Stakeholders' Perspectives on Generative Voluntary Safety Reporting Culture (GVSRC) in the Gulf of Mexico (GOM) Oil and Gas (O&G) Sector Using the Offshore Safety Action Program (OSAP)

Daniel Kwasi Adjekum [1,*] **, Nana Yaw Owusu-Amponsah** [2] **, Samuel Asante Afari** [3] **, Zachary Waller** [1] **, Vamegh Rasouli** [4] **, Gary Ullrich** [1] **, Paul Snyder** [1] **and Neal Corbin** [5]

[1] Department of Aviation, University of North Dakota, Grand Forks, ND 58202, USA; zachary.waller@und.edu (Z.W.); gary.ullrich@und.edu (G.U.); paul.snyder@und.edu (P.S.)
[2] Department of Earth System Science and Policy, University of North Dakota, Grand Forks, ND 58202, USA; nana.owusuamponsah@und.edu
[3] Department of Petroleum Engineering, University of North Dakota, Grand Forks, ND 58202, USA; samuel.afari@und.edu
[4] Department of Energy and Petroleum Engineering, University of Wyoming, Laramie, WY 82071, USA; vrasouli@uwyo.edu
[5] United States Coast Guard Headquarters, Washington, DC 20593, USA; neal.a.corbin@uscg.mil
[*] Correspondence: daniel.adjekum@und.edu

Abstract: To fill a gap in understanding of the Generative Voluntary Safety Reporting Culture (GVSRC) in the Gulf of Mexico (GOM) Oil and Gas (O&G) sector, perspectives of stakeholders based on their experiences were explored using attributes of a proposed Offshore Safety Action Program (OSAP) modeled after the Aviation Safety Action Program (ASAP). A phenomenological approach encompassing semi-structured interviews (*n* = 18) and five focus-group sessions (*n* = 18) was used to collect data from a cross-section of top management, supervisors, regulatory representatives, and subject-matter experts (SME). Four themes emerged from a Thematic Analysis: (1) Voluntary safety reporting culture, (2) Voluntary safety reporting bottlenecks, (3) Universality, and (4) Organizational review of safety events. Most respondents strongly supported the OSAP because it ensures a formalized adjudication of voluntary safety reports by an Event Review Committee (ERC) with representation from employees, management, and regulators. Most respondents supported the non-punitive and confidential attributes of the OSAP as a means to enhance GVSRC. However, there were varying perspectives on defining intentional disregard for safety under the OSAP. Due to the enumerated challenges of cost, respondents agreed that organizations use a scalable process commensurate with the complexity of their operations when adopting the OSAP. A veritable framework for data-driven corrective actions, organizational learning, and enhanced GVSRC in the offshore sector is a potential policy implication of adopting the OSAP.

Keywords: voluntary safety reporting; aviation safety action program; offshore safety action program; oil and gas; Gulf of Mexico

1. Introduction

The Energy Information Administration (EIA) forecasts US crude oil production in the United States Federal Gulf of Mexico (GOM) to increase in the next two years, according to the Short-Term Energy Outlook (STEO) [1]. The forecast had suggested that by the end of 2022, 13 new projects could account for about 12% of total GOM crude oil production based on a January 2022 estimate of 1,706,000 barrels/day, which was about a 4.3% drop from the January 2021 production estimate [2].

These projections suggest that the offshore oil and gas (O&G) industry in the GOM is among the most developed in the world; it provides thousands of jobs in the Gulf Coast region and meets a sizable portion of the energy requirements of the United States [3]. The Bureau of Labor Statistics (BLS) estimates the National Industry-Specific Occupational Employment figures for the US O&G extraction to be about 126,000 in March 2022 and a sizable proportion of the workforce is in the GOM region [3].

The BLS classifies O&G extraction industries as those that operate and/or develop oil and gas field properties. Such activities may include exploration for crude petroleum and natural gas; drilling, completing, and equipping wells; operating separators, emulsion breakers, and desilting equipment; and all other activities in the preparation of oil and gas up to the point of shipment from the producing property [3]. Figure 1 shows a map of the GOM and O&G resources.
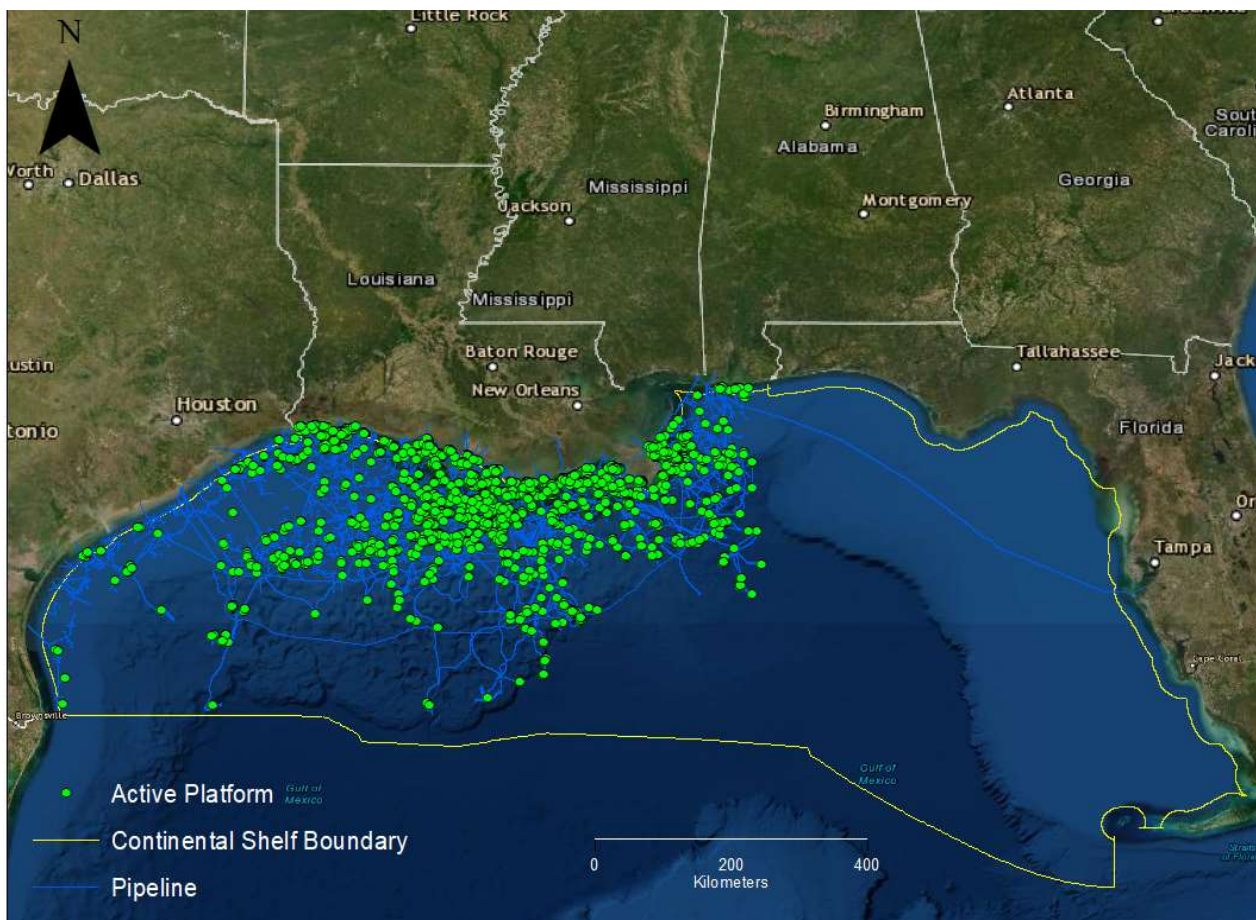
Figure 1. Gulf of Mexico Energy Infrastructure Layout. Source: Authors created a map using geographic data built from the Technical Information Management System (TIMS). TIMS consists of two separate databases: an attribute database and a spatial database from https://www.data.boem.gov/Main/Mapping.aspx, accessed on 29 April 2022.

Offshore O&G sectors worldwide share generic operational hazards, such as fire, explosions, gaseous suffocation, and elevated platforms, such as drilling platforms and masts. Bending, reaching overhead, pushing, and pulling heavy loads can lead to injuries. Compressed gases or high-pressure lines, and uncontrolled electrical, mechanical, and hydraulic energy pose great hazards [4]. Finally, safety risks associated with rotating wellhead equipment and confined spaces, such as petroleum storage tanks and electrical rooms, are intrinsically present in offshore operational work environments [5].

Producing O&G is an intrinsically hazardous activity. A report by the National Academies of Sciences suggests that, historically, the offshore O&G industry seems to have the propensity to prioritize production over safety goals because of the constant pressure to recoup the returns on huge investments made in leases, offshore production structures, equipment, and personnel as rapidly as possible [6]. Such a propensity was reflected in the 2010 Deepwater Horizon drilling rig accident which resulted in 11 deaths and 17 injuries and spilled an estimated 3.19 million barrels of oil into the GOM, causing immense marine and coastal damage [7]. The economic impact of the accident totaled $8.7 billion in lost revenue, profits, and wages, and the loss of about 22,000 jobs [7].

