

Modelling Safe Operational Behaviour in Oil and Gas Industries through Occupational Safety Management and Collective Action Mechanisms

Mayank Banjare ^{a*}, Dr. Neelam Rani ^b

^{a*} Research Scholar, Indian Institute of Management, Shillong, Meghalaya, India.

E-mail: mayank.phd20@iimshillong.ac.in, Orcid: <https://orcid.org/0000-0003-4943-8305>

^b Associate Professor, Department of Finance and Control, Indian Institute of Management, Shillong, Meghalaya, India. E-mail: neelam@iimshillong.ac.in, Orcid: <https://orcid.org/0000-0002-7020-8283>

Abstract

In spite of continuous investments in safety management systems, compliance to regulations and risk control measures, safe operational behaviour is still a concern in the oil and gas production (OGP) industry. It is a multidisciplinary topic with various studies conducted from the perspective of safety climate, process safety, human factors, resilience, governance, and occupational safety and health, but the evidence is scattered in a variety of lines of enquiry. The goal of this review is: identifying and modelling the factors associated with safe operational behaviour in OGP environments. This is achieved by the synthesis of 20 peer-reviewed studies from 15 bibliographic sources. The most frequently cited sources of the reviewed studies included Safety Science and the Journal of Safety Research (15% each), followed by Reliability Engineering & System Safety (10%). Six themes were identified in the thematic synthesis: Process Governance and Safe Operational Behaviour had the most author-mentions in the subthemes, followed by Occupational Safety and Health, Organisational Ergonomics and Collective Action and Safety Resiliency. In the literature, there are robust associations between whole organisation learning, workforce capability, compliance, governance, risk management, and collective coordination and safety outcomes, but not as strong associations with individual interventions. The review also reveals that there is growing interest in interactions between technical systems and organisational processes, with fewer studies looking at the interaction in an integrated conceptual framework. A synthesis of both observations, the paper suggests an integrated model, which integrates Collective Action Theory with Occupational Safety and Health Theory to provide a wider basis for understanding and modelling safe operational behaviour in complex OGP operations. The paper's main findings are that collective action theory is a suitable model for understanding collective behavior by workers during an oil and gas production process and that the framework of process governance allows for the identification of factors that support workers' collective behaviour.

Keywords: Safe Operational Behaviour, Oil and Gas Production, Collective Action Theory, Occupational Safety and Health, Process Governance.

Introduction

The oil and gas production (OGP) industry works in challenging and dangerous conditions with potentially serious consequences to people, property, communities and the environment in the case of a production failure (Yang et al., 2018). Risk management, organisational oversight and process safety remain weak areas in these high-hazard industries and the lessons of major accidents like Piper Alpha and Deepwater Horizon persist with the current thinking on safety (Mignan et al., 2022; Moura et al., 2017). As a result, organisations have worked very hard in establishing safety management systems, regulatory frameworks, process safety programmes and other risk-control measures. Despite this incident still do happen in various regions of the industry (Skogdalen & Vinnem, 2012). The frequency of these events indicates that technical controls and formal procedures are not the whole story. Organisational conditions, as well as the behaviour of individuals acting in complex operational systems affect day-to-day operational safety.

Operational safety has been a growing field of interest over the last 20 years. Safety culture (Muazu et al., 2021) and safety climate (Tang, 2021) have been studied, as well as process safety management, human factors, organisational learning, risk management and regulatory compliance. This body of literature all points to a strong safety performance being correlated with management's commitment, workforce competency, communication, and organisational culture. Other research has been directed towards organisational learning, resilience and governance in relation to accident avoidance and reliability of operations (Kvalheim et al., 2016; Lindsay et al., 2013). This knowledge is vast, but has grown more or less autonomously from each other, with the interaction among them only partially understood in the context of OGP.

There are existing studies on safety climate, process safety, resilience, governance, risk management and human factors (Bevilacqua & Ciarapica, 2018). These studies share several themes, including collective action, occupational safety and health, organisation ergonomics, safety resilience, process governance and safe operational behaviour (Dahl & Kongsvik, 2018). Far less has been done to explore how these themes work together, or against each other, in more complex contexts of operation.

Coordinating between employees, contractors, supervisors, regulators, and other stakeholders is essential for continued safe operations (Trautrimis et al., 2021). It is not just about individual actions or structure for safety, then. Stakeholder cooperation in achieving mutual benefits for safety are better understood with Collective Action Theory, and Occupational Safety and Health Theory makes sense of how hazard prevention, worker protection and systematic safety management processes benefit stakeholder cooperation. Together these considerations could provide a better perspective on safe operational behaviour arising from coordinated organisational action, instead of individual safety programmes (Hosseinnia Davatgar et al., 2021).

The study contributes by bringing together organisational, behavioural, occupational safety, governance, and stakeholder-coordination perspectives that have largely been examined separately in previous research. Twenty peer reviewed studies were reviewed to find the factors that influence safe operational behaviour in the OGP industry. Key themes, theoretical perspectives, methodological approaches, and gaps in studies are highlighted in the selected studies and frameworks for future studies are suggested.

Research Questions

RQ1: What are the organisational, behavioural and governance issues that affect safe operational behaviour in the OGP industry?

RQ2: What is the possibility of combining Collective Action Theory and Occupational Safety and Health (OSH) Theory for the purpose of modelling safe operational behaviour in the OGP industry?

