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Assessment Of Oil Spill Responders' Perception of Job Safety Analysis in Niger Delta, Nigeria

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Abstract- ***This study assessed Niger Delta oil spill responders' perceptions of Job Safety Analysis (JSA) and its impact on safety outcomes, addressing a critical gap in understanding the human and organisational factors affecting JSA implementation in this high-risk environment. A descriptive cross-sectional mixed-methods design was employed, collecting data from 66 responders across three spill response companies using a structured, mobile-optimised questionnaire. The study achieved an 88.0% response rate, with excellent internal consistency (Cronbach's α = 0.915). Descriptive, thematic, and inferential statistical analyses (Pearson's correlation, One-Way ANOVA) were conducted. Findings revealed a fundamental paradox: while responders overwhelmingly valued JSA (95.5% agreement, weighted mean = 4.6/5.0) and demonstrated strong self-rated understanding (mean = 4.0/5.0) significantly enhanced by formal training (r= .321, p= .009), implementation was critically undermined by cultural and leadership constraints. The "heroism-safety dichotomy" was empirically validated through a very strong correlation between perceived "speed-over-safety" culture and JSA bypassing (r = .702, p < .001). Management commitment emerged as the most influential factor (mean = 4.0/5.0) yet simultaneously the single biggest barrier (42.4% of respondents). One-Way ANOVA formally identified a significant "auditor-operator perception gap": HSE personnel perceived JSA effectiveness significantly higher than field operatives (p= .021), while operatives reported significantly higher bypassing rates (p = .023). The regression model explained 60.3% of variance in JSA effectiveness (R^2 = .603, p < .001), with management commitment as the strongest predictor (β = .387). The study concludes that the core challenge is not a lack of JSA awareness, but systemic and cultural barriers that decouple procedural knowledge from field practice. It is recommended that the management of spill response companies prioritise demonstrable leadership commitment and implement contextual, scenario-based JSA training to bridge the identified gaps and foster a more resilient safety culture.***

Keywords: Oil and Gas Industry, Niger Delta, Job Safety Analysis (JSA), Oil Spill Response, Safety Perception and Occupational Safety

I. INTRODUCTION

Oil spill response operations in the Niger Delta expose responders to hazards such as toxic vapours, fires, explosions, slips, musculoskeletal strain, and the region's characteristically unstable terrain. Between 2018 and 2023, the region has been the epicentre of numerous spill incidents, with databases tracking thousands of reported cases (Stakeholder Democracy Network, 2023; NOSDRA Oil Spill Monitor, 2023), highlighting the frequency and scale of these hazardous operations.

Although Job Safety Analysis (JSA) is recognised globally as a systematic methodology for identifying and controlling task-specific hazards, its application within the Niger Delta remains inconsistent and poorly studied. Previous research suggests that limited awareness, inadequate practical training, and cultural attitudes that prioritise urgency over systematic safety contribute to poor safety compliance among responders (Amnesty International, 2021; UNEP, 2011; Adeola & Picou, 2017).

With oil spill incidents continuing to occur frequently due to both operational failures and third-party interference, understanding the perceptions of those on the front line is critical for improving safe work practices, reducing preventable injuries, and strengthening the overall safety culture within spill response organisations. This study therefore focuses specifically on the human and organisational factors affecting JSA implementation in this challenging context.

The evolution of oil spill response in Nigeria reflects broader shifts in environmental governance and safety consciousness. Initial response efforts in the

1970s-1980s prioritised rapid containment with minimal formal safety protocols, establishing operational precedents that continue to influence contemporary practices.

This legacy of prioritising expediency occurred even as the international industry began to systematise responder safety through foundational guides such as the IPIECA Oil Spill Responder Safety Guide (2002) and subsequent good practice guidelines (IPIECA & IOGP, 2012). Domestically, the persistence of the outdated National Policy on Occupational Safety and Health (1999) has failed to provide the updated legislative mandate needed to counter these deep-seated cultural norms.

The transition from straightforward equipment failure responses to complex security-compromised scenarios has necessitated increasingly sophisticated safety analysis approaches that many existing JSA frameworks remain ill-equipped to handle.

The historical progression reveals a pattern of reactive adaptation rather than proactive safety system development. Early response cultures valued expediency and field ingenuity over systematic hazard analysis, creating deeply embedded operational norms that contemporary safety initiatives must now address. This historical context is crucial for understanding why JSA implementation faces such significant cultural resistance despite its demonstrated effectiveness in other global contexts.