Globally, O&G sectors have commonalities in terms of operations within the production value chain. Major operators and sub-contractors have the equipment, exploration, drilling, and production procedures. They have comparable industrial standards and documentation created by a network of expert actors and an international scientific and technical community [8,9]. In terms of safety regulatory oversight, offshore O&G operators in the United Kingdom (UK) and Norway have a single regulator [8,10,11], while operators in the GOM deal with multiple regulators, such as the Bureau of Safety and Environmental Enforcement (BSEE), the United States Coast Guard (USCG), and the Occupational Safety and Health Administration (OSHA).

This sometimes makes collaborative safety initiatives complex. An example is the adoption of performance-based regulatory standards to move away from requiring specific equipment or technologies as safety solutions and focusing on reducing the impact of human error and poor organization on incidents. The approach is more collaborative—an invaluable attribute given the technological complexity and sophistication of the offshore industry [12]. Performance-based regulations are more widely embraced in UK and Norway, but there are still challenges in the GOM sector with integrating the Safety and Environment Management System (SEMS) operationally, and many prescriptive regulations still exist in offshore regulations [12].

Acheampong and Kemp [13] suggest that operators and regulators should commit to focusing on major accident reduction efforts predicated on goal-setting safety case principles that identify key safety-critical elements of an O&G installation and put in place risk-based mitigation measures. Acheampong and Kemp [13] also suggest that fair, effective, and participatory regulatory regimes can ensure a collective drive by all stakeholders toward improving industry safety performance and promoting a better safety environment.

A critical process in safety event reduction is the proactive identification of hazards and effective risk controls using near-miss and potential violations data derived from safety reports [14,15]. A key outcome of the investigative process of the Deepwater disaster was the need for a generative voluntary safety reporting culture (GVSRC) in offshore O&G operations [15,16]. GVSRC is characterized by the proactive reporting of near-misses and potential violations that are precursors of safety events such as accidents [2,14,17]. Near-miss events are unplanned incidents that reveal the potential for future adverse events and have an important-yet-complex role in workplace safety [18]. The voluntary reporting of near-miss events and proper management can contribute to the improvement of safety procedures [19]. Gnoni et al. [20] opine that the voluntary reporting of near-misses has intrinsic value and represents a relevant source of proactive safety data for preventing workplace accidents.

1.1. Literature Review

1.1.1. Enforcement Actions and Voluntary Safety Reporting Behavior—Theoretical Perspective

Some organizational theorists and safety professionals believe that punitive actions for errors and safety infractions are justified to ensure organizational safety compliance, and most of this is grounded in person-centered theories [21,22]. The Classic Deterrence Theory also advocates for using punishment as a deterrent, with severity calculated to discourage non-offenders from becoming offenders [23]. The theory assumes that if the

cost of violating safety procedures at a workplace by employees is much higher than the cost of compliance, then the possibility that employees will comply willingly increases [24].

Others, such as Reason [15], Dekker [25], and Helander [26], argue that punishment for all violations can create an adversarial relationship between personnel and management and may also stifle personnel proactivity in participating in safety initiatives or not reporting safety occurrences and near-misses for fear of punitive action. Reason [15] further posits in the Person Attribution Theory that blame and punishments directed mainly at reducing unwanted variability in human behavior may have associated counter-benefits. Dekker [25] promotes the Systems-Centered Theory that seeks to fix systemic failures in the work environment instead of apportioning blame to the individual employee that enables near-misses and potential violations to be voluntarily reported without fear of retribution.

The relationship between industry regulators and operators on enforcement actions for violations can be viewed through the lens of the Theory of Responsive Regulation, which hypothesizes that when a regulatory enforcement agency takes enforcement action against an individual or organization, it will have either a good or bad impact on that individual's or organization's future cooperation with the regulator on safety reporting initiatives, such as the OSAP [27]. Responsive regulation, therefore, proposes that regulatory enforcement agencies should have a "socially intelligent" policy to ensure cooperation and restorative justice in the adjudication of potential violations [28]. Such relationships have been demonstrated between the Federal Aviation Administration (FAA) of the United States and airlines through ASAP. There could be such potential "socially intelligent" relationships between regulators and operators in the GOM under the OSAP.

1.1.2. Primers of Voluntary Safety Reporting Behaviors—Theoretical Perspective

Research suggests that employees' perceptions affect their behavior. More specifically, the perception of risk affects the likelihood of exhibiting certain behaviors [29–31]. The propensity to voluntarily report near-misses and potential violations in an organization by front-line employees is embodied in the Theory of Safety Culture, which has three main components: psychological, organizational, and behavioral [32]. The psychological component aims to analyze the attitudes and perceptions of the individual and the group. The organizational component corresponds to an analysis of business operations through its policies, procedures, and structures. Finally, the behavioral component evaluates external factors (following operating procedures, reporting safety events, etc.) applicable to individuals in the field and observable behavior.

The behaviors of front-line employees to voluntarily report near-misses and potential violations in an organization are rooted in a strong theoretical bedrock of safety motivation [33]. McGregor Theory Y postulates that employees are motivated primarily at the esteem levels and that they will be self-directed to meet organizational safety objectives, such as voluntarily reporting safety events, if rewards that address higher needs, such as a safe work environment, are assured [34]. This has practical implications for personnel to have "buy-in" and participate in voluntary safety reporting initiatives, such as the OSAP. In terms of expectations of rewards for desired safety behaviors, employees could change their level of effort according to the value placed on incentives received from voluntarily reporting safety issues and perception of the strength of the links between effort and outcome as suggested by the Expectancy Theory [35].

Thorndike's Reinforcement Theory explores the relationship between voluntary safety reporting behavior and its consequences. When employees voluntarily report near-misses and potential violations to improve safety (desired behavior), incentives such as non-punitive measures and safety acknowledgments (positive reinforcements) can make it more likely for personnel to repeat that same behavior [36,37].

The Theory of Planned Behavior (TPB) postulates that perceived behavioral control factors outside the individual's control may affect one's intention and behavior [38]. The theory suggests that behavioral performance, such as voluntary safety reporting, is determined jointly by motivation (intention) and ability (behavioral control). Perceived

behavioral control can encompass perceptions of management support to provide resources that facilitate easy access to safety reporting and sustain a just cultural environment. The behavioral perceptions of the ability to utilize the safety reporting infrastructure within the organization are also relevant to this theory.

Finally, the Social Exchange Theory (SET) posits a mutual relationship between two parties created through a process of cost-benefit analysis, and the voluntary safety reporting behavior of employees, the organization, and industry regulators can be viewed through the lens of this theory [39,40]. The SET perspective suggests that the voluntary safety reporting behavior of employees in an organization can be considered a form of safety citizenship behavior (SCB) [41,42].

1.1.3. Barriers to Voluntary Safety Reporting Effectiveness

In a qualitative study of oil and gas operations in the Danish sector of the North Sea, Rasmussen, Drupsteen, and Dyreborg [43] found that a major barrier to voluntary safety reporting effectiveness was the unclear definition of a near-miss and difficulty in delimiting what events should be included. Some other noted challenges were employees' unwillingness to report their own or their colleagues' behavior. Another barrier was a near-miss reporting system which was sometimes too demanding and discouraged employees from reporting.

Other factors that inhibit the voluntary reporting of near-misses or potential violations include front-line personnel's feeling of embarrassment, a convoluted reporting process, perceptions of being considered accident-prone or a "crybaby," and fear of suspensions, loss of a job or license [44]. Another challenge for an effective voluntary near-miss reporting system in the offshore oil and gas industry is that industry associations and regulators are typically limited to collecting data on agency-reportable incidents. With this limitation, other high-learning-value events or observed conditions could go unnoticed as a trend until a major event occurs [16].

Van der Schaaf and Kanse [45], in a study of chemical processing industries, suggested factors that influenced voluntary safety reporting, namely: the fear of disciplinary action, an attitude of risk acceptance, and a feeling of uselessness of reporting. Ahmadpour-Geshlagi et al. [46] used thematic analysis to proffer barriers to voluntary near-miss reporting in the gas industry as a lack of commitment to the job, lack of attention to social responsibility, forgetfulness, job instability among employees, lack of sufficient training, and failure of the organization to provide feedback. Adjekum et al. [47], in research on voluntary safety reporting behavior among aviation students, found out that when feedback from safety personnel is not expeditious, students' interest in self-reporting safety issues declined. Employee risk perceptions have been suggested as a barrier to voluntary safety reporting behaviors in high-risk industries [48–50].

1.2. GOM Voluntary Safety Data Collection Efforts and Limitations

Industries with high safety risks in their operations, such as aviation and O&G offshore sectors, have realized the benefits of collecting and analyzing safety data to identify risks and take actions to prevent accidents [51,52]. These activities are aided by industry stakeholders that collect and share safety information used to develop recommended standards and practices [51,53–56]. In the O&G sector of the GOM, one such entity is the SafeOCS program, which has a safety data collection framework and management database for major incidents that result in personnel injuries or fatalities. It also collects near-miss events and significant observations of unsafe conditions and/or actions in the offshore O&G sectors [2,57,58]. Other industry initiatives, such as the Incident Statistics Program (ISP) of the International Association of Drilling Contractors (IADC), track safety and accident information for the drilling industry [59]. The International Marine Contractors Association (IMCA) publishes safety statistics (covering injuries, fatalities, and reporting activity) based on anonymized submissions from its contractor members [60].