The remainder of the paper is organised as follows. The review methodology is presented in first section, which is organized into the systematic review process and the integrated theoretical model. The theoretical background is given in next section. The results of the literature review are reported in upcoming section in which three literature review tables and figures, which indicate the existing research gaps and future research directions. The implications are discussed in next section and the main findings and their theoretical implications are discussion in the last section.

Methodology

Systematic Review Process (PRISMA)

A systematic literature review (SLR) method was used to ensure an overview of existing research in the field of safe operational behaviour in the OGP industry. To ensure the process of identifying, screening and selecting relevant studies was structured and reproducible, the PRISMA guidelines were followed.

Only peer reviewed journal articles focusing on safe operational behaviour in OGP settings were included. The search focused on the themes of safety management, occupational safety and health, process safety, human factors, governance, resilience, risk management and operational performance, and included phrase searches including safe operational behaviour, oil and gas industry, occupational safety and health, and safety climate, human factors, process safety management, governance, risk management and resilience, among others. The technical (engineering) dimension of safety research has been deliberately omitted, only the organisational, behavioural, managerial and governance dimension of operational safety is considered. The process of identification, screening, eligibility and inclusion was presented according to the PRISMA framework in the fig. 1. Ninety publications were found, and 16 duplicates were eliminated, leaving 74 articles to be subjected to title and abstract screening. At this step 38 were excluded due to being outside the boundaries of a safer operational behaviour in OGP or due to not meeting the inclusion criteria of the review.

The remaining 36 articles were then read in full and 16 were removed at this stage because they were focused on mechanical engineering design or on the performance of the equipment, but not on the questions of the organizations, their behavior, their governance or their safety management. A reduced number of 20 peer reviewed articles, meeting the inclusion criteria and directly relating to safe operational behaviour in the production of oil and gas, were retained for the review.

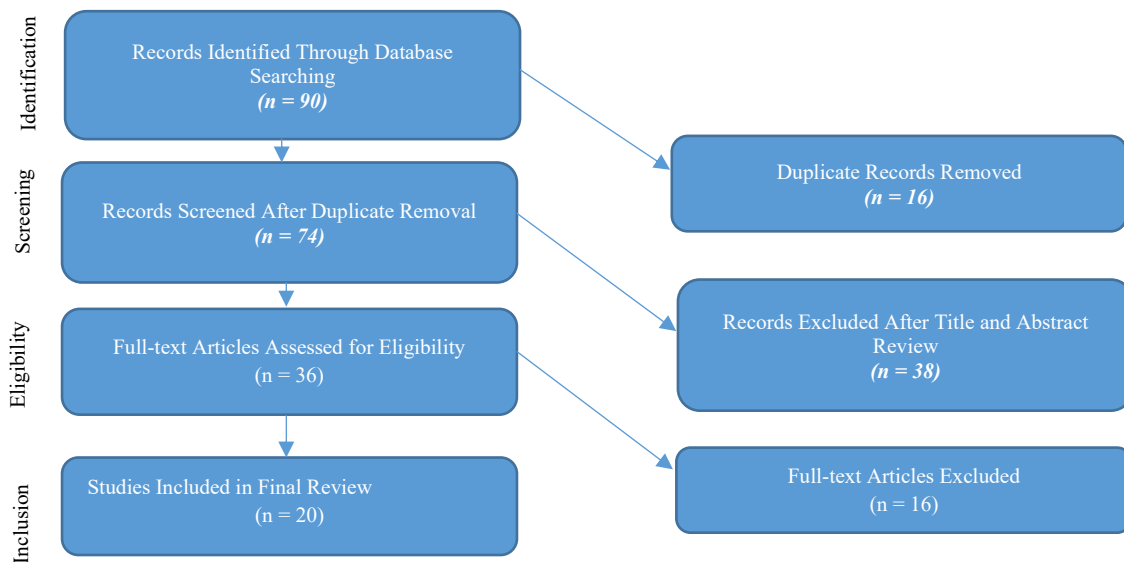


Fig. 1: PRISMA Flow Diagram of Study Selection

The review was organized in terms of finalised objectives, key findings and recurring themes to present the reasoning behind the integration of Collective Action Theory with Occupational Safety and Health Theory to model safe operational behaviour. Two literature review tables were developed, which present results in relation to publication sources, research objectives and results, and the recurring themes; industry context, methodological approaches, theoretical foundations, and geographic distribution of the studies are synthesized narratively in the results section of the report.

Integrated Theoretical Model

In addition to the review process this work suggests a conceptual model for safe operational behaviour that is integrated. Collective Action Theory describes how coordination, shared responsibility and the cooperation of stakeholders maintain collective safety outcomes, and Occupational Safety and Health Theory describes hazard

prevention, worker protection, and systematic management processes. It does not reflect the six parallel independent theories that emerged from the review, rather it is an integrated model that combines both theories into a single model to explain the outcome construct (safe operational behaviour) in the OGP industry as shown in fig. 2.

