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Regulatory Non-Compliance and Its Limitations Towards Risk Minimisation in the Oil and Gas Industry

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Abstract

The Piper Alpha Case, the Deepwater Horizon Case, and the Petronas Pengerang Integrated Complex Fire and Explosion are examples of undesirable occurrences in the oil and gas industry. These incidents frequently underscored the potential for extensive damage and losses that could result in injuries. Given the oil and gas industry's vast and critical nature, operational disruptions and events that jeopardise production were expected to be minimised at all times. Hence, this study aimed to identify the limitations of regulatory implementation in minimising risk impact within the Malaysian oil and gas industry. Initially, the risks of non-compliance with regulations in Malaysia's oil and gas industry were highlighted, followed by a discussion on the limitations of current regulations affecting overall performance. The findings identified and examined barriers to efficient risk management, such as non-standard regulations, communication issues, and technological changes. Understanding the key factors influencing regulatory non-compliance was beneficial for further assessing preventive actions and strategies to bring improvements to the practice.

Keywords: risks, regulatory, non-compliance, oil, and gas.

1.0 INTRODUCTION

Acknowledging the oil and gas industry's non-compliance with operational-related regulations could be an early intervention strategy to mitigate organisational ineffectiveness and prevent losses. These regulations oversee oil and gas activities and aim to optimise production from extraction to delivery. Compliance with these regulations is crucial as they are closely related to overall production processes and activities. Several studies have examined the effects of operational regulations non-compliance on operational staff, revealing significant damages and losses. They consistently show that ensuring compliance with regulations throughout the operational cycle is vital for aligning organisational safety culture and preventing risk failures.

Recent literature reviews have pointed out issues with regulatory frameworks, including inconsistent laws, overlaps, breaches, and conflicting regulatory functions. For example, safety rule violations are often cited as a cause of accidents in the oil and gas industry. Plus, regulatory complexity makes it challenging for regulators to set risk constraints effectively. Additionally, regulations that target different aspects of performance or task execution can result in various damages and losses. Uncertainties and lack of understanding contribute to lower success rates in regulatory frameworks, hindering effective risk management systems. Improving knowledge of management practices related to safety procedures compliance is essential. Therefore, there's a growing focus on developing reliable project risk management strategies to reduce failures in the oil and gas sector. This paper presents research findings on the risks of regulatory non-compliance and the limitations of regulatory implementation in minimising the risk impact.

2.0 LITERATURE REVIEW

2.1. Risks as the Impacts of Regulations Non-Compliance

The discussions among contemporary scholars regarding regulatory non-compliance have underscored the potential negative consequences it could entail. Bain et al. (2015) highlighted the wide-ranging damages and losses associated with non-compliance, whereas De Almeida and Vinnem (2020) stressed the risk of creating an unsafe work environment leading to injuries. Ensuring regulatory compliance tailored to operational activities is critical for fostering a safety culture within organisations and preventing failures in risk control (Bain et al., 2015; Iqbal et al., 2019), particularly in the oil and gas industry where any operational disruptions putting personnel at risk are highly undesirable.

Furthermore, regulatory non-compliance within the oil and gas sector can weaken organisational safety cultures, increase third-party disruption risks, and result in losses for parent organisations (Iqbal et al., 2019; Kraidi et al., 2019). Regulatory compliance's significance in this industry must be effectively communicated to relevant personnel, as compliance directly impacts production processes and activities (van Prooijen et al., 2021). Both organisational and operational stakeholders must be aware of regulatory requirements and maintain a symbiotic relationship, as they are mutually dependent. Ultimately, regulatory compliance is essential for addressing organisational capital, maintaining the facility’s integrity, ensuring smooth operational activities, and protecting public interests (Iqbal et al., 2019; Nuhu et al., 2020).