Even with the establishment of these initiatives to provide an effective process for capturing near-misses and safety occurrence trends, there are still some challenges with optimizing voluntary safety reporting rates by front-line personnel within the GOM O&G industry [57]. One of the challenges is a lack of codified agreement between industry regulators, O&G operator management, and employee representatives on a non-punitive/no-blame generative voluntary safety reporting program that ensures a representative, fairer, and trustworthy adjudication of near-miss/incident reports filed by individual employees. This challenge has created a need for a novel approach to enhance GVSRC in the O&G sector by exploring the viability of a proposed OSAP model which is developed using attributes of the ASAP that has been effective in sustaining a GVSRC in the US airline industry [53].

1.3. From Aviation Safety Action Program (ASAP) to Offshore Safety Action Program (OSAP)

The structure of the ASAP allows employees in an aviation organization to voluntarily report safety issues even though they may involve an alleged violation by using enforcement-related incentives designed to build trust and minimize fear of punishment [53]. Some of ASAP's incentives are non-punitive/no-blame reporting and the use of corrective actions such as re-training instead of certificate revocation. The ASAP, which can be part of an airline's Safety Management Systems (SMS), is based on a partnership between the FAA and the certificate holder and may include any third party, such as the employee's labor organization [53,61].

Transparency, equity, and formalized agreements are the success points of the ASAP, and it has expanded to include general aviation, collegiate aviation, corporate aviation, emergency medical air services, and air traffic management with the Air Traffic Safety Action Program (ATSAP). The ASAP allows an event review committee (ERC) made up of representatives from the FAA, aviation service provider's management, and employee representatives (normally unions) to accept or exclude reports based on safety interests rather than arbitrary time constraints [61]. From a legal framework and to ensure protection from disclosures, ASAP reports and process outputs are designated as protected from public disclosure under the United States 14 Code of Federal Regulations (CFR) Part 193 [53,61].

To ensure confidentiality and avoid biases in the review of submitted ASAP reports, the FAA suggests that reports should be distributed confidentially to each member of the ERC in advance of ERC meetings. The name of the reporting employee(s) should be removed from a report distributed to ERC members in advance of an ERC meeting. The policy of name-redaction is intended to prevent an ERC member's knowledge of the individual from potentially biasing the initial evaluation of an event. The ASAP aligns with the just culture philosophy that recognizes reporters' honesty in disclosure and provides assurance of non-punitive certificate action [25]. About 262 aviation organizations now have the ASAP and its attributes have also been adopted in safety-critical industries, such as medicine [62,63].

This study proposes an ASAP-style initiative in the O&G sector termed the Offshore Safety Action Program (OSAP) that will focus on generative voluntary reporting by operational employees of near-misses and potential violations within their organizations. The OSAP will require a memorandum of understanding (MOU) between employee associations, management, and industry regulators (BSEE and USCG) that will outline the process, procedures, incentives, and protections from punitive actions for voluntarily submitted safety reports by an employee. An independent office within the organization will manage the OSAP's reports to ensure their confidentiality and the anonymity of reporters. Any contact with a reporter will be made through trusted gatekeepers. A proposed workflow model of the OSAP is shown in Figure 2.
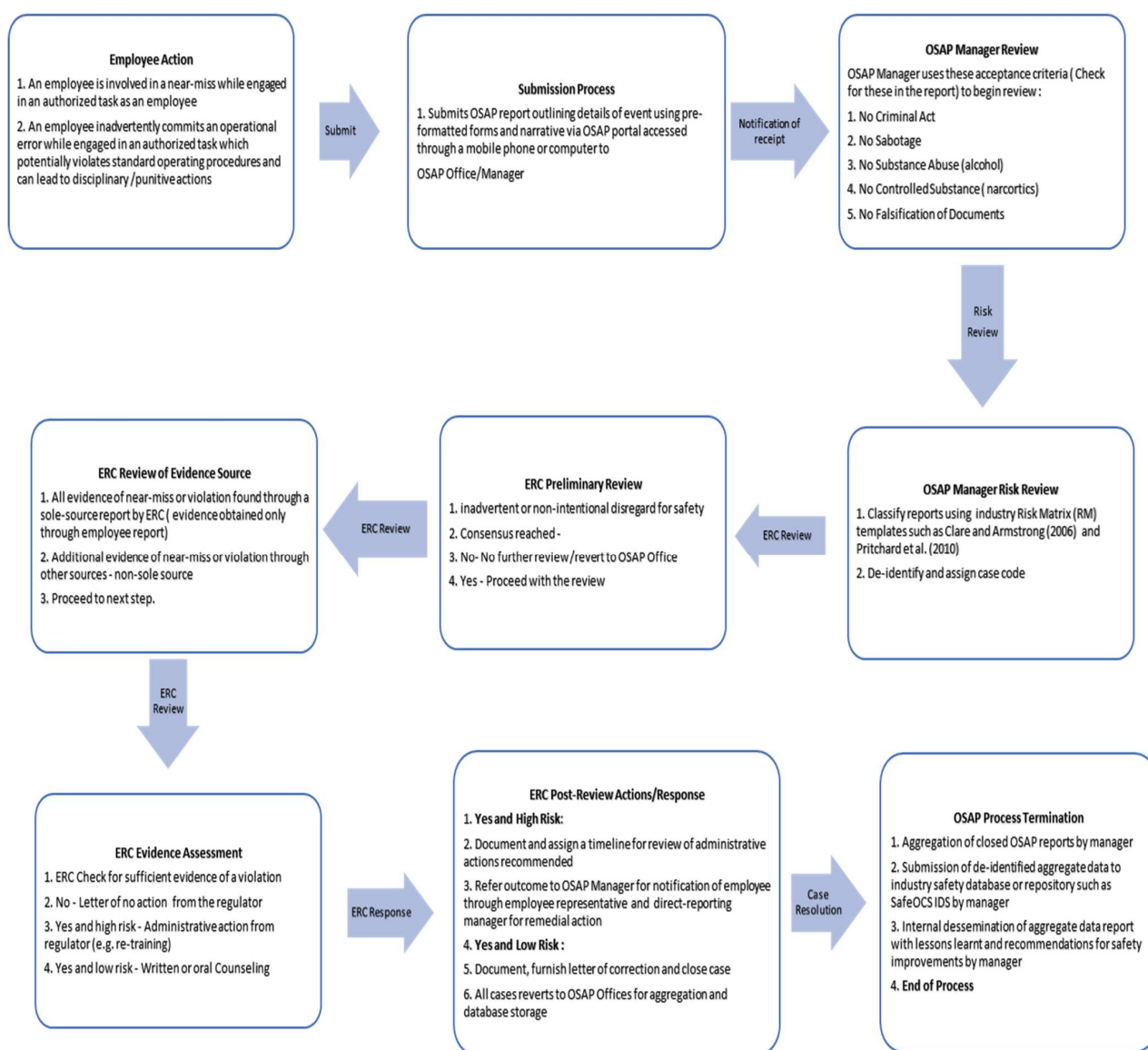
Figure 2. A model of OSAP (authors' concept based on the FAA ASAP structure). An example of a generic O&G Risk Matrix stated in the model for use by OSAP managers can be found in [64].

1.4. Study Rationale and Objectives

There have been some quantitative studies that assessed the theoretical underpinnings, practical benefits, and challenges of generative voluntary safety reporting in high-risk industries and its effects on GVSRC. However, there seems to be a gap in research that explores the perspectives of stakeholders on GVSRC in the O&G sector using a qualitative approach, specifically a model (OSAP) developed from an aviation industry safety initiative (ASAP). There is also a scarcity of literature that provides an understanding of the cross-disciplinary application of OSAP-type models in the O&G sector and its potential to address voluntary safety reporting challenges while optimizing the benefits of a GVSRC.

A phenomenological design was used to explore stakeholders' experiences with GVSRC in the O&G sector and its effects on their perceptions of OSAP's viability in the sector if adopted. This study also adds knowledge to the current literature on the use of generative voluntary safety reporting as an effective tool for continuous safety improvements in the O&G sector. The central research questions that guided this study are shown next.

1.5. Central Research Questions

1. What is the current state of voluntary safety reporting culture in the GOM O&G sector?

2. What are the challenges in managing non-punitive voluntary safety reporting programs in the GOM O&G sector?

3. What are the perceptions of respondents on the OSAP as a generative voluntary safety reporting initiative in the GOM O&G sector?

2. Materials and Methods

2.1. Interview and Focus Group Protocol Questions

Based on the three overarching research questions, a documentary analysis of the ASAP Advisory Circular (AC 120-66 C) [53], Aviation Safety Reporting System [65], and the Aviation Safety Information Analysis and Sharing [54] was done to identify GVSRC attributes in aviation to formulate question items. Three subject matter experts (SMEs) reviewed the items. The first SME is an experienced aviation safety officer working with a regulator in the O&G sector. The second SME is an academic scholar with extensive research and practical experience in the O&G industry. The third SME is a researcher with experience in SMS. They provided suggestions to modify some of the sub-questions/items to reflect the industry context and understanding. Details of sub-questions/items for each of the three central questions are shown in Appendix A (Table A1).

2.2. Semi-Structured Interviews and Focus-Group (FG) Sessions

Based on a constructivist worldview, a phenomenological design was used to understand how the operational experiences of respondents influenced their perceptions of GVSRC and the viability of OSAP in the GOM O&G sector [65]. A research proposal and Invitational email were sent to 12 major operators, 10 independent contractors, and 2 industry regulatory agencies working on the GOM O&G sector via the Oil and Gas Industry Advisory Council (IAC), which is an industry group of all major O&G organizations in the US. The University of North Dakota (UND) is a member of IAC and has a liaison who facilitated the contacts.