The aim of this study is to assess Niger Delta oil spill responders' perceptions of JSA and its impact on safety outcomes. The objectives of this study are:

i. Evaluate responders' awareness and understanding of JSA.
ii. Analyse cultural attitudes affecting JSA adoption.
iii. Assess perceived effectiveness of JSA in hazard control.
iv. Identify key factors influencing JSA implementation.
v. Propose region-specific recommendations for JSA improvement.

II. METHODOLOGY

2.1 Study Area

The study was conducted across selected operational bases of three Spill Response Companies (SRCs), referred to pseudonymously as SRC-A, SRC-B, and SRC-C to maintain confidentiality. These companies were selected based on their significant operational footprint and high spill response frequency within the Niger Delta region, which was chosen as the exclusive study area because it is the epicentre of oil and gas activities and oil spill incidents in Nigeria.

The region, comprising states such as Rivers, Delta, Bayelsa, Akwa Ibom, and Cross River, is characterised by difficult terrain including mangrove forests, creeks, and estuaries, making oil spill response particularly complex and hazardous.

It accounts for approximately 86% of oil spill incidents in Nigeria between 2018 and 2023, presents frequent exposure to Tier 1 operational hazards such as hydrogen sulphide (H_2S), flammable vapours, and confined spaces, and reflects a complex operational landscape where safety decisions are influenced by regional differences in terrain, regulation, and infrastructure.

To provide a geographical overview of the selected research zones and operational distribution of the three SRCs, this information is depicted in Figure 3.1.

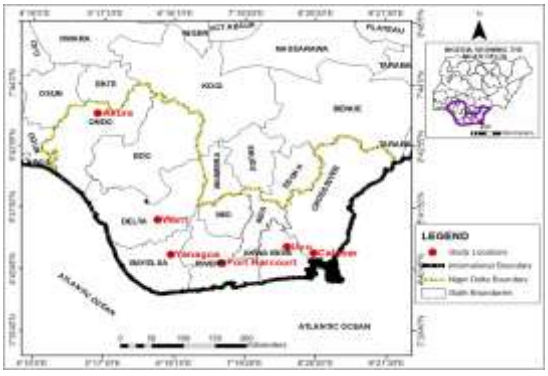

Figure 3.2: Map Showing Operational Coverage of SRCs.

2.2 Population for the Study

The target population for the study consisted of 543 core operational staff of Spill Response Companies (SRCs) engaged in high-risk oil spill response activities from 2023 to 2025. This population was a pragmatic sub-set of the staff, focusing on those most routinely involved in field operations and Job Safety Analysis (JSA) execution, and included Field Responders, Supervisors, and Health, Safety, and Environment (HSE) Officers.

2.3 Sample and Sampling Technique

A non-probability sampling strategy, integrating both convenience and purposive techniques, was adopted for this study due to the dispersed, high-risk, and often inaccessible nature of oil spill response operations within the Niger Delta region. A single digital questionnaire was distributed via a shared web link through the internal communication channels of the three Spill Response Companies (SRCs) to facilitate efficient and consistent data collection.

Convenience sampling was used to obtain data from readily accessible and willing respondents, while purposive sampling ensured the inclusion of safety supervisors and Health, Safety, and Environment (HSE) officers with specialised knowledge and experiential understanding of Job Safety Analysis (JSA) practices. Although this approach limits the statistical generalisability of the findings, it supports the study's primary goal of analytic generalisation.

To determine an appropriate sample size for the study, Cochran's formula (1977) was applied. The population was set at N= 543 core operational personnel from the three participating SRCs. Cochran's formula is used to calculate sample size for large populations, especially when the population proportion (p) is unknown and assumed to be 0.5 for maximum variability and statistical efficiency:

$$n_0 = \frac{Z^2 P(1-P)}{e^2} \quad (3.1)$$

Where n0 is calculated sample size, Z is the standard normal deviate for 95% confidence level = 1.96, p is estimated proportion (0.5) and e is the margin of error (0.1132 or 11.32%).