The discussions on regulatory non-compliance risks in the oil and gas industry highlight several key themes for instance. Firstly, scholars emphasise the importance of regulatory compliance in managing interactions between oil and gas activities, social aspects, and environmental concerns, aiding parent organisations in forecasting outcomes and improving effectiveness for future planning (Jain et al., 2017; Kokkoni & Salmachi, 2021). Secondly, the risks associated with environmental hazards due to regulatory non-compliance have garnered significant attention (Datta & Hurlbert, 2019; Konstandakopoulou et al., 2020). Scholars stress the significance of implementing innovative and sustainable technologies to comply with environmental regulations, emphasising the need for thorough evaluations and policy re-evaluations to address pollution and emissions (Chapman et al., 2016; Grigoriev et al., 2021; Hiatt et al., 2015).

Equally crucial is the focus on safety and health risks stemming from regulatory non-compliance. Scholars stress the importance of identifying potential failure modes in oil and gas production processes and advocate for government agencies to enforce regulatory standards to ensure safe working environments and control failures within acceptable limits (Abboud et al., 2020; Gai et al., 2018; ØstebØ et al., 2018). Additionally, the risks to operational processes due to regulatory non-compliance are a significant concern. Scholars highlight the need for proactive exploration and addressing anticipated issues during operational processes, stressing efficient decision-making and resource allocation to ensure regulatory compliance throughout project lifecycles (Green & Wills, 2017; Iqbal et al., 2021; Meyer-Gutbrod et al., 2020).

Also, the risks to public society arising from regulatory non-compliance are addressed. Scholars emphasise society's perceptions and the impact of regulations on local and global economies, underscoring the importance of understanding the connection between oil and gas companies, society, and the economy (Marlin-Tackie & Smith, 2020; Novoselov et al., 2019; Ogwang & Vanclay, 2019). They stress the need for effective regulation to manage interactions between oil and gas operations and social systems and caution against the negative impacts of non-compliance on operational time, profits, and reputation (Eze et al., 2016; Marlin-Tackie & Smith, 2020). Despite ongoing efforts to stimulate operational improvement, gaps in compliance persist, necessitating further attention and action from industry stakeholders and scholars to address these risks effectively (Kapadia & Elliott, 2019; Liaropoulos et al., 2016).

After all, despite ongoing efforts and the presence of numerous work procedures and standards for managing risks, it remains crucial for project teams to adequately prepare to understand their projects better (Rui et al., 2017). Risk management should be integrated into policy development, with guidelines typically offering several options for managing risks (Nolan & Anderson, 2015). These options include avoiding the risk by not proceeding with the activity, accepting the risk to pursue an opportunity, eliminating the source of the risk, altering the likelihood or consequences of the risk, sharing the risk with other entities through contracts or risk financing, or retaining the risk through informed decision-making (Hassan, 2017; Naderpour & Khakzad, 2018; Olawuyi, 2019).

In discussions about safety and risk, accident procedures are closely linked to defining and supporting risk constraints among various industry roles, including regulators, companies, and the work environment (Garcia De Almeida & Vinnem, 2020). The absence of requirements or oversight from regulators can create unfavourable conditions for preventing major accidents, even with safety responsibilities assigned to companies (Embrey & Henderson, 2011; Okstad et al., 2011; Zara et al., 2023). Regulatory practices vary depending on social, cultural, and political factors in each country, requiring essential supporting elements beyond the standards and guidelines within the regulatory domain (Balaji et al., 2019; Zara et al., 2023).

2.2. Operational Regulations in the Oil and Gas Industry

As industries evolved with technological advancements, the oil and gas sector found it imperative to embrace digital transformation to enhance productivity, efficiency, and cost-effectiveness. However, this shift introduced challenges such as skill gaps influenced by technological disruptions, demographic factors, and regulatory requirements set by authorities and industry standards like ASME and API (“Jurutera IEM November Bulletin,” 2019). The bulletin highlighted a lack of knowledge of key technologies relevant to operational activities, including project management, engineering, planning, regulatory compliance, and site preparation. Addressing these gaps comprehensively required collaboration among industry stakeholders, educational institutions, professional bodies, training centres, and regulators (Hirst, 2012; Mittal et al., 2018; Nwankwo et al., 2021).