The organizations that agreed to participate facilitated respondents who voluntarily agreed to take part in the study by responding to the emails and signing a consent letter approved by the UND Institutional Review Board (IRB). The respondents were mostly front-line inspectors, supervisors, and managers for the FG sessions and industry subject-matter experts (SMEs) for the semi-structured interviews. The FG provided preliminary brainstorming sessions to elicit a general perspective of GVSRC and OSAP. The semi-structured interviews with SMEs on safety reporting processes provided detailed technical perspectives on the viability of OSAP and the general state of GVSRC.

2.3. Research Participants

There were five FG sessions with a total of eighteen respondents ($n = 18$) and eighteen individual semi-structured interviews ($n = 18$). Table 1 shows the descriptive statistics of FG respondents' demographic details. Table 2 shows the demographic details of the semi-structured interview respondents.

Table 1. Demographic Details of Respondent—FG Sessions.

FG Sessions	Gender	Role	Industry Experience
1	Female	Offshore Drilling Inspector	14
	Male	Marine Safety Officer	15
	Female	Marine Safety Officer	12
	Male	Marine Inspection Officer	16

Table 1. *Cont.*

FG Sessions	Gender	Role	Industry Experience
2	Male	Regional Director of Operations	25
	Male	Global Sales Manager	24
	Female	Training Manager (Health, Safety & Environment)	17
3	Female	Government-Industry Safety Affairs Liaison	22
	Female	Human Resource Professional with safety oversight	13
	Male	Director of Safety	25
4	Male	Marine Safety Inspector	23
	Male	Offshore Engineering Consultant	45
	Female	Movable and Fixed Vessel Safety Compliance Officer	14
5	Male	Detachment Chief -OCS National Center of Expertise	22
	Male	OCS Vessel Inspector	32
	Male	Offshore Supply Vessel Master/Inspector	37
	Male	Mobile Offshore/Fixed Platform Drilling Inspector	18
	Male	Mobile Offshore/Fixed Platform Drilling Inspector	21

Table 2. Demographic Details of Respondent—Semi-structured Interview Sessions.

Organization	Gender	Age	Role	Industry Experience	Highest Education Level
Regulator A	M	39	Chief—Safety Data Analysis	15	Bachelors
Regulator A	M	48	Head-Safety Assessment & Risk Analysis	17	Masters
O&G 1	F	53	Snr. Advisor. Occupational Health and Safety. GOM	13	Masters
O&G 2	M	46	Safety Manager—NA. Operations	12	Bachelors
Regulator B	M	38	Deputy Officer in Charge Marine Inspection OCS	16	Masters
Regulator B	M	63	Offshore Engineer/Vessel Inspection	46	Bachelors
O&G 3	M	32	President/CEO/Contractor	10	Bachelors
O&G 4	M	-	O&G Technical Consultant	42	Masters
O&G 5	M	-	Director for Industry and Government Affairs. OCS/GOM	15	Bachelors
O&G 6	M	-	Director of Government Industry Affairs. Offshore	11	Bachelors
O&G 7	M	-	Legislative /Legal Affairs	2	Bachelors
O&G 8	M	51	North American Offshore HSE Manager	18	Masters
O&G 9	M	62	HSE Manager for GOM Operations	19	Associate
Independent	M	42	Operations Manager	9	Bachelors
Independent	M	62	Academia/Industry Consultant	40	Doctorate
O&G 10	M	40	Safety Manager	12.5	Bachelors
Independent	M	-	Drilling Well Supervisor	31	Bachelors
Independent	M	-	HSE Professional	19	Masters

Note: M—Male; F—Female; O&G—Oil and Gas Organizations; Independent—Independent Contractors; GOM—Gulf of Mexico; NA—North America; HSE—Health/Safety/Environmental; OCS—Outer Continental Shelf.
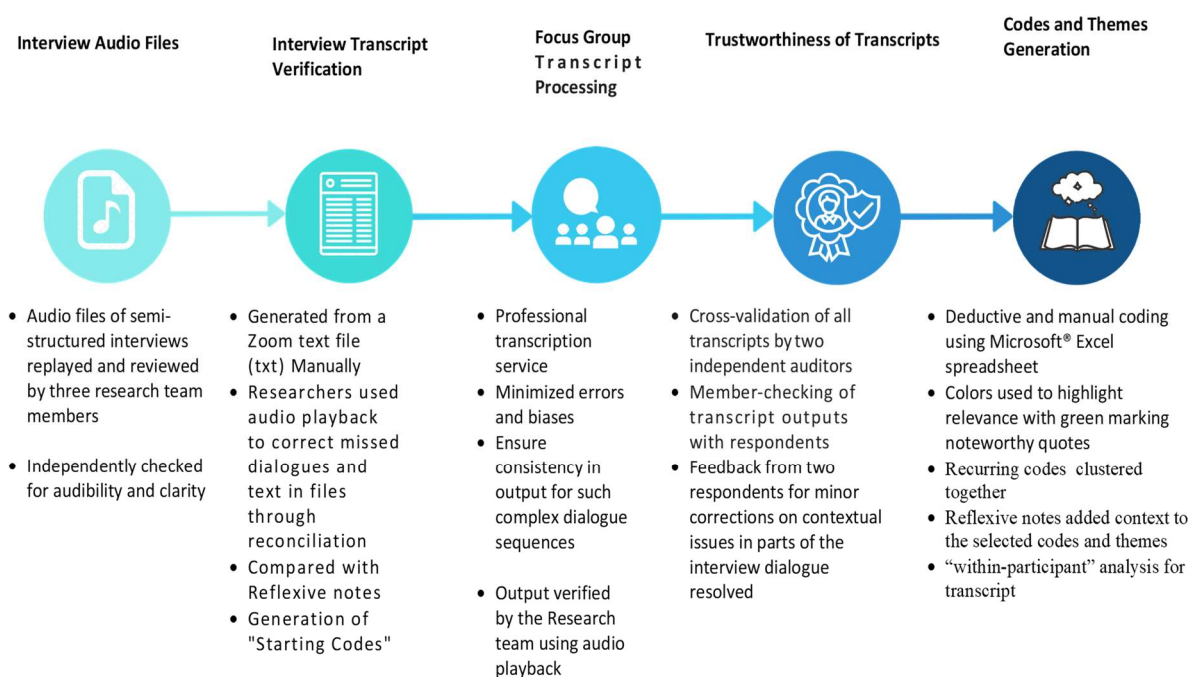
2.4. Data Collection

Each semi-structured interview and FG ranged from thirty minutes to two hours using a prepared question guide. Participants were provided with the question guides and descriptions of the interview format for review before the interviews and FG ses-

sions. A single member of the research team (principal investigator) conducted all interviews and also served as a group moderator for the FG session. Most of the interviews were conducted using the university subscribed ZOOM® video-conferencing application (https://und.zoom.us/, accessed on 19 April 2023) but five interviews and three FG were done in person. In both interviews and FG sessions, only the audio part of the interactions was recorded and saved as .mp3 files in a password-encrypted folder on a research laptop. Data saturation was obtained after the 5 FG sessions and 18 semi-structured interviews [66].

2.5. Data Analyses—Coding and Theming

2.5.1. Review of Audio Files, Trustworthiness of Transcripts, and Coding/Themes

A review of the audio data files was completed, and the transcription of the semi-structured interviews and FG sessions and their trustworthiness checks are shown in Figure 3.

| Interview Audio Files | Interview Transcript Verification | Focus Group Transcript Processing | Trustworthiness of Transcripts | Codes and Themes Generation |

- Audio files of semi-structured interviews replayed and reviewed by three research team members

- Independently checked for audibility and clarity

- Generated from a Zoom text file (txt) Manually
- Researchers used audio playback to correct missed dialogues and text in files through reconciliation
- Compared with Reflexive notes
- Generation of "Starting Codes"

- Professional transcription service
- Minimized errors and biases
- Ensure consistency in output for such complex dialogue sequences

- Output verified by the Research team using audio playback

- Cross-validation of all transcripts by two independent auditors
- Member-checking of transcript outputs with respondents
- Feedback from two respondents for minor corrections on contextual issues in parts of the interview dialogue resolved

- Deductive and manual coding using Microsoft® Excel spreadsheet
- Colors used to highlight relevance with green marking noteworthy quotes
- Recurring codes clustered together
- Reflexive notes added context to the selected codes and themes
- "within-participant" analysis for transcript

Figure 3. Flow Process of Preliminary Review and Trustworthiness of Transcripts.

In terms of coding, the research team used a theory-driven thematic analysis to provide a comprehensive understanding of the data by assigning data points to a priori codes and themes [67,68]. The three researchers involved in the coding/theming process read the verified transcripts independently to have a general understanding of the viewpoints of the respondents. The transcripts were marked up by underlining sentences and sometimes entire paragraphs that appeared meaningful to researchers and related to the research questions and codes that were predetermined.

2.5.2. Agreeability of Codes/Themes

The two independent experts who initially reviewed the transcripts were asked to provide codes and emergent themes derived inductively from the transcripts to compare with those deductively used by the researchers. The first independent coder has a Ph.D. in counseling psychology and extensive experience with qualitative research, and the second coder was a doctoral student in the same field.

There were some semantic variations related to the final themes derived from the two teams. The authors have backgrounds in aviation and petroleum engineering, and the independent coders are psychologists, which could have influenced the semantic variations in codes and themes.

