus Short Term Orientation CC (0.454), and Directive PGL (0.442). Participative PGL shows a moderate influence with a path coefficient of 0.310, while Group Experience TE and Supportive PGL have coefficients of 0.233 and 0.231, respectively. Uncertainty Avoidance CC is also influenced with a path coefficient of 0.194. The strongest negative influence is from Individualism versus Collectivism CC (-0.228), followed by Power Distance CC (-0.150). Notably, CB-SEM indicates that Organizational Culture has a much stronger influence on the Project Environment with a path coefficient of 0.891.

Table 6. CB-SEM Ranking of Project Environment Variables

Ranking (Ascending Order)	Determinants of Project Environment: CB-SEM Simulation	Path Coefficient	Significance (p-value)
1	Socializing Process TE	0.564	0.000
2	Achievement Oriented PGL	0.562	0.000
3	Productive Output TE	0.487	0.000
4	Long Term versus Short Term Orientation CC	0.454	0.000
5	Directive PGL	0.442	0.000
6	Participative PGL	0.310	0.000
7	Group Experience TE	0.233	0.005
8	Supportive PGL	0.231	0.005
9	Uncertainty Avoidance CC	0.194	0.022
10	Power Distance CC	-0.150	0.069
11	Individualism versus Collectivism CC	-0.228	0.016

Source: Researcher's Field Survey.

While both SEM approaches identify similar influential factors on the Project Environment, CB-SEM reports generally higher path coefficients, especially highlighting the stronger impact of Organizational Culture compared to PLS-SEM. The methodological differences between the two approaches contribute to these variations. PLS-SEM focuses on maximizing explained variance in endogenous constructs using latent variables and is less stringent about data distribution assumptions. In contrast, CB-SEM assumes multivariate normality and typically provides more precise estimates for large sample sizes. Consequently, CB-SEM emphasizes a stronger influence of organizational culture on the project environment.

Despite these differences, both methods have offered valuable insights into the relationships between various determining dimensions of cross-culture, team effectiveness and path-goal leadership and the Project Environment, providing important implications for organizational management and strategy. Earlier, the project controlling variables when

all the dimensions of organisational culture were correlated with the project environment variables adopted in the study were long-term/short-term orientation CC, directive PGL, achievement-oriented PGL, and socializing effectiveness TE. However, the analysis from the SEM productive output TE increased the controlling project environment variables to five. The addition of productive output TE underscores the significance of productivity to project success.

5. DISCUSSION

Since the normality of the data and the covariance among the measured variables cannot be ascertained, PLS-SEM results are adopted for the discussion on SEM in this section. The discussion will provide the general outlook of the correlations, and followed by the PLS-SEM outcomes. To enhance project success in the oil and gas industry, a detailed discussion of the relationship between leadership dimensions, organizational culture, and cross-cultural factors is essential.

Achievement-oriented leadership significantly correlates with team effectiveness and organizational culture. This suggests that leaders who focus on setting challenging goals and achieving high-performance standards can promote a culture that enhances team effectiveness and overall project success. This dimension is particularly relevant in expert and highly specialized roles within the team, where individual achievements contribute significantly to project outcomes. Literature evidence suggests that business objectives and goals are achieved by integrating diverse expertise (Kozlowski et al., 2016; Kozlowski, Ilgen, 2006). The current study has provided further insight into the dimensions of leadership, organizational culture and team effectiveness, which was relatively lacking in previous studies.

Also, participative leadership, which involves including team members in decision-making processes, strongly correlates with uncertainty avoidance in cross-cultural settings and mission-driven organizational culture. This implies that involving team members in decision-making can reduce uncertainty and create a strong sense of mission, which is needed to drive project success. The participative leadership approach also correlates with socializing processes within the team and an involvement-driven organizational culture, emphasizing the importance of inclusive leadership in enhancing team cohesion and involvement. These findings resonate with the definition of leadership provided in the literature (Blake, Mouton, 1981), where the authors established that the relationship between involvement and commitment to productivity (achievement-driven) provides the necessary force for achieving organizational goals.

Supportive leadership, characterized by leaders who show concern for their team members' well-being and provide support, is positively correlated with long-term orientation in cross-culture and productive output in team effectiveness. It also aligns with an adaptability-driven organizational culture. This indicates that supportive leaders can promote long-term commitment and adaptability, which are essential for maintaining high productivity and achieving project goals in the dynamic oil and gas industry. However, this leadership approach is relatively absent on projects in the Nigerian oil and gas industry, rather support is provided within the team through a socializing process (Umuteme, 2024; Umuteme, Adegbite, 2023).

Directive leadership, where leaders provide clear instructions and closely supervise team activities, correlates positively with long-term orientation in cross-culture, socializing process of team effectiveness, and the dimensions of organizational culture (mission-

driven, adaptability-driven, and consistency-driven). Thus, the findings of the current study corroborate the position advocated in the literature (Blanchard et al., 1993, 2013), of the need to integrate supportive and directive leadership for enhanced productivity. This suggests that directive leadership can enhance social cohesion and ensure alignment with the organization's mission and adaptability, which are vital for navigating the complex and often unpredictable nature of oil and gas projects. Again, in supporting the position reiterated in the literature (Mumford et al., 2000), of the need for the leadership to encourage the team in driving the mission of the organization, the current study shows a positive Pearson's correlation between mission and the leadership dimensions studied in the following order: *Directive leadership (0.27)-> Achievement-oriented (0.25)->Supportive (0.18)->Participative->(0.12)*. Whereas Mumford et al. did not indicate which leadership approach is most appropriate in driving the "Mission" of the organization, this study has closed this gap.