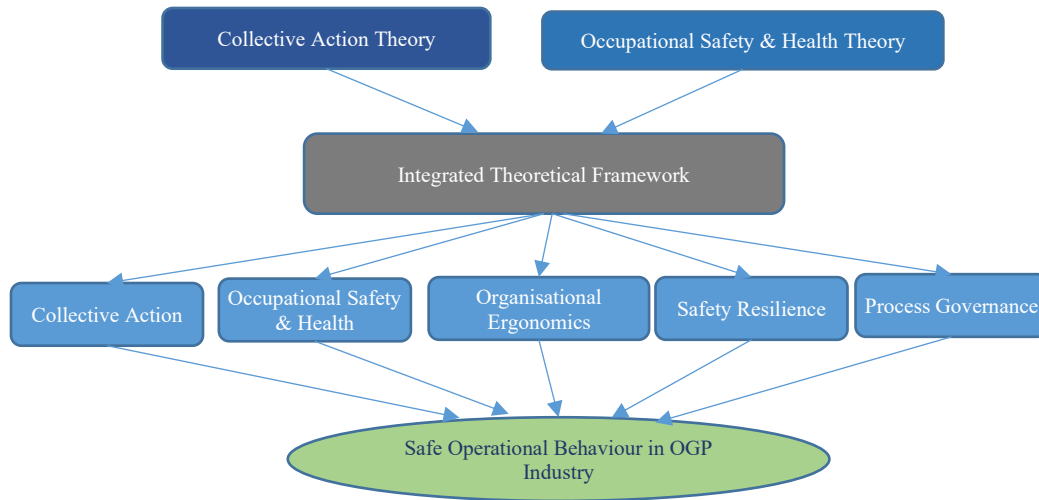


Fig. 2: Integrated Conceptual Model of Safe Operational Behaviour

The model in the fig. 2 is used for the entire results and discussion, each of the six themes being treated as a pathway that contributes to the common goal of safe operational behaviour.

Theoretical Background

Collective Action Theory

Coordinating the efforts and actions of individuals and groups to attain outcomes that are unattainable without such coordination is the foundation of the Collective Action Theory (CAT). It is a theory that can be seen in many fields, but here it is applied to those fields in which the coordination of respondents is essential for the safe operation. The key to achieving safety outcomes is cooperation, shared responsibility and effective coordination. Also, the literature emphasises governance arrangements and institutional mechanisms that maintain collaboration and shared responsibility by matching individual behaviour with collective interests, specifically in the context of complex operational environments where multiple actors have accountability.

The literature shows that the macro effect of collective operational safety in the OGP industry is not obtained by isolated individual actions, but rather by concerted action, involving all the participants of the organisation. All employees, contractors, supervisors, managers and regulators play their part in making day-to-day decisions, and their roles and responsibilities vary depending on the level and type of organisation. Even if formal safety protocols are in place, there is a possible increase in operational risk.

procedures exist if there are a lack of responsibility or lack of information sharing between groups. Structural safety is when the organization is able to achieve safety as a whole, with others working to achieve the same rather than treating safety as a separate task, responsibility or duty to individual employees, systems or processes (Bodin, 2017).

Occupational Safety and Health Theory

Hazardous substances, complex technologies, high-pressure systems and stringent regulatory and working conditions are used during OGP operations. In this context, Occupational Safety and Health (OSH) Theory is a suitable theory, as it is necessary to apply theory in addition to practical control in occupational safety and health, if the environment is hazardous. This is why, in the context of the above, Occupational Safety and Health (OSH) Theory seems to be a suitable theory, because when the environment is hazardous, it is necessary to apply theory in addition to the practical controls of the working environment. Strong organisations strengthen operational safety through the establishment of formal governance, the building of workforce capability, an embedding of safety into operational processes and fulfilment of regulatory requirements. A strong safety culture is linked with continuous workforce development, systematic process risk management and adherence to regulatory frameworks. Therefore, OSH Theory gives a base to understand the role of workplace safety practices in broader operational safety and worker protection (Ismail & Jkatisan, 2025; Ajmal et al., 2022).

Integration of Collective Action Theory and Occupational Safety and Health Theory

In this regard, Collective Action Theory and Occupational Safety and Health Theory are complementary—systems, controls and workplace practices are all required for the reduction of hazards and the protection of workers. Collective Action Theory is rooted in a cooperative mode of thinking, holding that good organizational results are achieved when the actors involved coordinate their actions, contribute together and share the responsibility. Both theories are proven theories separately, but have not been seriously discussed together in OGP safety research. Combining the two theories provides a wider understanding of safe operational behaviour, as it connects organisational safety systems with the collective action necessary for their effective implementation. The combination of the two theories provides a more comprehensive understanding of safe operational behaviour, as the two theories span from organisational safety systems to the collective action that underpins their integration (Iqbal et al., 2019). This integration becomes valuable in an OGP environment where the implementation of organisational systems and technical controls is essential for safety, but coordination between the various stakeholders is crucial.

Results and Discussion

The results of systematic literature review give a general overview of the safe operational behaviour research in the OGP industry. Instead of analysing each publication individually, the review draws together common features of publications by industry, purpose and results; and common themes in research across the 20 manuscripts reviewed and is written narratively in upcoming section.

Bibliographic Sources

Most outlets where safe operational behaviour research is published are safety science and occupational safety journals with Safety Science and Journal of Safety Research being the two leading journals. In addition to this safety-related mainstream, the literature reviewed also has a growing presence in different, non-engineering, risk-related journals, but increasingly in public health, sustainability and general-science journals, indicative of the expansion of safe operational behaviour research from traditional engineering and risk-related journals into public health and sustainability-oriented scholarship.

Research Objectives and Findings

Looking back at the literature it can be seen that initial safety research focused on accident prevention, process safety, maintenance, regulatory compliance, and risk reduction. The aims and results listed and summarised to capture this evolution, with the more recent literature focusing more on the lessons learned in the organization, capability of the workforce, governance, resilience, safety culture, as well as the more traditional safety performance parameters or measures.