The outputs from both teams were cross-validated by an auditor who is a director of research evaluation and analysis at a major Midwestern university in the United States. The codes/theme from the two teams were compared and the most semantically representative codes/theme from the two analyses were selected based on the recommendations of the auditor.

3. Findings

3.1. Themes

Four (4) major themes were identified from the semi-structured interviews and focus-group sessions. The themes were (1) voluntary safety reporting framework, (2) voluntary safety reporting bottlenecks, (3) universality, and (4) organizational review of safety events. The perspectives of respondents under each theme and underlying codes/sub-themes are discussed using a narrative style. Some direct quotations from the participants are presented to provide context. Figure 4 summarizes the themes and codes.
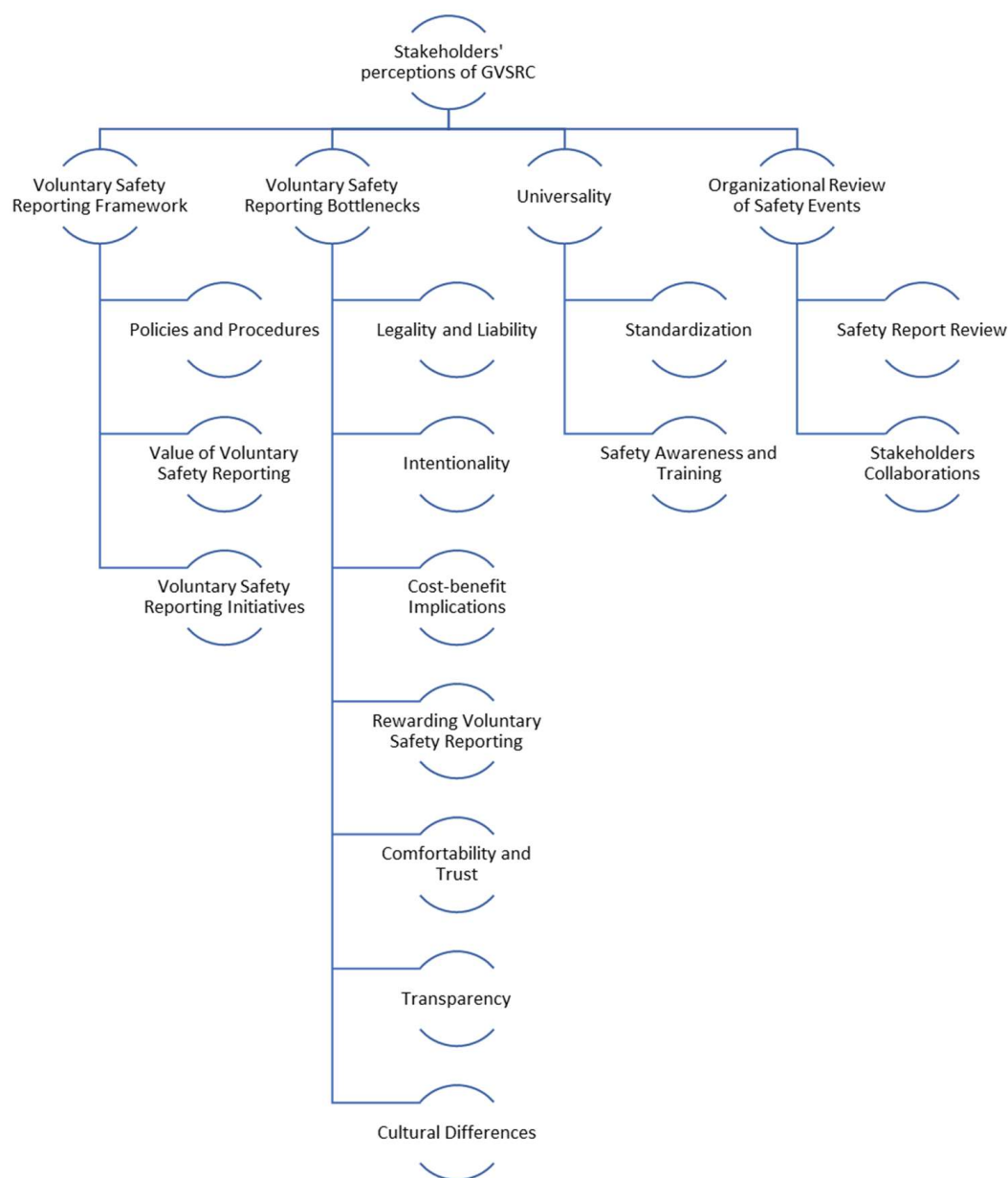
Figure 4. Themes and codes.

3.2. Theme 1—Voluntary Safety Reporting Framework

The voluntary safety reporting framework represented policies and procedures, the value of voluntary safety reporting, and existing voluntary reporting initiatives in the GOM O&G sector, and their impact on GVSRC is explored.

3.2.1. Policies and Procedures

This sub-theme relates to policies and procedures on voluntary safety reporting frameworks within organizations in the O&G sector. Most respondents intimated that a formalized process that has pragmatic procedures for handling and reviewing voluntary safety reports from employees by an all-inclusive committee as practiced in aviation (ASAP) will be beneficial. A manager from a major O&G organization suggested that policies and procedures related to a non-punitive voluntary safety reporting system within the O&G industry can impact the safety reporting culture and supported the OSAP concept.

Most respondents strongly agreed with the framework of the OSAP which requires corporate development by the organization and employee representatives with expert input from a regulator if possible. Respondents noted that the OSAP should standardize the administrative process of dealing with reported safety issues by ensuring fairness and accountability for all employees who participate in the program.

Some respondents noted that documented guidelines on effective practices related to the OSAP can be used industry-wide to set procedural and professional standards which can be very helpful during the turnover of ERC members as normally done in the ASAP. The respondents, however, stated that the OSAP MOU must ensure transparency and fairness which may make the process more acceptable to all stakeholders. Below is a quote from one of the respondents:

> *"So, whether you call it a memorandum of understanding or it's something a little less formal, having a committee with top-level executives involved is critical and we've found it to be beneficial. So, we support the concept wholeheartedly."*

3.2.2. Value of Voluntary Safety Reporting

This sub-theme relates to the practical benefits of reporting safety issues and hazards to the organization and the O&G sector. Most respondents noted that understanding the value of voluntary safety reporting was important in their organization for safety improvements. A respondent stated:

> *"The role would be to help demonstrate the value of lessons learned from reporting near-misses and how corrective actions can be taken to prevent future occurrences when providing relevant information to their employees on safety incidents."*

Some respondents appreciated the sharing of de-identified aggregate data from organizational-level voluntary safety reports with industry regulators. These respondents noted that the best value in such a partnership is obtained when there exists a non-adversarial relationship between regulators and industry operators. Respondents also stated that the benefit of gaining safety intelligence for system improvements cannot be understated. A respondent during one of the FG sessions stated that:

> *"We will have to encourage operators to voluntarily report hazards and incentivize the process and have a mindset that the safety intelligence gleaned from such process would be more beneficial than trying to force near-miss reports from operators."*

3.2.3. Voluntary Safety Reporting Initiatives

This sub-theme explored respondents' perspectives on current voluntary safety reporting initiatives industry-wide and how the OSAP could complement these initiatives. The significant role of the SafeOCS program was highlighted and there were favorable perceptions of the SafeOCS program. Other respondents noted the patronage of a sizable number of O&G organizations in the SafeOCS program. A respondent stated that:

"Right now, we have twenty-two companies that are participating in voluntary near miss and safety data reporting. That represents 90% of oil production. That's pretty huge considering how long we've been around, which is not that long."

However, most respondents highlighted the SafeOCS program's challenges in capturing individual-level safety reports from employees in an organization due to some institutional barriers to reporting directly to the SafeOCS program by employees. Some respondents suggested that the OSAP, with its focus on individual employees, can complement the SafeOCS program's efforts by sharing aggregate organization-level safety data.

The respondents also discussed the Port State Information Exchange (PSIX), which is a public-facing website for detailed vessel information, including safety reports. There were mixed opinions on PSIX. Respondents stated that the recent policy of the USCG not to publish voluntary safety reports with identifiable information of reporters on public websites has incentivized voluntary reporting of hazards and near-misses into the PSIX. Despite this move, most respondents claimed anecdotally that O&G organizations patronized the SafeOCS program more than PSIX.

Some respondents also stated that currently, existing federal whistleblower policies and laws provide some limited levels of anonymity and confidentiality for voluntarily reporting some categories of unsafe practices and conditions in the industry. However, a concern was raised by another respondent from a regulatory agency on the lack of legal barriers to restrict the release of the name of a whistleblower during an investigative process, which is contrary to suggestions by Dekker [25] and Boysen [69].

3.3. Theme 2—Voluntary Safety Reporting Bottlenecks

This over-arching theme explored the perceptions of respondents on the current challenges or hindrances to voluntary safety reporting within O&G organizations in the GOM. The sub-themes explore these challenges within the potential adoption of the OSAP.

3.3.1. Legality and Liability

This sub-theme describes the tendency of operators, employees, and regulators to comply with existing laws. Respondents suggested that because the O&G sector is very fragmented, with several entities participating in a single project, the issue of legal liability is a challenge even in the current regulatory environment and may pose challenges for a robust OSAP. For example, the legal responsibility for ensuring the privacy and security of safety information that an employee can voluntarily submit was raised. Some respondents also noted the widespread use of non-disclosure agreements (NDA) in the O&G sector can be a challenge to voluntary safety reporting programs, such as the OSAP. Under such agreements, employees may not voluntarily report safety issues for fear of dismissal. A respondent stated:

"It is common in the oil and gas industry to have every employee under a non-disclosure agreement whatsoever. And so, reporting something even though safety-related but proprietary as an individual to any regulator could be grounds for dismissal of an employee, and they live in constant fear about that."