Given the hazardous nature of oil and gas plants handling flammable, explosive, and toxic substances, compliance with safety regulations was paramount. Operators had to adhere to stringent measures to manage major accident hazards, as mandated by the Occupational Safety & Health Act 1994 and CIMAH Regulations 1996 (Official Website Department of Occupational Safety and Health - Petroleum Safety Division, 2019).

The Department of Occupational Safety and Health (DOSH) required that safety reports demonstrate how operators of hazardous facilities applied strict measures to manage these risks effectively.

Standardisation within regulatory frameworks was also crucial for ensuring consistency and quality across operations. Standards serve as a bridge, providing technical specifications and definitions to facilitate understanding among stakeholders from diverse backgrounds (Aubault et al., 2016; Kevorkova et al., 2020; Kumar et al., 2021). By promoting uniformity and order, standards contributed to effective quality control and operational procedures (Jain et al., 2017; Wu et al., 2016). Moreover, the creation of regulations and standards in the oil and gas industry was understandable given the numerous risks involved (Fang et al., 2019; Mehr et al., 2020; Moreno-Trejo et al., 2012).

Compliance not only safeguarded organisations from fines but also protected employees from financial and health-related harm (Sabel et al., 2018). Regulatory assessments, mandated at intervals, served as records of compliance, and effective risk management platforms aided operational teams in navigating these assessments (Birnie et al., 2019; Sutton, 2014; Zhen et al., 2019). Regulations like OSHA ensured safe working conditions for employees and underscored the importance of adherence to regulatory standards (Reavis & Loop, 2014; Wu et al., 2019; Yu et al., 2017).

3.0 METHODOLOGY

This study implemented a qualitative approach by using open-ended interviews with groups of experts as the main method, as these series of questions will guide the researcher's interview session with the participant (Braun & Clarke, 2013). Firstly, it identified current regulations in the Malaysian O&G industry through individual experiences to recognise themes. Then, it identified the types of risks affecting operational activities and thus explored the limitations of regulatory implementation in minimising the risk impact.

As highlighted by Creswell and Creswell (2018), it is vital to decide whether audience members are knowledgeable enough about the main elements of the research. Hence, the approach of semi-structured interviews with the practitioners will be used mainly because it is practical to obtain descriptive data and to seek qualitative knowledge (Braun & Clarke, 2013; Kallio et al., 2016). The targeted participants were professionals related to O&G operations in the industry with over 5 years of experience. Data collection was conducted from March 2022 to August 2022, and it continued until saturation was reached, meaning no new insights or properties were revealed.

The process of analysis began with importing and preparing the data, ensuring it was well-formatted and labelled. Initial coding followed, where data segments were tagged with descriptive labels, identifying key themes and patterns. Once the initial coding was complete, organising codes into code groups was done by reviewing the similarities and differences. Similar codes were then grouped under higher-order categories or themes by selecting the relevant codes and creating new code groups in ATLAS.ti. During this phase, key themes, concepts, or patterns were identified, helping to structure the analysis.

The process stopped when no new themes emerged, indicating thematic and theoretical saturation. Data saturation occurs when the researcher can no longer find new information, whereas qualitative researchers analyse their data continuously throughout the entire study process (Saunders et al., 2018). In this study, saturation was reached with 17 participants. After transcribing, the analysis involved coding participants' comments and organising them into themes. ATLAS.ti was used to facilitate data analysis, as it could handle large data sets, code text, conduct searches, and visualise qualitative data (Zairul, 2020). This software helped in generating credible qualitative findings through a systematic analysis procedure.