Substituting the values:

$$n_0 = \frac{(1.96)^2(0.5)(1-0.5)}{(0.1132)^2} = 75 \quad (3.2)$$

Since the study population is finite (N=543), Cochran's correction formula for finite populations was applied:

$$n = \frac{n_0}{1+(\frac{n_0-1}{N})} \quad (3.3)$$

Substituting the values:

$$n = \frac{75}{1+\frac{75-1}{543}} = \frac{384}{1+\frac{74}{543}} \approx 66 \quad (3.4)$$

The final adjusted sample size was therefore 66 respondents. A total of 75 questionnaires were distributed, and the achieved sample size used for the data analysis was 66 respondents, representing an 88.0% return rate.

i. Convenience sampling was used to reach accessible and willing respondents across all three SRCs' operational bases, especially where entry restrictions, time constraints, or safety protocols limited structured sampling.
ii. Purposive sampling was used to select safety supervisors and officers from all three companies who possessed specialised knowledge and decision-making authority relevant to JSA implementation.
iii. Although non-probability sampling was operationally necessary due to security and logistical constraints, it limits the statistical generalisability of the findings to the wider population.

However, the primary goal of this research is analytic generalisation (Firestone, 1993), whereby the findings are generalised to the theoretical propositions being examined, specifically the Theory of Planned Behaviour and Safety Culture Theory, rather than to a statistical population. This approach is aligned with the study's exploratory and context-specific aims. Nonetheless, efforts were made to maximise representativeness across roles, regions and companies through strategic dissemination and

supervisor engagement to capture the diverse experiences of staff.

2.4 Data collection/instrument

Data were collected using a 22-item digital questionnaire hosted on Google Forms and distributed through a shared web link to potential respondents across the three participating Spill Response Companies (SRCs), ensuring complete standardisation of the data collection instrument and process.

The questionnaire comprised four sections covering respondents' demographic profile, Job Safety Analysis (JSA) awareness and understanding, cultural attitudes and implementation barriers, and perceived effectiveness and support needs. Items in Sections B, C, and D were measured using a 5-point Likert scale ranging from “Strongly Disagree (1)” to “Strongly Agree (5).” The instrument was designed for mobile accessibility and clarity to suit the field-based nature of respondents' duties.

2.5 Data Analysis

Quantitative data collected through Google Forms were exported to the Statistical Package for the Social Sciences (SPSS) version 28 for analysis. Data cleaning involved listwise deletion of missing responses and outlier removal using z-scores (±3.29). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarise the data.

Inferential statistics comprised independent t-tests, Pearson's correlation, one-way Analysis of Variance (ANOVA) with Tukey's post-hoc test, and multiple regression analysis to examine relationships, compare group differences, and identify predictors of perceived Job Safety Analysis (JSA) effectiveness.

2.6 Ethical Considerations

Ethical approval was obtained from the University of Port Harcourt Research Ethics Committee. The study adhered to the principles of autonomy, confidentiality, and beneficence through a digital consent form embedded in the questionnaire, the exclusion of personally identifiable information, pseudonymisation of the participating Spill Response Companies (SRCs) and their operational locations, and the provision for participants to skip questions without penalty. Findings were shared anonymously with the participating SRCs to support safety improvement.

III. RESULT AND DISCUSSION

3.1 Rationale for Combined Sector-Wide Analysis

The data collection process was designed such that responses could not be traced back to any specific company; consequently, a formal statistical comparison between the three participating Spill Response Companies (SRCs) was not feasible (Creswell & Plano Clark, 2018; Firestone, 1993).

The companies were therefore treated as a single cohort because they operate within the same shared operational ecosystem of the Niger Delta and are subject to identical regulatory frameworks, similar socio-political pressures, comparable terrain challenges, and the same industry-wide safety culture norms (UNEP, 2011; Amnesty International, 2021; Onyena & Sam, 2021; Reason, 1997; DiMaggio & Powell, 1983; Adeola & Picou, 2017; Onyena & Sam, 2020).

Accordingly, the consolidated findings reflect the pervasive, sector-wide challenges of the Niger Delta oil spill response industry rather than isolated company-specific phenomena, thereby validating the treatment of the sample as a single cohort for sector-wide analysis (Stakeholder Democracy Network, 2023; NOSDRA Oil Spill Monitor, 2023; Ordinioha & Brisibe, 2013; Adeola & Picou, 2017; Obi, 2010; Firestone, 1993; Vinodkumar & Bhasi, 2011).

3.2 Response Rate and Reliability

A total of 75 questionnaires were distributed, yielding 66 completed responses, resulting in a robust response rate of 88.0% (Sobol, 2014; Ellis et al., 2022). The achieved sample size (N = 66) was used for all subsequent statistical analyses. The reliability of the measurement instrument was confirmed using Cronbach's Alpha ($\alpha = 0.915$), indicating excellent internal consistency and exceeding the acceptable threshold of 0.70, thereby validating the reliability of the instrument (Taber, 2018; Gliem & Gliem, 2003; Nunnally & Bernstein, 1994; Tavakol & Dennick, 2011; George & Mallery, 2003).