In addition, these respondents believed that there are usually legal implications for disclosing proprietary information in safety reports, not only for the employee but sometimes for the federal entity that collects that information. The respondent further noted that this challenge was exacerbated by the lack of a legal framework to protect employees who inadvertently disclose safety information deemed proprietary to federal regulators while filing a voluntary safety report.

A respondent with senior management background stated that these NDAs are necessary to protect proprietary information and maintain a competitive advantage from the companies' standpoint. The respondent, however, noted that it is often challenging to separate safety information from proprietary information. The respondent further averred

that most O&G organizations put in place these strict NDAs as safeguards from potential adversarial use of the information by media entities and other vested parties.

Another respondent with a senior management role in the O&G industry also stated that when it comes to sharing information related to safety incidents, a lot of consulting is done with the legal departments in the company to determine potential legal exposures even though there may be a request for such information by the public using the Freedom of Information Act (FOIA).

3.3.2. Intentionality

This sub-theme describes the impact on voluntary safety reporting when employees intentionally disregard safety procedures and do not take prompt action to correct a known deficiency, and punitive actions need to be taken against them. Non-punitive voluntary reporting is fundamental to the OSAP, and the opinions of respondents were sought on the viability of the OSAP in an operational environment with the potential for complacency and intentional disregard for safety. Some respondents were receptive to the concept of non-punitive voluntary safety reporting for inadvertent errors and potential violations.

However, other respondents were wary of the unintended consequences of a non-punitive voluntary reporting system on employee safety behaviors. These wary respondents noted undesired behavioral traits of complacency could morph into intentionality. When asked to provide context on intentionality and its meaning, respondents generally agreed that it refers to when employees are intentionally not following safety procedures and not taking prompt actions to address a known deficiency. A respondent defined intentionality as:

> "In my opinion, intentionality can be viewed as egregious behavior, negligence, and vital disregard of safety and safety procedures. There is always a possibility that a few employees may abuse the system and get complacent in a non-punitive, voluntary reporting setting. The issue, therefore, becomes where to draw the line regarding operational personnel's actions or activities on safety."

Most respondents agreed that punitive measures are warranted in the case of intentional disregard for safety as one respondent phrased it:

> "If it's intentional, drop the hammer on them. I mean literally, they need to be removed, they need to be isolated, and they need to be held responsible."

Another focus of the sub-theme was to explore the perceptions of respondents on punitive actions when inadvertent errors are committed by employees as opposed to intentional disregard for safety. There were some divergent opinions on the value of punitive actions under the OSAP. Some respondents supported a non-punitive reporting framework under the OSAP but made it clear that intentional disregard for safety should not be condoned. Others were of the view that a voluntary safety reporting program with a no-blame/no-punishment approach could be counter-intuitive since punishments offer deterrence from future unsafe behaviors and such a non-punitive system could be abused.

Some respondents agreed that despite the intentions of the employee, non-punitive remediation for safety infractions as in the OSAP has organizational safety improvement value. They intimated that it could foster an atmosphere of trust and allow for enhanced GVSRC. Some respondents intimated that sometimes factors outside the individual's control, such as unrealistic performance targets and time pressures, may affect one's intention and safety behavior and should be considered during remediations by the ERC. A respondent noted:

> "What I'd like to see is much less of a punitive environment, much less of a fear environment, where people could feel safe to report anything."

Some respondents who are experienced safety managers agreed that defining intention or delineating willful intent can be challenging since employees can be faced with unpredictable workspace situations in which their training is deficient, or they may lack

the experience to manage, leading to near-misses and accidents. They intimated that it was important to create a trustful and non-punitive environment for voluntary reporting of such near-misses and potential violations using initiatives such as the OSAP. Respondents agreed that as employees are human and will be prone to errors there must be a need to design the work area to be error-tolerant. A respondent stated:

> *"because of the conditions in which work is taking place, we do not have perfect days, perfect equipment, perfect people, perfect processors, perfect weather. And consequently, as human beings, we're not able to adapt very rapidly to changing conditions."*

3.3.3. Cost-Benefits Implications

This sub-theme was the overall cost implication (human and financial) of the OSAP and the projected benefits to the industry. Respondents agreed that some challenges for a generative voluntary safety reporting system are financial, technological, and personnel resourcing costs. A respondent noted that judging from the current ASAP model used in aviation, the resource requirement for an OSAP will be huge and posited:

> *"The number of FAA inspection personnel that are associated with implementing the ASAP program is huge. Resourcing is not a simple issue. Before you make a full recommendation to go forward with something, there should be a true evaluation of the total resource commitment."*

Some respondents noted that much of the focus in the O&G industry was on productivity gains to meet the expectations of shareholders and it sometimes becomes challenging to ensure commensurate attention on safety investments. Some respondents noted that it will require skillfulness and tact to get industry stakeholders' acceptance of the financial, human, and technological investments that must be made in the OSAP. A respondent noted that if tangible benefits, such as reductions in insurance premiums from excellent safety performance, are highlighted as potential gains for the industry with the OSAP, it may gain acceptance from industry leadership.

Some respondents opined that there are always cost-benefit tradeoffs and strong requirements for positive economic value on investments for new initiatives in most O&G organizations as compared to the aviation industry. Referring to the ASAP, a respondent with in-depth knowledge of safety reporting programs in both the aviation and O&G industry stated:

> *"One of the things that could make your case for investment in safety initiatives is if you show a compelling case for cost, like what is the impact? I guess this is an underlying challenge; the people who run these companies aren't necessarily always engineers, and so you have to explain things in terms of what it is costing them if they understand that everyone one of these events where they lose somebody for a few days is costing them $160,000 maybe they will not brush it off."*

A respondent from one of the regulatory agencies encouraged the need for presenting a compelling value proposition to industry leadership to incentivize their participation in the OSAP.

3.3.4. Rewarding Voluntary Safety Reporting

This sub-theme describes how companies and regulators can use incentives to promote voluntary safety reporting. The majority of the respondents noted that currently, some companies have safety incentive programs meant to encourage employees to meet and exceed safety standards in the workplace. These programs usually reward employees for not having safety incidents, but some respondents stated that it was important to include employees who participate in voluntary safety reporting programs, such as the OSAP, in awards schemes to bolster such desired behaviors. A respondent stated:

> *"You have to create a culture where people feel empowered and that when they bring things forward there is no adverse retribution. And that's why we encourage people, and we reward people for participating."*

A respondent who is also a supervisor in the industry stated that rewarding safety also comes from understanding and listening to the concerns of front-line workers.

However, some respondents agreed that despite the good intentions, safety awards programs can become counterproductive for voluntary safety reporting in the operational environment. A respondent highlighted the paradox:

> *" It's a double-edged sword. They'll tell you that you are required to report anything. A scratch? You have to report it. And that's fine. I can report a scratch. Then if I report and go to the doctor, I just lost my quarterly safety bonus. You know, that's $500, you know, and for three months of service. And that might affect my $2000 or $1500 a year."*

3.3.5. Comfortability and Trust

The degree to which reporters are at ease to report incidences without fear of repercussions is highlighted in this sub-theme. Some respondents stated that within the O&G industry reporting standards around safety are highly important. A respondent with a management role stated that:

> *"The first one is making sure your employees are comfortable reporting near misses and observations and that they aren't in fear of repercussions."*

However, other respondents with supervisory roles in the O&G industry believed employees do not feel comfortable reporting and fear voluntarily reporting near-miss incidents. In the opinions of these respondents, the fear of job loss was a major driver, and that impedes a robust safety reporting system. A respondent with an extensive senior management role in maritime support stated:

> *"As far as the regulatory side of things and having a master's ticket, I've never feared losing a certificate for reporting something like an accident. Fear of losing my job. Yeah! It's always been the case."*

The respondent noted that a lot of the fear was towards the employer, not the regulator, and suggested that most employees are more comfortable providing safety information to regulators. However, doing so may violate their employer's reporting policies and risk losing employment. Some respondents also stated that on a higher level, some O&G operators do not feel comfortable sharing safety data with regulators because of trust. In the opinion of a respondent, many companies are opposed to providing or allowing individual employees to provide safety information to regulators.

In terms of strategizing to minimize fear and ensure comfortability, respondents with senior management roles iterated the significant role that senior management can play through a commitment to allaying fears and ensuring that employees feel comfortable with voluntary safety reporting. A respondent stated:

> *"So, management has to show a very strong commitment to the employees, a strong commitment that reporting incidents is a good thing, it's not a terrible thing. We don't want incidents to occur but we need those reports to come in so we can understand them and take the corrective action to make sure they don't happen again."*

Some respondents noted that trust is one of the key attributes of any successful employee engagement and acceptance of safety initiatives implemented. These respondents noted that trust and comfortability with any voluntary reporting program should also be rooted in management and supervisors spending time and resources to explain how safety reporting can lead to a safer work environment that benefits employees. A respondent who represents employee unions and is active in engaging senior management in employee welfare issues stated:

"To instill trust for such a reporting system to be effective, we would have to trust management that everyone was abiding by this MoU and was reporting those things that we've demonstrated value and passing along to all concerned stakeholders. The overall goal is that . . . we want to create trust and believe in the program."