Visualisation through network diagrams was a powerful feature in ATLAS.ti, facilitating the explanation of complex relationships between codes and themes. These diagrams helped visualise the relationships between different elements, allowing for the identification of central themes, clusters of related codes, and overall patterns in the data (Braun & Clarke, 2013). In conclusion, using ATLAS.ti for qualitative data analysis involved a systematic process of coding, organising, querying, and visualising data.

4.0 RESULTS AND DISCUSSIONS

4.1. Risks of Non-Compliance with Operational Regulations

In the early stage of this study, interview questions were structured to explore risks associated with non-compliance with regulations in participants' work environments, based on their job routines. These questions prompted participants to discuss their work activities and the risks they faced during task execution. They were also asked to share their knowledge of common standards or procedures for assessing risks in their organisation.

The first set of interview questions aimed at gathering data on risk assessment and identification. The answers were then analysed, revealing the pattern as shown in Figure 1.

Various empirical studies identified the main elements crucial to the O&G industry, which were People, Environment, Assets, and Reputation (Kashwani & Nielsen, 2017; Kumaraningrum et al., 2019; Zara et al., 2023). These studies consistently found themes that were aligned with the findings obtained in the preliminary section of this paper. The initial codes resulted in five code groups as the main themes of non-compliance risks were related to:

- The organisation and its business
- The natural environment
- The safety and health of personnel
- The operational activities and work progress
- The local society of the area

It was observed that the risk factors contributing to this were distributed across various aspects. Table 1 specifically showed the participants' most perceived impacts of regulatory non-compliance as significant risk factors.

Table 1. Themes on The Regulations Non-Compliances

No.	Themes	Contributing Factors
i.	The organisation and its business	Organisation's reputation
		Additional cost incurred
		Penalty
		Property damages
		Failed to achieve goal
ii.	The natural environment	Hazardous to environment
		Waste/discharges management
iii.	The safety and health of personnel	Injuries
		Area's catastrophic incident
		Life/health risks
		Accidents
iv.	The operational activities and work progress	Affect production planning
		Disruptions of work schedule
		Low quality of work done
		Add more unnecessary tasks
v.	The local society of the area	Loss of a family member
		Affect career security
		Affect external parties of the project
		Society's impression