Recurring Themes

Six recurring themes emerge: Collective action, occupational safety and health, process governance, safe operational behaviour, organisational ergonomics, and safety resilience. In the literature typically these themes are addressed in isolation, but this review also shows thematic linkages between themes of governance, organisational behaviour and organisational processes that in turn have an impact on workforce performance and human factors affecting overall effectiveness of safety management systems. The six themes explained together are more useful to model operational safety than each theme individually.

Industry Context, Methods, Theoretical Foundations, and Geographic Distribution

The reviewed studies cover a variety of operational environments, ranging from offshore platforms to onshore refineries or petroleum production facilities, downstream construction operations, pipeline systems and even wider governance and sustainability issues, and the number of human-factor/behavioural studies has grown beyond offshore platforms to refinery and downstream operations. The studies highlight the following challenges for the organization: Risk management, Workforce coordination, Communication, Safety leadership and Organisation learning are all important issues that arise in both environments of operation.

The quantitative approaches are still the more prevalent, largely in the form of questionnaire surveys, structural equation modelling, and the analysis of accident and incident data, while there are fewer contributions that focus on the qualitative or case-study or conceptual framework approaches. Quantitative designs are used, and qualitative and mixed-method designs are used to a lesser extent, which results in relatively under-researched aspects of operational safety, namely collaborative aspects, decision-making aspects and learning aspects.

Currently, occupational safety and health / safety management, safety climate theory and risk management theory are still the main theories applied but other theories are also beginning to be cited in the literature to explain the process of safety culture and safety-promotion outcomes, particularly social exchange theory and behavioural models like the Geller and Health Belief Models (Haghighi et al., 2017). Even though OGP safety operations are collaborative and coordination-dependent, a large amount of OGP-specific studies still do not receive enough direct attention in their theoretical work from Collective Action Theory. The integrated model proposed is motivated directly by the fact that, despite the collaborative and coordination dependent nature of OGP safety operations, there is still no direct attention in OGP specific studies to Collective Action Theory.

Geographically, there are a significant proportion of studies from Malaysia, Norway and Iran, and there are studies from Canada, Nigeria, Italy or studies with no specific country. There is still relatively little research work conducted across broader geographical and institutional settings, and this would help to better inform the understanding of the impact of institutional and organisational conditions on safe operational behaviour in various contexts (Ambituuni et al., 2014; Jamil et al., 2025).

Together with the synthesis above, the evidence in the results suggests that safety research is now shifting from the technical to the organisational view of OGP safety, and that the importance of engineering controls, risk management, governance, capability of the workforce, organisational learning, leadership, safety culture and human factors are now all gaining ground.

Table 1: Bibliographic Sources of OGP Safe Operational Behaviour Literature

Bibliographic Source	Articles	%
Safety Science	3	15.00
Journal of Safety Research	3	15.00
Reliability Engineering & System Safety	2	10.00
Environmental Development	1	5.00
Journal of Business Ethics	1	5.00
Science	1	5.00
Journal of Marine Science and Engineering	1	5.00
Journal of World Energy Law and Business	1	5.00
PLoS ONE	1	5.00
International Journal of Services and Operations Management	1	5.00
Journal of Engineering Research and Reports	1	5.00
Process Safety Progress	1	5.00
Frontiers in Public Health	1	5.00
Current Science and Technology	1	5.00
Sustainability	1	5.00
Total	20	100.00

A summary of the distribution of the 20 articles reviewed that were found in bibliographic sources is presented in table 1. The most cited journals were Safety Science (15.00%, three articles) and Journal of Safety Research (15.00%, three articles), followed by two articles each for the journals Reliability Engineering & System Safety (10.00%). The remaining 12 journals each published one article which accounted for 5.00% of the reviewed literature, each separately. Overall, the distribution suggests that research on safe operational behaviour is spread across a number of journals, and has more focus in journals relating to safety and reliability. The multidisciplinary nature of OGP safe operational behaviour research is also evident in publications in journals across environmental, business ethics, marine engineering, public health, energy, operations management and sustainability fields.

The distribution of the 20 reviewed articles is shown in fig. 3 according to the sources of the bibliographic. The most represented sources were Safety Science (three articles) followed by Reliability Engineering & System Safety (two articles). The journals that did not submit articles each had one article, indicating the distribution of research on safe operational behaviour is found in safety, engineering, environmental, public-health, management and sustainability-oriented subjects.