However, another respondent thought that mistrust is present within the workplace at the systematic level and stated:

"And I feel in the discussion I've had with regular operators that there's a general distrust of the system and how the data would be used. You have to create a psychologically safe work environment and people have to trust you that you don't intend to harm them as a result of their speaking up."

3.3.6. Transparency

This sub-theme explored the extent to which regulators and companies are willing to disclose and share safety information. Interestingly, there was no clear consensus among the respondents on whether transparency with the public would be beneficial to the sector. Some respondents believed that transparency with the public is important and noted that the industry must have friendly engagements with the public on some of the challenges of the offshore work environment to get them to appreciate the efforts put in place to mitigate safety risks.

On the contrary, some respondents believed that transparency is not beneficial for the O&G sector and one respondent stated:

"As a business owner, I would say I would prefer not to have my organization's safety data disclosed unless it was required by federal law or state law."

While many respondents believed that their organizations were transparent and reporting aggregate safety data, other respondents expressed concern about their organizations having to be transparent and the risk of safety reports containing identifying information becoming public. Some respondents strongly supported the sharing of safety-critical aggregate information and lessons learned across organizations in the industry even though there were few contrary opinions.

Some respondents pointed out that some O&G companies would refrain from sharing even safety aggregate data with regulators unless mandated. Some respondents stated that the recent cooperation among companies regarding safety data sharing through the International Association of Drilling Contractors (IADC) was encouraging. Some respondents also noted that intra-organizational sharing of lessons learned was more prevalent as compared to sharing across industries, and some safety events with learning value only become public domain when shared with entities such as the USCG who put it into public-facing websites.

Within the various organizations, some respondents stated that expeditious safety information dissemination was an important facet of a GVSRC and must be sustained. A respondent with a safety management background noted that prompt feedback to employees for safety reports submitted to the safety office motivates future reporting behaviors. The respondent notes:

"But there's also a problem of transparency. Why should I bother doing this? I put in the safety report, I fulfilled my side of the deal, I sent it forward, and that's the last I ever hear of it. But other people are working on this, and they're tabulating the data, and they're doing all the massaging the statistics and all this, that, and the other thing, and then it goes through another check belt. It never flows back. Well, we don't see anything. We don't need to report all this, and maybe something happens in six months."

3.3.7. Cultural Differences

This sub-theme delved into the effect of cultural diversity on voluntary safety reporting behaviors within the industry. Some respondents stated that the GOM O&G sector attracts employees with diverse cultures and perspectives on safety. Maintaining a consistent voluntary safety reporting culture can be challenging when national culture disparity

exists. A respondent with extensive experience working around the globe in various O&G organizations summarized:

> *"It's also when you're dealing with folks from around the world as I have in the last 40 years, you're dealing with different types of cultures. You've got Americans, you got Canadians, you've got Brits, you've got different Arab groups from the Middle East, you've got the Russians, and of course, you. You've got distinct cultures looking at how safety is perceived and that affects willingness to voluntarily report certain safety issues."*

Most respondents also agreed that sometimes occupational or institutional cultural differences can have an impact on perceptions of safety reporting within the operational settings. A respondent noted that it is common to have several companies, including contractors, working on a single project in the same location. The respondent stated that each company may have its own safety culture and reporting protocols.

3.4. Theme 3—Universality

This theme examined the viability of ensuring universal voluntary safety reporting systems and data sharing across the O&G sector and beyond. Most respondents agreed that the universality of voluntary safety reporting systems and safety data sharing across the entire O&G industry will be highly productive in the prevention of safety occurrences and catalyzing effective universal policies and standards.

3.4.1. Standardization

Some respondents agreed that a standardized framework for voluntary safety reporting and data sharing in the O&G industry can sustain a learning culture by using lessons learned from past mistakes to inform the future. A respondent intimated that though safety requirements may be given a different name, the expectations across the O&G sector are homogenous due to the similarity in tasks and risks. Another respondent from a regulatory agency supported the point made earlier and suggested that safety reporting practices have improved across the sector in recent times. Some respondents from a regulatory agency suggested a gradual harmonizing of safety systems for disseminating safety information and alerts among the various regulatory agencies in the sector.

A respondent from an O&G company suggested that it behooves organizations to develop voluntary safety reporting policies based on applicable best standards from other industries and ensure integration across multi-disciplinary silos for organizational learning. Another respondent with a safety management role in one of the major O&G organizations suggested that to be open to learning, a critical process required was an ability to share safety data across disciplines about what works and does not work effectively in the workplace. The respondent summarized this by stating:

> *"So anytime you're sharing data like that, you're always hoping that somebody is going to learn from the data that you're putting out. And that's the big reason, is experience sharing to make the world a better place, if you will. To improve the industry, to share what happens so it doesn't happen somewhere else so someone else gets hurt."*

3.4.2. Safety Awareness and Training

Some respondents also discussed incentives such as safety training using lessons learned from an industry-wide aggregate of voluntary safety reports. These respondents agreed that safety training is a continuous process and individuals need to be allowed to learn from previous mistakes, which is also necessary for institutional learning. A respondent stated:

> *"Well, I think that anytime we terminate someone's employment after a safety issue you lose an opportunity for a training moment, or you lose experience in your organization. That is if there's some type of accident or some type of minor fail, of procedural review."*

Another respondent summed it up by stating:

> *"I think training is probably one that we see most often where we want to make sure the individual is bought into the program, and we give an opportunity to retrain the individual. I think it's just a part of our management system to plan out, check, and do. It's that continuous learning loop if you will call it that way."*

Respondents generally agreed that it was important to promote a universal culture of training and awareness by creating a uniform safety data-sharing platform to facilitate training and learning from previous safety events. Some respondents also mentioned that a deep awareness of pragmatic safety practices within the oil and gas industry can help in safety improvements and highlighted the vital role that promotion activities, such as briefings and safety meetings, play in sustaining a generative safety reporting culture.

3.5. Theme 4—Organizational Review of Safety Events

This theme defines the organizational review after an incident occurs. This theme explores specific procedures taken after the reporting, the legality behind the incident, and lastly employee and/or employer not wanting to take ownership of the incident that resulted in disciplinary action.

3.5.1. Safety Report Review

Respondents discussed the policies and procedures for the management of safety reports within various organizations, and respondents generally agreed that there were variations based on the scope, size, and complexity of the organization. Some respondents discussed how safety events at the worksite are reviewed as compared to the OSAP. A respondent highlighted some of the challenges that can be envisaged with the OSAP in his organization:

> *"Furthermore, discussing reports of near misses and close calls, an MoU would have to be drawn up in a way that will review the incident in terms of acceptable performance expectations of the person and ensure some levels of anonymity. In my organization, when the review committee analyzes and reviews safety reports, it does not consider reports submitted anonymously. We know who's involved."*

3.5.2. Stakeholder Collaborations

A summary of the discussion points from respondents suggested that unlike the aviation industry in the US with a single regulator (FAA), the O&G sector in the GOM has multiple regulators (BSEE, USCG, OSHA) with sometimes overlapping jurisdictions, which may pose a challenge in the management of voluntarily submitted reports due to having more than one regulator to be part of an ERC under the OSAP.

A respondent who is a supervisor and safety inspector with one of the regulatory bodies in the O&G industry stated that there can be challenges working in a cross-jurisdictional environment with different regulations and applicable standards coupled with varying oversight responsibilities. The supervisor recommended that any organization that adopts the OSAP needs to engage with all regulatory stakeholders during the implementation phase. Despite these challenges, another respondent stated that the O&G sector has witnessed numerous collaborations between the USCG and BSEE on safety issues in the O&G sector, and the OSAP could offer collaborations aimed at continuous safety improvements.

3.6. Interpretation of Results

Interpretation in qualitative research summarizes the overall findings, compares the results to the literature, and outlines study limitations [66]. The study findings suggest that generative voluntary safety reporting policies and procedures that identify the role of all stakeholders and seek their input can lead to program effectiveness and ensure process engagement and acceptability. This is theoretically grounded in the Social Exchange Theory's safety citizenship concept and aligns with Adjekum [47] and Chen and Chen [70] on the need for safety process engagement of all personnel. It may be intuitive for management to

actively involve all stakeholders, especially front-line personnel, when developing policies and procedures for voluntary reporting to ensure "buy-ins" and process identity.

Regarding organizational-level safety reporting, the findings align theoretically with the Theory of Responsive Regulation which seeks a socially intelligent and collegial relationship between a regulator and the regulated. For the OSAP to be viable in the GOM sector, any perceived adversarial relationship between operators, contractors, and specifically, the individual employees who are vital to its success must be minimized. That can be demonstrated through a good faith effort on the part of the regulators to develop a proactive safety support role aimed at systemic improvements than the traditional punitive posture.

Findings regarding recent efforts by O&G organizations to share some safety data via industry trade groups in the GOM are encouraging. Such actions enhance system safety through proactive reporting, as suggested by Rubin et al. [50] and Ringstad and Szameitat [71]. The perspectives of respondents on O&G organizations to see voluntary safety reporting as a valuable tool for continuous system risk monitoring and safety improvements aligns with the findings of Collia and Moreau [16], Gnoni et al. [20], and Okafor et al. [72]. Finally, organization-level safety officers can obtain valuable safety intelligence through the analysis of such databases and use it to formulate safety risk management tools.