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3.3 Gender Distribution

Of the 66 respondents, 55 (83.3%) were male and 11 (16.7%) were female, reflecting the male-dominated field operations characteristic of the Niger Delta oil and gas sector (Human Rights Watch, 2019; Udonwa et al., 2009; ICIR Nigeria, 2022; Helbert, 2020; Oduji et al., 2023).

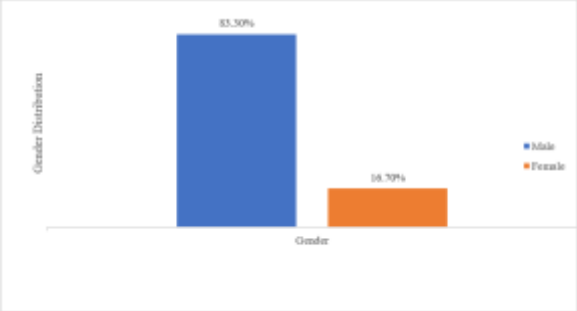

Figure 3.1: Percentage Distribution of Responder Gender

3.4 Age Distribution

Figure 3.2 shows that the majority of respondents were within the 35–44 age group (40.9%) and the 45–54 age group (47.0%), indicating that the survey feedback originated from an experienced, mature workforce with substantial field exposure. This concentration of mid-career professionals lends high credibility to their assessments of Job Safety Analysis (JSA) practicality and its challenges.

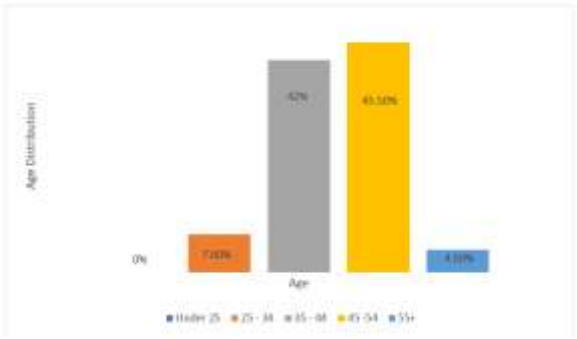

Figure 3.2: Percentage Distribution of Responder Age

3.5 Years of Experience

Figure 3.3 shows that 89.4% of respondents had more than 10 years of experience in oil spill response, indicating an exceptionally experienced respondent pool. This depth of field experience suggests that the data reflect the perceptions of seasoned experts who have witnessed the evolution of safety programmes over time.

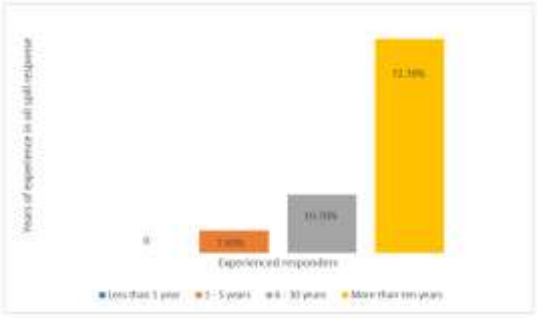

Figure 3.3: Percentage Distribution of Responder Experience

3.6 Primary Role in Oil Spill Response

Figure 4.4 analyses role distribution to ensure findings reflect perspectives across leadership, frontline, and safety compliance functions, which is critical for contextualising the findings and assessing the Auditor-Operator Perception Gap (Objective iv). This column chart illustrates that Team Leader/Supervisor was the most frequently identified role (59.1%), followed by Field Operatives (40.9%) and HSE Personnel (31.8%). The percentages total more than 100% as respondents could select multiple roles, reflecting the overlapping responsibilities common in field operations. This balance across organisational levels ensures the data captures a holistic view of the JSA process from diverse operational perspectives.

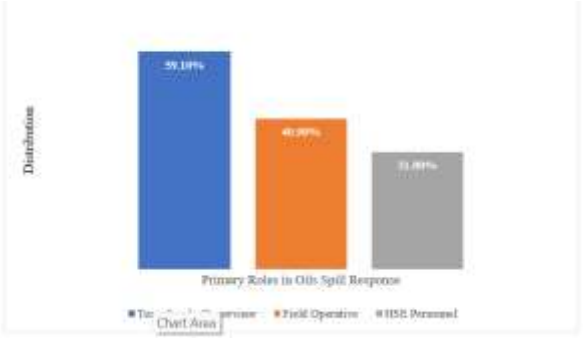

Figure 3.4: Percentage Distribution of Primary Roles in Response remove

3.7 JSA Awareness and the Impact of Formal Training

Descriptive analysis showed that 65.2% of responders had received formal Job Safety Analysis

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(JSA) training, while 34.8% remained untrained. Despite this training gap, respondents reported a high level of self-rated understanding (Weighted Mean = 4.0; Criterion Mean = 3.00).