Furthermore, the analysis indicates that power distance is positively correlated with collectivism. This relationship suggests that in cultures with high power distance, there is a tendency for team members to work interdependently, which can strengthen team bonds and improve project outcomes. This indication provides a soothing solution to the problem of the leadership in a large power distance work culture assuming the role of *decision-maker, mentor, expert, and facilitator,* identified in the literature (Miroshnik, 2013), and the master-servant approach suggested elsewhere (Oruh, Dibia, 2020). Conversely, individualism negatively correlates with achievement-oriented leadership, thus highlighting potential challenges in integrating individualistic behaviours within a collectivist-oriented team structure. The novel understanding from this study is essential for project managers to navigate cultural dynamics effectively. Long-term orientation is significantly correlated with several dimensions of organizational culture and leadership styles (directive, achievement-oriented, and supportive). This highlights the importance of advancing a long-term perspective within the team, which can drive consistent and adaptive behaviours essential for sustained project success in the oil and gas sector.

Both Partial Least Squares Structural Equation Modelling (PLS-SEM) and Covariance-Based Structural Equation Modelling (CB-SEM) provide insights into the relationships between leadership, organizational culture, and project environment. However, PLS-SEM tends to show stronger path coefficients, indicating more robust relationships between these variables. For instance, PLS-SEM reveals stronger positive influences of achievement-oriented leadership and socializing processes on the project environment compared to CB-SEM. The PLS-SEM analysis identifies the five strongest positive influences on the project environment in the following order: *Achievement-Oriented Leadership (PGL)->Socializing Process (TE)->Productive Output (TE)->Directive Leadership (PGL)->Long-Term vs. Short-Term Orientation (CC)*. This study suggests that these critical factors provide a project environment that is conducive to project success in the oil and gas industry. Notably, organizational culture itself has a significant positive impact on the project environment, underscoring the importance of cultivating a supportive and mission-driven culture.

6. FULFILLING THE OBJECTIVES OF THE STUDY

To align the fulfillment of the objectives with the outcomes of the study, we assess how the findings support each objective as follows:

Objective 1 *– To examine the role of path-goal leadership in enhancing project performance in the Nigerian oil and gas industry by assessing how different leadership styles and behaviours influence project outcomes*: The outcome of the study suggests that (1) Achievement-oriented dimension of P-G leadership significantly correlated with team effectiveness and organizational culture, suggesting that this leadership style enhances project performance; (2) Directive leadership also showed strong positive influences on the project environment, indicating that certain P-G leadership styles are effective in guiding and motivating project teams towards better performance; and (3) The significant positive impact of Organizational Culture on the Project Environment with a path coefficient of 0.620 reinforces the idea that leadership styles aligned with the organizational culture can enhance project outcomes.

Objective 2 – To *explore the influence of organizational culture on team effectiveness in the Nigerian oil and gas industry*: The study suggests that (1) Organizational culture dimensions positively correlated with socializing process, and productive output aspects of team effectiveness, while group experience was only correlated with consistency-driven OC. Thus, highlighting the critical role of culture in promoting team effectiveness; and (2) The study identified that mission-driven, adaptability-driven, and consistency-driven organizational cultures significantly enhance team effectiveness, aligning with the objective to shape a culture that promotes collaboration and innovation.

Objective 3 *– To analyse the influence of cross-cultural dimensions on the project environment from the perspective of participative leadership*: The results of the study suggest that (1) Participative leadership was positively and significantly correlated with the uncertainty avoidance dimension of cross-culture and mission-driven organizational culture, suggesting that it can effectively manage cross-cultural dynamics in the project environment; and (2) The moderate positive influence of participative leadership on the project environment (0.398) indicates its relevance in cross-cultural contexts within the industry.

Objective 4 *– To assess the alignment between project goals and broader organizational goals in the Nigerian oil and gas industry*: The outcome of the study suggests that (1) The significant positive impact of organizational culture on the project environment suggests that projects aligned with the organization's culture and goals are more successful; and (2) Achievement-oriented and directive P-G leadership styles, which showed strong positive influences on the project environment, can help align project objectives with broader organizational goals, ensuring consistency and strategic alignment.

Objective 5 *– To rank the dimensions in terms of their loadings and explain the variables influencing the project environment dynamics*: The study suggests that (1) The strongest positive influences on the Project Environment were from Achievement-oriented PGL (0.660) and Socializing Process TE (0.658), followed by Productive Output TE (0.592) and Directive PGL (0.562); (2) Organizational culture's significant positive impact on the project environment (0.620) underscores its role as a controlling variable; and (3) Negative influences from Individualism vs. Collectivism (-0.291) and Power Distance (-0.208) highlight areas for potential improvement.