Some of the identified challenges with a generative voluntary safety reporting program in the GOM sector had to do with a fear of public disclosure of safety information and its use in legal processes. These findings are not unique to the O&G industry as some aviation service providers have had similar reservations about the release of ASAP information and other safety information with a proprietary value that can lead to potential legal exposure despite the protections of 14 CFR 139 [40]. Researchers in this study suggest that despite the inherent non-disclosure clause of an OSAP MOU, all stakeholders be made aware of the potential limitation for safety information sharing in line with existing federal disclosure laws and a court-ordered request for information in tort cases.

Another interesting sub-theme was the role of punitive actions in a generative voluntary safety reporting environment, such as the OSAP. There were some divergent opinions on the value of punitive actions under the OSAP. While there seems to be general support for a non-punitive framework under the OSAP, there were some concerns as to the extent to which cases involving intentional disregard for safety should be condoned.

The results suggested that some respondents viewed a generative voluntary safety reporting program with a no-blame/no-punishment approach as counter-intuitive since punishments offer deterrence from future unsafe behaviors and such a non-punitive system could be abused. This view suggests that some respondents align with the Classic Deterrence Theory perspective, and it behooves the OSAP implementers to assuage the fears of these stakeholders by outlining the transparency of the process to ensure that intentional disregard for safety, such as the "big 5" elements, will not be admissible as part of the OSAP. Organizations that intend to adopt the OSAP should also highlight the benefits of non-punitive remediation for safety infractions, such as organizational safety improvements value, fostering of an atmosphere of trust, and an enhanced GVSRC.

The expectations of an OSAP ERC should be framed within the Theory of Planned Behavior regarding how some factors outside an individual's control in the operational workspace can influence behaviors. Unrealistic performance targets, poorly designed working environments, and time pressures can affect an employee's intention towards an assigned task and safety behavior and should also be considered during remediations by the ERC. A holistic consideration of all intrinsic and external factors to recommend safety improvements by an ERC aligns with the principles of the System Safety Theory.

The financial and personnel cost of the OSAP was also highlighted as a potential bottleneck in implementation. It is realistic to acknowledge the cost components in terms of personnel to manage the OSAP office and the need to provide it with technological resources for the receipt, processing, and archiving of closed reports. Other costs related to the security of these reports need to be considered. These sentiments about program costs

are not novel; in aviation, some service providers have stated financial and personnel costs as a reason for the non-implementation of ASAP [40,48].

However, in the case of aviation, the FAA recommends that each service provider develops a program that is commensurate with the scope and complexity of their operations. Researchers in this study highly recommend the use of existing resources and expertise of the BSEE, BTS, SafeOCS, and the USCG by O&G operators intending to adopt the OSAP, as that may be beneficial and cost-effective.

The issue of incentivizing safety behavior has a theoretical underpinning in Reinforcement Theory, Expectancy Theory, and Theory Y. There were varying thoughts on the incentives that will be provided under the OSAP. A conflicting perspective was ensuring the anonymity of reporters while attempting to provide enforcement-related incentives [71,73]. It is plausible that anonymous voluntary safety reporting could affect the expediency of the response from the entity entrusted with providing feedback. However, de-identifying personal information in any voluntary safety reporting program is critical in protecting reporters from biases and undue punitive actions, and it also engenders trust.

The use of an OSAP manager who does the initial de-identification of the report is very important. It is also important that any contact with a reporter by the ERC be made through a trusted "gatekeeper" who is normally an employee representative or union representative. A key facet of the OSAP is a documented MOU ratified by employee groups, regulators, and management which outlines requirements and can help to bolster trust and comfortability. The involvement of all stakeholders leads to process acceptance in line with the Social Exchange Theory which highlights a mutually beneficial relationship among stakeholders.

In an industry where operational personnel may come from different national and professional cultural backgrounds, perceptions on the merits and challenges of a generative voluntary safety reporting program need to be considered. The diversity in perspectives on what and when to voluntarily report as part of operational activities was evident through the responses. This disparity in understanding safety hazards, associated risks, and safety reporting culture among various silos of O&G professionals can pose a challenge, and it must be considered during the safety reporting policy formulating stage as recommended by Gnomi et al. [20] and Harsul et al. [74]

The issue of the standardization of voluntary safety reporting in the GOM sector with the adoption of the OSAP was highlighted. There was a consensus that a standardized template of an MOU for the OSAP that is acceptable industry-wide among regulators, management, and employees will be beneficial. However, there is also a reality that, due to differences in an operational environment coupled with financial and personnel constraints, especially for multi-employer workplaces, a "one-size fit" template may not be feasible. The researchers suggest that as practiced in aviation (ASAP), there should be flexibility in the framing of an MOU based on the scope and complexity of operations. An MOU must be acceptable to all stakeholders to meet key safety reporting performance objectives as suggested by Bugalia et al. [48], Barach and Small [75], and Deraniyagala et al. [76].

Awareness of generative voluntary safety reporting through effective training was an important sub-theme. Initial and recurrent safety training in O&G organizations can include information on the OSAP. Such training for operational employees can also build their capacity to proactively identify hazardous conditions and practices and voluntarily report them as recommended by Tetzlaff et al. [77]. Despite this training, operational employees may stop reporting if they do not see changes or receive feedback and updates from safety staff for reports submitted. It will be instructive for safety personnel and management to be proactive and expeditious with feedback and updates on voluntarily submitted reports [47,50,78].

A limitation of this research was the inability to have a diversity of respondents, especially non-supervisory operational employees, willing to take part in the FG and semi-structured interviews, despite the best efforts of researchers in the recruitment phase of the study.

Some O&G organizations have policies that limit the disclosure of some safety information and that could impact the candidness of some respondents even though questions were sent to respondents before interviews. Potential social desirability biases were minimized by framing semi-structured items that allow the respondent to feel comfortable answering. Coding and theming of transcripts can be subjective, based on the experiences and reflexivity of researchers. Every effort was made to ensure validity through the use of both inductive and deductive data analysis, external validators/auditors, and member-checking.

4. Conclusions and Implications for Policy and Research

The objective of this study was to explore the experiences of respondents to understand the current state of GVSRC in the GOM OCS and the viability of the OSAP. Four (4) major themes were identified from the semi-structured interviews and focus-group sessions, namely: (1) Voluntary safety reporting culture, (2) Voluntary safety reporting bottlenecks, (3) Universality, and (4) Organizational review of safety events.

A significant finding of this study was that most respondents supported the adoption of the OSAP for handling and review of voluntary safety reports submitted by employees in O&G organizations due to its non-punitive attributes and the potential to provide aggregate safety data for both organizational-level and industry-wide safety improvements.

In terms of policy implications, the OSAP can be viable if O&G organizations adopt a scalable implementation process commensurate with the scope and complexity of their operations and resources. These organizations can use the existing expertise of the BSEE, BTS, and SafeOCS, as well as the USCG, during the implementation process.

From a theoretical perspective, codes and themes derived from this exploratory qualitative study can be used to build survey instruments and hypothesized measurement models to quantitatively assess the strength of relationships of variables that measure GVSRC in the O&G industry before and after the implementation of the OSAP. The overt disagreement among respondents on punitive actions for employees in cases of intentional disregard for safety, even under the OSAP, presents an interesting area of probing in future studies.

The findings of this study add to the body of knowledge on GVSRC in the O&G sector. Future research will be focused on a mixed-methods approach that assesses the perceptions of GVSRC before and after the implementation of the OSAP in O&G organizations operating in the US. A replication of this study in other global O&G sectors using attributes of the OSAP is highly recommended.

Conflicts of Interest: Commander Neal Corbin is a USCG Officer and a public servant who was duly authorized by the USCG Institutional Review Board and USCG Command to take part in this research. His participation in no way conflicted with the fact that participants from the USCG were interviewed as part of the study. Professor Vamegh Rasouli has previously worked with Schlumberger, a major service provider in the oil and gas industry as a trainer and consultant. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Appendix A

Table A1. Interview Items/sub-questions developed from Central Research Questions.

Central Research Question #	Corresponding Sub-Questions/Items
1	What are the perceptions of the voluntary safety incident and near-miss reporting policies, procedures, and practices within the GOM O&G industry?
2	What are the challenges with managing non-punitive voluntary safety reporting programs in the GOM O&G sector?
3	What are some of the challenges with interpreting "Intentional disregard for safety" as a subject-matter expert and should there be enforcement actions for "Intentional disregard for safety" by management or regulator?
	In your opinion, what should be some of these enforcement actions?
	What are some of the obstacles in developing, implementing, and maintaining an effective voluntary and non-punitive safety incident reporting program within your industry from the perspective of a subject-matter expert?
	What is your opinion on having a memorandum of understanding between employees, management, and a regulator for an event review committee that will be charged with reviewing safety reports to ensure fairness and corrective actions that are not punitive in nature (Shared responsibility in the administration of justice for safety infractions)?
	How can we encourage operational personnel to proactively file hazard reports or self-report incidents that potentially may have violated existing regulations on safety in a company without fear of punishment?
	What role can the regulator and top-level management play in ensuring transparency, fairness, and shared representations in the administrative review of potential safety violations/near-misses reports filed by operational employees?
	Where should the line be drawn on actions or activities of operational personnel related to safety that may not be covered under such MOU for events review and who should have the final say in determining what will be enforced or punished if the need be?
	Should information on potential violations and safety issues reported by personnel and administered by an event review committee be subject to public disclosure?
	Under what conditions can such information be released per federal laws on confidentiality and non-disclosure (14 CFR 193)?

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