Thematic analysis indicated strong conceptual knowledge, with 78% identifying Hazard Identification and Risk Assessment as the primary purpose of JSA. Pearson's correlation analysis revealed a moderate, positive, and statistically significant relationship between formal JSA training and self-rated understanding ($r(64) = .321$, $p = .009$), indicating that formal training contributes significantly to higher perceived JSA competency.

3.8 Cultural Attitudes and Barriers to JSA Adoption
The data quantifies the critical tension between procedural safety and operational urgency, validated by a strong correlation between culture and bypassing behaviour. This findings on cultural attitudes, addressing study Objective 2.

Table 3.1: Descriptive Analysis of JSA Training Receipt and Self-Rated Understanding

Variable	N	Mean	Std. Deviation	Weighted Mean	Criterion Mean
Formal JSA Training (% Yes)	66	-	-	65.2%	-
Self-Rated Understanding	66	4.0	0.98	4.0	3.0

A. Descriptive Analysis of Cultural Attitudes
Descriptive analysis showed that protocol bypassing under urgency was the most significant cultural challenge (Weighted Mean = 3.2), with 71.2% of respondents agreeing that Job Safety Analysis (JSA) is sometimes abandoned in urgent situations. Hierarchical pressures also exceeded the benchmark (M = 3.5). Pearson's correlation analysis revealed a very strong, positive relationship between a 'speed-over-safety' culture and protocol bypassing ($r(64) = .702$, $p < .001$), validating the heroism-safety dichotomy within the response team culture.

Table 3.3: Descriptive Analysis of Cultural Attitudes Affecting JSA Adoption

Cultural Factor	N	Mean	Std. Deviation	Weighted Mean	Criterion Mean
JSA sometimes bypassed under urgency	66	3.2	1.5	3.2	3.0
Culture prioritises speed over safety	66	2.9	1.5	2.9	3.0
Junior staff hesitate to challenge seniors	66	3.0	1.5	3.0	3.0
Pressure to agree with group JSA	66	3.0	1.5	3.0	3.0

3.9 Perceived Effectiveness of JSA in Hazard Control
Evaluation of Job Safety Analysis (JSA) effectiveness revealed overwhelmingly positive perceptions among responders despite implementation hurdles. JSA was regarded as essential by 95.5% of respondents (Weighted Mean = 4.6), while its effectiveness in hazard identification was also highly rated (Weighted Mean = 4.5).

The consistently high scores across all effectiveness dimensions indicate strong workforce buy-in for the theoretical and practical utility of JSA, suggesting that the primary challenge lies in addressing operational barriers rather than convincing responders of its value. The finding addresses study Objective 3.

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Table 3.4: Descriptive Analysis of Perceived JSA Effectiveness

Effectiveness Dimension	N	Mean	Std. Deviation	Weighted Mean	Criterion Mean
JSA is essential for safety	66	4.6	0.8	4.6	3.0
Effectiveness in hazard identification	66	4.5	0.9	4.5	3.0
Helps prevent incidents/injuries	66	4.3	1.0	4.3	3.0
Improves safety communication	66	4.4	0.9	4.4	3.0

3.10 Factors Influencing JSA Implementation

Descriptive analysis identified management commitment as the most influential factor (Weighted Mean = 4.0), followed by safety culture (Weighted Mean = 3.9). Lack of management commitment was also identified as the single biggest barrier, accounting for 42.4% of responses.

Pearson's correlation analysis showed a strong, positive, and statistically significant relationship between management commitment and the belief that Job Safety Analysis (JSA) is essential ($r(64) = .587$, $p < .001$), underscoring the central role of leadership in JSA adoption.