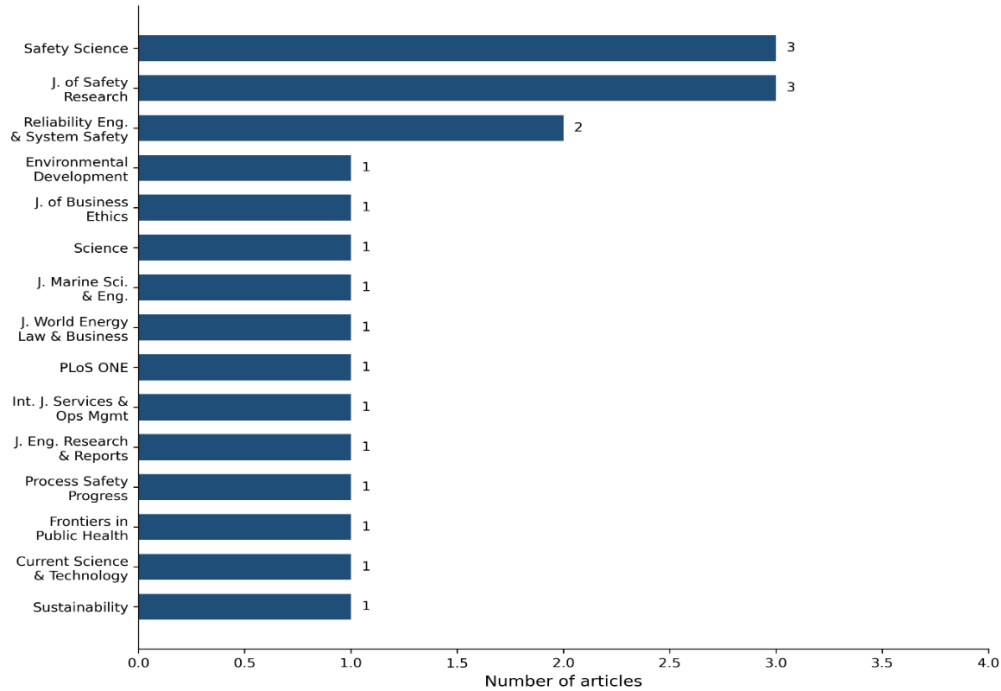


Fig. 3: Distribution of Reviewed Articles by Bibliographic Source

We presented all the evidence achieved from the literature in tables 2-6. Collectively we observed that the safety research is not progressing gradually from technical perspective to organisational view of OGP safety. It is good to see that current body of knowledge will appreciate the importance of governance, workforce capability, organizational learning, leadership, and human factors alongside engineering controls and risk management.

Table 2: Themes and Sub-themes of OGP Safe Operational Behaviour

Theme (T)	Sub-theme (ST)	Author(s)
Collective Action (T1)	Shared responsibility and collective coordination (T1ST1)	Berkowitz et al., (2017); Bodin, (2017)
Collective Action (T1)	Stakeholder governance and participation (T1ST2)	Lindsay et al., (2013); Muazu et al., (2021)
Occupational Safety and Health (T2)	Hazard prevention and worker protection (T2ST1)	Ambituuni et al., (2014); Kvalheim et al., (2016); Jamil et al., (2025)
Occupational Safety and Health (T2)	Safety management systems (T2ST2)	Dahl & Kongsvik, (2018); Theophilus et al., (2018); Tang, (2021)
Organisational Ergonomics (T3)	Human factors and work design (T3ST1)	Theophilus et al., (2018); Bevilacqua & Ciarapica, (2018); Ismail & Jkatisan, (2025)
Organisational Ergonomics (T3)	Human-technology-organisation interaction (T3ST2)	Moura et al., (2017); Skogdalen & Vinnem, (2012)
Safety Resiliency (T4)	Adaptive capacity and learning from failure (T4ST1)	Moura et al., (2017); Hosseinnia Davatgar et al., (2021)
Safety Resiliency (T4)	Reliability enhancement and recovery capability (T4ST2)	Mignan et al., (2022); Yang et al., (2018)
Process Governance (T5)	Compliance and regulatory adherence (T5ST1)	Ambituuni et al., (2014); Lindsay et al., (2013); Tang, (2021)
Process Governance (T5)	Competency development and training (T5ST2)	Kvalheim et al., (2016); Haghighi et al., (2017)
Process Governance (T5)	Risk management and operational control (T5ST3)	Bevilacqua & Ciarapica, (2018); Muazu et al., (2021); Iqbal et al., (2019)
Safe Operational Behaviour (T6)	Safety compliance and participation (T6ST1)	Dahl & Kongsvik, (2018); Kvalheim et al., (2016); Ajmal et al., (2022)
Safe Operational Behaviour (T6)	Safety leadership and commitment (T6ST2)	Dahl & Kongsvik, (2018); Jamil et al., (2025)
Safe Operational Behaviour (T6)	Sustainable safe operations (T6ST3)	Tang, (2021); Hosseinnia Davatgar et al., (2021); Muazu et al., (2021)

The reviewed literature was thematically synthesised and six main themes emerged from the literature and are summarised in table 2: Collective Action, Occupational Safety and Health, Organisational Ergonomics, Safety Resiliency, Process Governance, and Safe Operational Behaviour. Their sub-themes reflect areas of shared responsibility, stakeholder involvement, hazard prevention, safety management systems, human factors, human–technology–organisation interaction, organisational learning, regulatory compliance, competency development, risk management, safety participation and leadership. Together, these themes illustrate how safe behaviour to operate is a multi-dimensional result of the interaction of organisational, managerial, behavioral and governance factors. The thematic synthesis, therefore, helps to build in these dimensions into the proposed conceptual framework.