Thus, the synthesis of the findings of this study outcomes shows that the study provide comprehensive support for the objectives, and highlights the importance of leadership styles, organizational culture, and cross-cultural dimensions in enhancing project performance and aligning project goals with broader organizational objectives in the Nigerian oil and gas industry.

7. CONCLUSIONS AND IMPLICATIONS

This study investigates the key dimensions influencing team effectiveness, culture, and leadership in the oil and gas project environment. It focuses on four controlling variables: cross-culture, organizational culture, path-goal leadership, and team effectiveness. Cross-cultural dynamics significantly impact team dynamics, decision-making processes, conflict resolution, and project delivery. Utilizing both PLS-SEM and CB-SEM methodologies provides robust insights into project dynamics, enabling better decision-making and strategic planning. Adopting PLS-SEM for its flexibility in handling complex models and CB-SEM for its precision helps tailor approaches to specific project needs and data contexts. The outcome of this study was analysed using correlation and PLS-SEM. The adoption of PLS-SEM was based on the fact that the normality of the data and covariance among the measured variables could not be ascertained.

In the volatile Nigerian oil and gas business landscape, an adaptability-driven culture can help organizations respond swiftly to regulatory changes, market fluctuations, and operational challenges. Promoting adaptability encourages innovation and flexibility, enabling organizations to leverage new technologies and methodologies. Recognizing the presence of high-power distance and collectivist tendencies is imperative for project success, and project managers should promote a team-oriented work environment where hierarchical structures can support collaboration and collective effort. Clear communication from leaders can bridge power distance gaps, ensuring all team members are informed and engaged. A mission-driven culture cultivates a unified team-centred work-driven purpose and motivates employees to work towards common objectives. This is essential for large-scale projects as obtainable in the industry. Emphasizing long-term goals can drive sustainable practices, essential for environmental stewardship and community relations. Furthermore, a long-term orientation cross-culture can encourage strategic planning and investment.

Given the complex and often hierarchical nature of organizations, directive leadership can ensure clarity in roles and responsibilities, reducing misunderstandings and enhancing efficiency. Directive leadership can enforce strict adherence to safety protocols and regulatory compliance, which is critical in the high-risk oil and gas industry. Emphasizing supportive leadership can improve employee well-being and morale, leading to higher productivity and reduced turnover rates. Building supportive relationships aligns with the long-term orientation prevalent in many Nigerian cultures, furthering loyalty and commitment.

Involving team members in decision-making processes can be particularly effective in Nigeria's diverse cultural landscape. This approach mitigates uncertainty and builds a cohesive, mission-driven team. Participative leadership also enhances engagement with local communities and stakeholders. In the oil and gas sector, leveraging achievement-oriented leadership can drive projects requiring high technical expertise and specialization. Leaders should set clear performance standards and recognize individual contributions to motivate high achievers. Recognizing and rewarding high-performance, organizations can help in retaining top talent, which is important for maintaining a competitive advantage in the industry.

The study outcome implies the need for the following project management strategies to enhance project success in the oil and gas industry:

1. Implementation of leadership development programs for achievement-oriented, participative, supportive, and directive leadership skills.

2. Providing cultural competency training for effective navigation of Nigeria's diverse cultural landscape.
3. Developing stakeholder engagement plans incorporating participative leadership to build trust and support.
4. Integrating long-term sustainability goals into project planning and execution.
5. Establishing innovation hubs to promote adaptability and continuous improvement.
6. Strengthening safety and compliance protocols through directive leadership to ensure adherence to industry standards and regulations.

8. LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This study has some limitations necessitating the need for further research in the following areas. First, there is a need to research the balance between directive and participative leadership styles. This could involve identifying situations where a blend of both styles is most effective, thereby preventing the dominance of autocratic behaviours while ensuring project objectives are met efficiently. Second, there is a need to conduct longitudinal mixed-method studies to understand the long-term impact of participative and supportive leadership on project success. This could provide insights into how these leadership styles contribute to sustained project performance and organizational growth over time. Third, the emphasis is on developing and validating metrics and key performance indicators (KPIs) to assess the effectiveness of participative and supportive leadership. These metrics could help organizations evaluate and improve their leadership practices systematically

Acknowledgement

The authors acknowledge the partial scholarship from UNICAF University in Zambia, which supported the completion of the PhD study during which the data was generated. All authors have read and agreed to the published version of the manuscript.

Author Contributions: Conceptualization and study design, O.M.U; literature review, O.M.U.; methodology, O.M.U. and W.M.A; validation, O.M.U and W.M.A.; software, O.M.U; formal analysis, O.M.U. and W.M.A.; resources, O.M.U. and W.M.A.; writing – original draft preparation, O.M.U.; writing – review and editing, O.M.U. and W.M.A.

Sources of Funding: Partial scholarship for the PhD from UNICAF University in Zambia.

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

Data Availability Statement: The data presented in this study are available on request from the corresponding authors. The data are not publicly available due to restrictions.

Declaration of Conflicts of Interest: The authors declare no conflict of interest. All authors have read and agreed to the published version of the manuscript.

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