Table 3.5: Descriptive Analysis of Factors Influencing JSA Implementation

Influencing Factor	N	Mean	Std. Deviation	Weighted Mean	Criterion Mean
Management commitment	66	4.0	1.3	4.0	3.0
Safety culture and attitudes	66	3.9	1.3	3.9	3.0
Quality of training	66	3.8	1.3	3.8	3.0
JSA template design	66	3.6	1.3	3.6	3.0
Time pressure and resources	66	3.4	1.4	3.4	3.0

3.11 Training and Support Needs for Enhanced JSA Effectiveness

The data indicates a clear demand for applied, field-based learning methodologies. Thematic analysis (Table 3.6) revealed an overwhelming preference for Practical, hands-on training (requested by 65% of respondents), with specific suggestions for scenario-based exercises and field simulations.

Professional certification courses (42%) and regular refresher courses (38%) were also identified as key demands. This strong emphasis on applied learning suggests that current JSA training may be overly theoretical, failing to prepare responders for the complex, dynamic challenges of actual spill response addressing the study objective 5.

Table 3.6: Thematic Analysis of Training and Support Needs

Training Need	Frequency	Representative Quote
Practical, hands-on training	65%	"Practical hands-on training"
Professional certification courses	42%	"HIRA, Oil Spill Response and Process Safety Training"
Regular refresher courses and drills	38%	"Regular drills and refreshers, hazard recognition skills"

3.12 Inferential Analysis: Relationships and Perception Differences by Role

This presents the results of the inferential analyses to formally test for statistically significant relationships and differences, providing empirical proof for the key findings.

i. Correlation Analysis

The inferential analysis (Table 3.7) established three critical, statistically significant correlations that substantiate the descriptive findings:

a) The relationship between formal training and JSA understanding was moderately positive ($r = .321$, $p = .009$).
b) The relationship between management commitment and belief that JSA is essential was strong and positive ($r = .587$, $p < .001$).
c) The relationship between 'speed-over-safety' culture and JSA bypassing was very strong and positive ($r = .702$, $p < .001$).

Table 3.7: Correlation Analysis of Key JSA Factors

Variable 1	Variable 2	Pearson's r	p-value	N
Formal JSA Training	Self-Rated Understanding	.321	.009	66
Influence of Management	JSA is Essential	.587	< .001	66
Culture Prioritises Speed	JSA is Bypassed	.702	< .001	66

Note: Correlation is significant at the 0.01 level (2-tailed).

ii. One-Way ANOVA (Role-Based Differences)

The ANOVA (Table 4.8) formally tested for the existence of a perception gap between the three key roles. A statistically significant difference was found for perceived JSA effectiveness ($F(2, 63) = 4.128$, $p = .021$) and for protocol bypassing ($F(2, 63) = 3.981$, $p = .023$).

Post-hoc testing confirmed that HSE Personnel had significantly higher positive perceptions of JSA effectiveness, while Field Operatives reported significantly higher levels of JSA bypassing. This provides empirical validation for the existence of a critical Auditor-Operator Perception Gap between the staff who design/audit safety and those who execute it.

Table 3.8: One-Way ANOVA Results for Role-Based Differences in JSA Perceptions

Dependent Variable	Role Group	N	Mean	Std. Deviation	F-statistic	p-value	Post-Hoc Significance (Tukey HSD)
JSA Hazard ID Effectiveness	Field Operative	27	4.33	1.03	4.128	.021	HSE > Field Operative
	Team Leader	39	4.51	0.81			
	HSE Personnel	21	4.86	0.36			
JSA Bypassed Under Urgency	Field Operative	27	3.63	1.50	3.981	.023	Field Operative > HSE Personnel
	Team Leader	39	3.18	1.50			
	HSE Personnel	21	2.62	1.36			

Note: Mean scores based on a 5-point Likert scale.

Table 3.9 synthesises the statistically significant differences in Job Safety Analysis (JSA) perceptions among Field Operatives, Team Leaders/Supervisors, and Health, Safety, and Environment (HSE) Personnel, as identified by the One-Way ANOVA. It contrasts mean scores and qualitative themes across several domains, including perceived JSA effectiveness, observed bypassing behaviour, and identified barriers.

The data starkly illustrates the operational-clinical decoupling: HSE Personnel, who audit the system, report the most positive views on JSA effectiveness and the lowest levels of bypassing, while Field Operatives, who execute the work, report the most negative views and the highest levels of procedural shortcuts. This gap highlights a critical failure in safety system design and communication.