Table 3: Objective(s) and Finding(s) of Previously Published Works

Author(s)	Objective(s)	Finding(s)
Ambituuni et al., (2014)	Examine safety and environmental regulations for downstream petroleum operations in Nigeria.	Weak regulatory enforcement and institutional gaps constrain safe and responsible petroleum operations.
Andersen & Mostue, (2012)	Assess risk analysis and risk management approaches in petroleum integrated operations.	Human, technological and organisational factors need to be integrated into risk analysis for safe operations.
Bevilacqua & Ciarapica, (2018)	Develop and apply a human factor risk management approach in a refinery/process industry context.	Human-factor risk indicators and corrective actions support improved refinery risk management.
Berkowitz et al., (2017)	Investigate collective action and meta-organisation processes in the oil and gas industry.	Collective governance supports shared standards and coordinates sustainability practices in OGP.
Dahl & Kongsvik, (2018)	Study safety climate and mindful safety practices in the oil and gas industry.	Safety leadership and mindful practices influence compliance, participation and safe behaviour.
Dey et al., (2004)	Develop a risk-based maintenance model for offshore oil and gas pipelines.	Risk-based maintenance improves pipeline integrity, reliability and operational safety.
Hosseinnia Davatgar et al., (2021)	Examine risk-based safety barrier management for the oil and gas sector.	Safety barriers reduce accident frequency and strengthen operational resilience.
Kariuki & Lowe, (2007)	Explain how human factors can be integrated into process hazard analysis.	Human-factor integration improves hazard identification and process safety assessment.
Kvalheim & Dahl, (2016)	Examine safety compliance and safety climate among petroleum workers.	A positive safety climate is associated with higher safety compliance.
Lindsay et al., (2013)	Apply the UN Guiding Principles to human rights responsibilities in the oil and gas sector.	Due diligence, governance and accountability reduce legal, social and operational risks.
Mearns et al., (2003)	Investigate safety climate, safety management practice and safety performance in offshore environments.	Safety climate and management practices are strongly related to offshore safety performance.
Mignan et al., (2022)	Analyse severe accidents in the oil and gas energy sector using the ENSAD database.	Accident dynamics reveal systemic chains of events that support learning and prevention.
Moura et al., (2017)	Explore learning from accidents through interactions between human factors, technology and organisations.	Accident learning requires attention to interactions among people, technology and organisational systems.
Muazu et al., (2021)	Examine operational excellence, regulatory framework and enterprise risk management in the oil sector.	Regulatory framework and enterprise risk management contribute to operational excellence.
Tang, (2021)	Analyse asset integrity and process safety management in major oil and gas companies in Malaysia.	Asset integrity and process safety practices support reliable and safe operations.
Theophilus et al., (2018)	Integrate human factors into process safety management systems.	Embedding human factors into process safety improves learning, control and safe operations.
Waqar et al., (2024)	Evaluate critical safety factors causing accidents in downstream oil and gas construction projects in Malaysia.	Training, supervision and procedural control are critical safety factors in downstream OGP projects.

The objectives and findings in table 3 encapsulate it in the same progression. However, if one looks at the existing literature, then it becomes evident that it discusses the themes of organizational learning, capabilities, governance, resilience, and human factors while addressing safety performance as the main theme. Organizational capability, leadership, communication, and workforce behavior remain the main outcomes of the results so as to reflect the operational questions raised by the safety research. We have seen many indicators in our study that safe operation is as much dependent upon organizational effectiveness as technical reliability.

The selected research papers originate from settings such as offshore platforms, petroleum production facilities, refineries, downstream operations, pipeline systems, maintenance activities, governance arrangements, and accident investigations. Interpretations can be found in table 4 of our research. The research is different as they differ in aspects of technology, operations, and regulations. However, it is essential to state that the studies pose similar organizational challenges for all kinds of operational settings. Risk management, workforce coordination, communication, safety leadership, and organizational learning are still crucial regardless of where operations take place. We observed a certain level of consistency in the details used to determine safe operational behavior across the OGP value chain.

Table 4: Industry-wise Literature Context of OGP Safe Operational Behaviour

Industry Stream	Author(s)
Oil and Gas / General Operations	Berkowitz et al. (2017); Dahl & Kongsvik (2018); Kariuki & Lowe (2007); Lindsay et al. (2013); Moura et al. (2017); Tang (2021); Theophilus et al. (2018)
Offshore Oil and Gas	Mearns et al. (2003); Dey et al. (2004); Andersen & Mostue (2012); Hosseinnia Davatgar et al. (2021)
Petroleum Industry / Petroleum Operations	Kvalheim & Dahl (2016); Andersen & Mostue (2012); Ambituuni et al. (2014); Muazu et al. (2021)
Oil Refineries and Process Plants	Bevilacqua & Ciarapica (2018); Theophilus et al. (2018); Tang (2021)
Downstream Oil and Gas	Waqar et al. (2024); Ambituuni et al. (2014); Muazu et al. (2021)
Pipeline and Asset Integrity	Dey et al. (2004); Tang (2021); Hosseinnia Davatgar et al. (2021)
Energy Accident / Severe Accident Context	Mignan et al. (2022); Moura et al. (2017)
Governance, Sustainability and Compliance	Berkowitz et al. (2017); Lindsay et al. (2013); Ambituuni et al. (2014); Muazu et al. (2021)

Table 5: Commonly Applied Methods for OGP Safe Operational Behaviour

Method	Sub-stream	Author(s)
Quantitative	Survey / Safety Climate Analysis	Mearns et al., (2003); Kvalheim & Dahl, (2016); Dahl & Kongsvik, (2018)
Quantitative	Statistical / Accident Data Analysis	Mignan et al., (2022); Waqar et al., (2024)
Quantitative	Risk-based Maintenance / Decision Analysis	Dey et al., (2004)
Qualitative	Interview / Exploratory Inquiry	Andersen & Mostue (2012); Lindsay et al. (2013)
Qualitative	Governance and Stakeholder Analysis	Berkowitz et al., (2017); Ambituuni et al., (2014)
Case Study	Human Factor Risk Management	Bevilacqua & Ciarapica, (2018)
Case Study	Asset Integrity / Process Safety	Tang, (2021)
Conceptual Model	Human Factors in Process Hazard Analysis	Kariuki & Lowe, (2007)
Conceptual Model	Human Factors into Process Safety Management	Theophilus et al., (2018)
Conceptual / Risk-based Framework	Safety Barrier Management	Hosseinnia Davatgar et al., (2021)
Review / Learning Study	Accident Learning and Resilience	Moura et al., (2017); Mignan et al., (2022)
Survey / Governance Analysis	Operational Excellence and ERM	Muazu et al., (2021)