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Table 3.9: Auditor-operator Perception Gap

Perception Domain	Field Operatives	Leaders/Supervisors	Personnel
JSA Effectiveness (Mean Score)	4.33	4.51	4.86
JSA Bypassing Under Urgency (Mean Score)	3.63	3.18	2.62
Primary Barrier Cited	Lack of Management Commitment /Time Pressure	Time Pressure / Resource Deficits	Cultural Attitudes / Lack of Training
Perceived Usefulness of Current JSA Templates	Low	Moderate	High

3.13 The Impact of Experience on JSA Perception and Compliance

3.13.1 Descriptive Analysis by Experience Cohort

An independent samples t-test comparing highly experienced responders (>10 years, n = 59) with less experienced responders (1–10 years, n = 7) revealed no statistically significant differences in Job Safety Analysis (JSA) perceptions across belief in JSA's essential nature, protocol bypassing, and perceived training effectiveness (all $p > 0.05$).

Descriptively, the highly experienced group demonstrated a slightly stronger belief in JSA's essential nature (M = 4.62), whereas the less experienced group reported a higher level of protocol bypassing (M = 3.71).

Table 3.10: Experience-Based Differences in JSA Perceptions

Perception Dimension	>10 Years (M)	1-10 Years (M)	t-value	p-value
JSA Essential Nature	4.62	4.43	0.894	0.375
Protocol Bypassing	3.15	3.71	-1.203	0.234
Training Effectiveness	3.85	3.57	0.967	0.337

3.13. 2 The Experience-Safety Paradox

The findings suggest a nuanced relationship between experience and safety compliance. Although highly experienced responders demonstrated stronger theoretical commitment to Job Safety Analysis (JSA), they also reported marginally higher levels of protocol adaptation under pressure.

This finding suggests that extensive field experience may influence how responders balance procedural compliance with operational demands.

3.14 Regression Analysis of JSA Effectiveness Predictors

3.14.1 Multiple Regression Model

A multiple regression analysis was conducted to predict JSA effectiveness based on five predictor variables: management commitment, training quality, safety culture, resource adequacy, and hierarchical transparency. The regression model was statistically significant, $F(5, 60) = 18.34$, $p < .001$, and explained 60.3% of the variance in JSA effectiveness ($R^2 = .603$).

Table 3.11 summarises the results of a multiple regression analysis performed to identify the key predictors of perceived JSA effectiveness. The model was statistically significant ($F(5, 60) = 18.34$, $p < .001$) and accounted for 60.3% of the variance ($R^2 = .603$) in JSA effectiveness scores. All five predictor variables were statistically significant positive contributors.

The unstandardized (B) and standardized (β) coefficients indicate the relative strength of each predictor. Management Commitment emerged as the

strongest unique predictor (β = .387, p < .001), followed by Training Quality (β = .298, p < .001) and Safety Culture (β = .234, p = .003). Resource Adequacy and Hierarchical Transparency were also significant, though slightly less powerful predictors.

This analysis quantifies the multi-faceted nature of JSA implementation, demonstrating that leadership, training, culture, resources, and organisational structure collectively and significantly determine the tool's perceived effectiveness in the field.

Table 3.11: Multiple Regression Analysis Predicting JSA Effectiveness

Predictor Variable	B	SE B	β	t	P
Management Commitment	0.42	0.08	.387	5.25	<.001
Training Quality	0.31	0.07	.298	4.43	<.001
Safety Culture	0.28	0.09	.234	3.11	.003
Resource Adequacy	0.19	0.06	.187	3.17	.002
Hierarchical Transparency	0.15	0.05	.134	3.00	.004

3.14.2 Discussion of Regression Analysis

The regression analysis quantifies the relative importance of each factor in determining JSA effectiveness. Management commitment emerges as the strongest predictor (β = .387), supporting the qualitative findings about its pivotal role (Reason, 1997; Vinodkumar & Bhasi, 2011).

The collective predictive power of these five variables underscores the multi-faceted nature of JSA implementation, requiring simultaneous attention to leadership, training, culture, resources, and organisational structure (Manuele, 2020; Reason, 1997; Fernández-Muñiz et al., 2021). This statistical model provides empirical support for the integrated approach proposed in the Contextual JSA Implementation Model (C-JSAIM).

IV. DISCUSSION

The findings of this study provide multi-layered insights into the awareness, cultural attitudes, effectiveness, and implementation challenges of Job Safety Analysis among oil spill responders in the Niger Delta (UNEP, 2011; Amnesty International, 2021). The results are organised by objective, synthesising descriptive, thematic, and inferential findings to provide a complete and evidence-based argument.

The inferential analyses provide robust statistical support for the relationships identified in the descriptive data. The very strong correlation between a 'speed-over-safety' culture and the bypassing of protocols (r = .702, p < .001) offers definitive, quantitative evidence for the 'heroism-safety dichotomy', empirically validating that a cultural prioritisation of speed is intrinsically linked to the bypassing of safety protocols (Adeola & Picou, 2017; Obi, 2010).

The ANOVA results empirically validated a statistically significant Auditor-Operator Perception Gap. The finding that HSE Personnel perceive JSA as significantly more effective than Field Operatives (p = .021), while Field Operatives report significantly higher levels of JSA bypassing (p = .023), exposes a critical disconnect between the designers/auditors of safety systems and the frontline personnel (Ohiomah & Aigbavboa, 2021).

This indicates a critical failure in the perceived behavioural control (Theory of Planned Behaviour) of frontline staff, where JSA, while valued theoretically, is practically undermined by operational realities and hierarchical pressures that discourage its consistent use (Ajzen, 1991; Tajfel & Turner, 1979).

The finding that Management commitment is simultaneously the most influential factor and the single biggest barrier (42.4%) powerfully illustrates the central role of leadership in safety culture success.

This aligns with the principles of Safety Culture Theory, where management commitment establishes the true priority of safety within the organisation (Reason, 1997; Reason, 2016), and with Institutional Theory, which suggests that formal safety practices are often decoupled from actual field work due to conflicting institutional pressures (e.g., speed of

response) (DiMaggio & Powell, 1983; Adeola & Picou, 2017).

In summary, this study reveals that JSA implementation in the Niger Delta is characterised by strong theoretical acceptance but is critically challenged by significant cultural, leadership, and training deficits (UNEP, 2011; Ordinioha & Brisibe, 2013; Amnesty International, 2021).

These factors converge to create an environment where proven methodologies are understood and valued but inconsistently applied due to contextual and systemic constraints (Onyena & Sam, 2020; Onyena & Sam, 2021).

V. CONCLUSION

The findings demonstrate that Job Safety Analysis (JSA) is widely understood and valued by oil spill responders in the Niger Delta; however, its effectiveness is constrained by the operational and institutional environment rather than by technical knowledge. Although JSA is recognised as an indispensable safety tool, the high prevalence of protocol bypassing and the strong influence of a 'speed-over-safety' culture indicate that rapid response often takes precedence over thorough safety planning. These findings suggest that the formal requirement for JSA is frequently compromised by conflicting operational pressures.

The study further concludes that leadership and organisational culture are the primary determinants of successful JSA implementation. Management commitment emerged as both the strongest influence and the biggest barrier, highlighting the need for leadership to consistently prioritise safety through actions as well as policy.

To improve JSA effectiveness, future interventions should focus on practical, scenario-based training, strengthen management commitment, and align safety policies with operational realities through a context-responsive JSA process that supports effective decision-making under field conditions.

VI. RECOMMENDATIONS

The following recommendations are structured to provide actionable guidance to bridge the gap between JSA's theoretical value and its compromised operational application.

A. For Oil Spill Response Management and Operating Companies

i. Institutionalise Psychological Safety: Implement mandatory protocols that grant Stop-the-Job Authority to all personnel, irrespective of rank, with zero tolerance for punitive actions against those who exercise it. Introduce anonymous, continuous feedback mechanisms for JSA quality to dismantle hierarchical pressure.

ii. Refocus Leadership Metrics: Prioritise quality and compliance over speed. Implement key performance indicators (KPIs) for supervisors based on JSA Quality Scores (e.g., complexity of identified hazards, completeness of control measures) to directly counter the 'speed-over-safety' culture evidenced by the strong correlation with bypassing ($r(64) = .702$).

B. For Regulatory and Accreditation Bodies (e.g., NOSDRA, NMDPRA)

i. Audit the System, Not Just the Paper: Shift regulatory audit focus from checking for the existence of JSA documents to assessing the robustness of the safety culture and the quality of JSA implementation. Audits should include observing pre-job briefings and interviewing frontline staff about the pressures they face.

ii. Develop Context-Sensitive Guidelines: Develop region-specific JSA guidelines that explicitly integrate the unique socio-political and communal factors of the Niger Delta (e.g., security, community liaison) into the hazard identification process.

C. For Industry Associations and Professional Bodies

i. Develop Niger Delta JSA Competency Standards: Create region-specific JSA competency frameworks that account for the unique operational challenges and hazard profiles characteristic of deltaic environments.

ii. Establish Knowledge Sharing Platforms: Facilitate cross-organisational learning through industry forums, case study repositories, and best practice exchanges focused specifically on JSA implementation challenges and solutions

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