Table 5 illustrates the methods used in selected literature of our review. Quantitative research is the most dominant method across the body of safety research knowledge base. The use of questionnaires, investigations of accidents, assessment of safety climate, and statistical analysis were found to be the most commonly used methods for carrying out the research. A majority of the research papers used similar techniques to show the relationship that existed

between organizational variables and their safety performance. The use of quantitative research and the failure to use qualitative research to understand complex concepts such as organizational decision-making, collaboration, leadership, and learning is somewhat lacking. The lack of mixed-method research is also a weak point in understanding how these organizational processes influence safe operational behavior under different operational conditions.

Table 6 represents the glossary of used theoretical foundations in our reviewed literature. Safety Climate Theory, Risk Management Theory, Process Safety Management, and Human Factors are the common theories visible across the surveyed literature. The areas discussed by the theories above include workplace safety, organizational performance, and operational risks. There was a degree of complexity in them because they interact with one another within complex industrial settings. Collective Action Theory has not been traced in the current literature to any significant extent, although all safety operations involve collective actions in OGP operations. The continuous interaction among organizational stakeholders is the key to maintaining safe production. However, weaker theoretical attention remains a gap in collaborative relationships under the current explanations of operational safety.

Table 6: Commonly Applied Theories of OGP Safe Operational Behaviour

Theory	Author(s)
Collective Action Theory	Berkowitz et al., (2017)
Occupational Safety and Health / Safety Management	Ambituuni et al., (2014); Mearns et al., (2003); Kvalheim & Dahl, (2016); Dahl & Kongsvik (2018)
Safety Climate Theory	Mearns et al., (2003); Kvalheim & Dahl, (2016); Dahl & Kongsvik, (2018)
Organisational Ergonomics / Human Factors	Kariuki & Lowe, (2007); Theophilus et al., (2018); Bevilacqua & Ciarapica, (2018)
Resilience Engineering / Accident Learning	Moura et al., (2017); Mignan et al., (2022); Hosseinnia Davatgar et al., (2021)
Risk Management Theory	Andersen & Mostue, (2012); Dey et al., (2004); Muazu et al., (2021)
Process Safety Management	Tang, (2021); Theophilus et al., (2018); Kariuki & Lowe, (2007)
Governance and Compliance Theory	Lindsay et al., (2013); Ambituuni et al., (2014); Muazu et al., (2021)
Asset Integrity Management	Tang, (2021); Hosseinnia Davatgar et al., (2021)
Competency and Training-based Safety	Waqar et al., (2024); Kvalheim & Dahl, (2016)

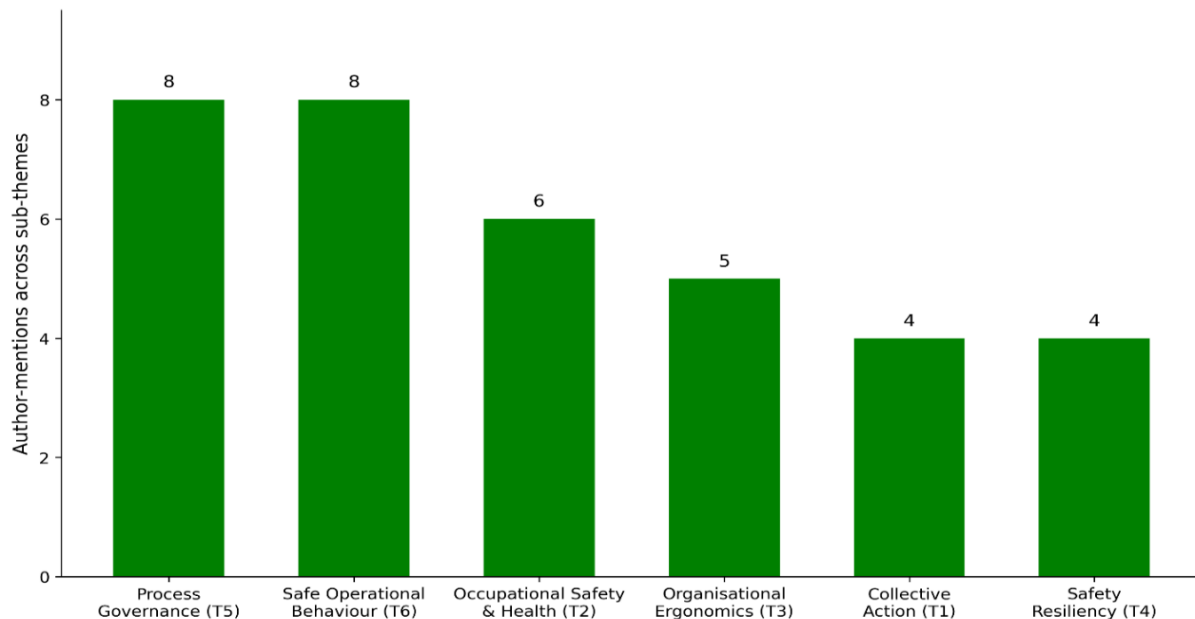


Fig. 4: Frequency of Recurring Themes Across Reviewed Literature

The frequency of author-mentions by identified sub-themes is illustrated in fig. 4. The highest frequencies are Process Governance (T5), Safe Operational Behaviour (T6) with eight author-mentions, followed by Occupational Safety and Health (T2), Organizational Ergonomics (T3) with five mentions and the other two with four each, Collective Action

(T1) and Safety Resiliency (T4). From the distribution it is clear that governance and safe operational behaviour are highly represented areas in the literature reviewed while collective action and safety resiliency are represented comparatively less. This distribution reinforces the need of embedding these dimensions in a larger picture of explaining safe operational behaviour.

Implications

The review identifies some areas that require more attention in the research and practice of operational safety in the oil and gas production environment.

Research Implications

The research implications contribute to the positioning of the emerging discourse on safe operational behaviour in the OGP industry. While the focus on organisational and behavioural parameters of operational safety has intensified, compared to the conventional safety requirements, the review shows that the research has expanded from safety climate and occupational safety and health to human factors, process safety, governance, resilience and risk management.

A novel contribution of this review is the integrated model of collective action, occupational health and safety (OSH), organisational ergonomics, safety resilience, process governance and safe operational behavior as depicted in fig. 2. The review reveals that these six themes cannot be analysed separately; security is a result of the interplay between governance arrangements, workplace practices, organisational learning and human factors (Theophilus et al., 2018). In future studies the review suggests that these dimensions should be studied collectively, not individually, as variables. There is also little theoretical focus on the collaborative elements of safety in this review. Although the importance of safety climate, risk management, process safety management and human factors has been studied, the collaboration aspect, and the contributions of employees, contractors, managers, regulators and other stakeholders in the collaborative production of operational safety is relatively under-examined in the present literature.

Practical Implications

The practitioner's viewpoint further emphasizes the importance of safety as a more than a technical problem or compliance requirement. The synthesis of the organisational practices, workforce capability, leadership commitment, governance arrangements and the continuous learning from the review are a step towards a stronger leadership, effective communication, workforce development and clear accountability for the responsibilities associated with delivering a high-quality education for all.

Safety controls do not need to be systems and procedures. The role of employees, contractors, supervisors and senior management in determining operational safety outcomes is identified; communication and engagement in the decision making process around safety issues are identified as important, especially when activities are spread across multiple teams and/or stakeholders. There are specific actions identified in the literature that can be focused on for competency development, such as frequent training, supervision and knowledge sharing, to ensure safety awareness, operation procedures and promote safer working behavior.

They also discover a close relationship between operational safety and human factors such as workload, work design, communication, and human-technology concerns, which, if not considered, can help to enhance operational errors and reduce process safety performance. The theme of organisational learning is also found again in the literature, with the message that practitioners should implement processes and procedures for capturing, sharing and learning from operational incidents and near-miss events, and then disseminate and apply these lessons to build organisational resilience and to contribute to ongoing organisational improvement over time, along with change management processes that take account of changing operating conditions and emerging risks.

Limitations and Future Research Directions

Sample size of studies included in the final sample is the limitation of this review. The articles chosen are lessons from safe operational behaviour in the OGP industry but it is possible that there is evidence other than that covered in the 20 peer reviewed studies that have been reviewed here. Another restriction relates to the geographic focus of the literature, which is heavily skewed by the publications from a few countries, and questions can be raised about the validity of the evidence in operational context in a new OGP economy. The integrated model suggested in this review can be further explored in future research, with a broader set of geographical contexts as well as by empirically testing how collective action, occupational safety and health, organisational ergonomics and process governance evolve in practice.

Conclusion

Despite ongoing investments in safety management systems, regulations and risk-control practices, safe operational behaviour is a constant concern in the oil and gas production (OGP) industry. This systematic literature review was based on 20 peer-reviewed studies from 15 bibliographic sources. There were also multiple sources that had only a few studies, such as, Applied Physics Letters, Human Factors, and Human Factors and Ergonomics. The most represented source were Safety Science, with 15% of the reviewed studies, followed by the Journal of Safety Research at 15% and Reliability Engineering & System Safety at 10%, reflecting the multidisciplinary nature of OGP safety research.

The thematic synthesis resulted in the following six recurring themes: Collective Action, Occupational Safety and Health, Organisational Ergonomics, Safety Resiliency, Process Governance and Safe Operational Behaviour. The highest mention in author-mentions of those with a focus on the sub-theme of Process Governance and Safe Operational Behaviour (8) was followed by Occupational Safety and Health (6), Organisational Ergonomics (5) and Collective Action and Safety Resiliency (4). The results suggest that the research emphasis on governance, safety-management processes, and behavioural outcomes is that these have been largely studied, whereas the presence of collective coordination and resilience are still relatively underrepresented.

The literature reviewed indicates that safe operational behaviour is not solely technical in nature. These factors workforce capability, organisational learning, governance, compliance, human factors, risk management, and stakeholder interactions—all have an impact on safety outcomes. The results thus confirmed and substantiated a multi-dimensional concept of safe operational behaviour, which combines organisational and human factors with the formal safety-management functions.

There is limited development of Collective Action Theory in OGP safety research. The proposed integrated model, based on Collective Action Theory and Occupational Safety and Health Theory, offers a more comprehensive basis for connecting the coordination of stakeholders, occupational safety management, organisational processes and safe operational behaviour. The framework can facilitate more integrated safety-management practices, and serves as a foundation for empirical testing in a variety of OGP operational settings.

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