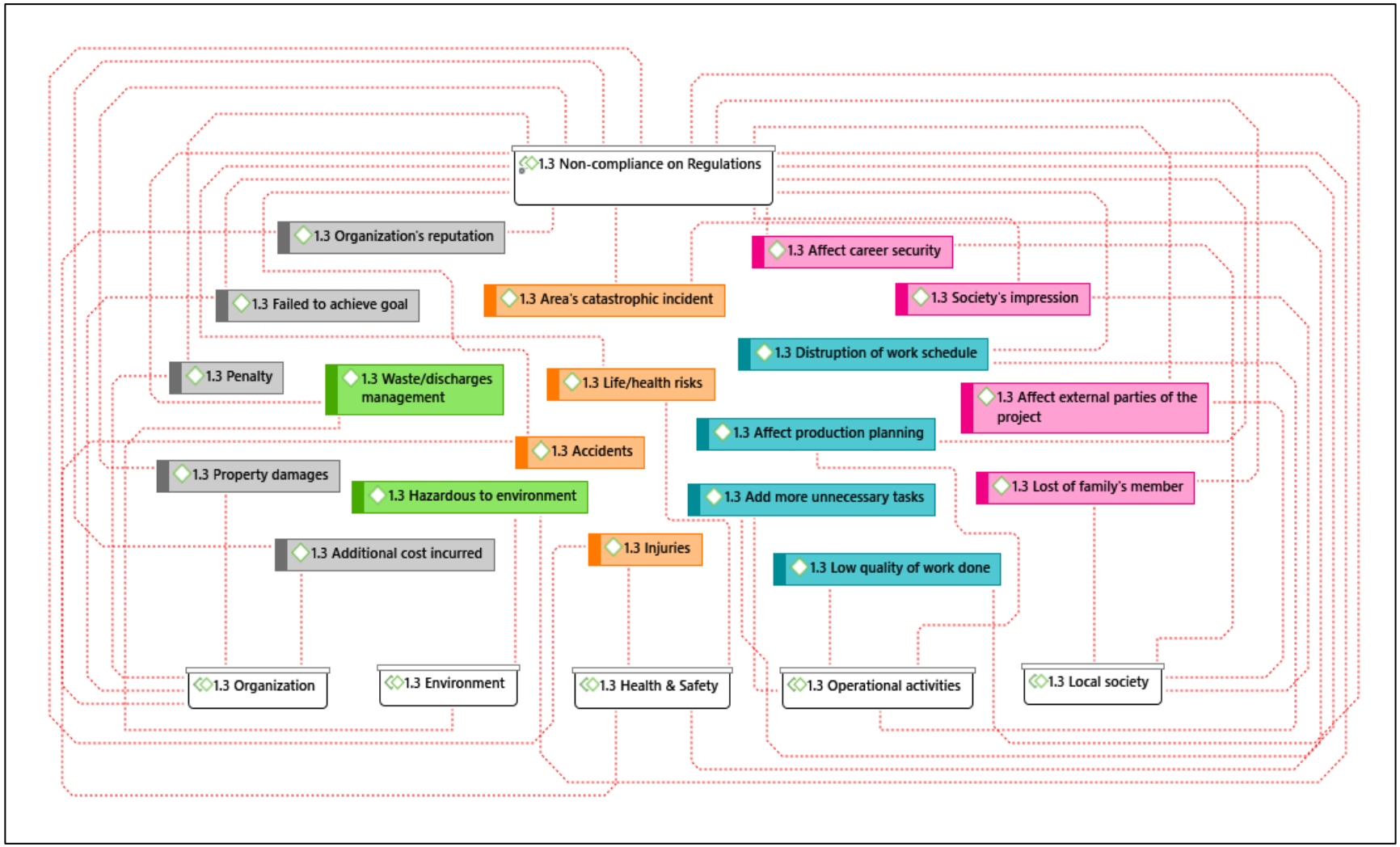

Figure 1. The Participants' Answers Pattern.

Participants in the study underscored the importance of identifying project risks, emphasising the need for a thorough examination of processes and conditions to anticipate errors. They stressed the significance of identifying all potential factors contributing to project risks and understanding their consequences.

4.1.1.Impacts on the Organisation and Its Business

In Malaysian O&G operations, regulatory non-compliance can have profound negative impacts on organisations and their business operations (Brown, 2021). This is aligned with the findings highlighted one of the most immediate consequences is damage to the organisation's reputation, which can erode public trust and investor confidence, leading to a potential loss of business opportunities and partnerships. Financial impacts include substantial costs due to fines and penalties imposed by regulatory authorities, legal proceedings, and corrective measures to address violations. Property damage resulting from unsafe practices, such as accidents, spills, or explosions, further adds to these financial burdens (Grasso & Heede, 2023). Moreover, operational disruptions hinder the organisation's ability to achieve strategic goals and meet production targets.

Property damage is another critical concern, as unsafe practices and inadequate safety measures can lead to accidents, spills, or explosions, resulting in significant repair and replacement expenses. Moreover, the organisation may face operational disruptions that hinder its ability to achieve strategic goals and meet production targets (Stella Emeka-Okoli et al., 2024). The literature supports these findings. For instance, stakeholder theory emphasises the importance of maintaining trust and confidence among all stakeholders, including the public and investors, as critical for long-term success (Freeman, 2018). The resource-based view of the firm (Barney, 1991) also suggests that regulatory compliance can be a strategic asset, enhancing the firm's reputation and operational efficiency. Ensuring compliance with regulations is essential not only for environmental stewardship but also for safeguarding the organisation’s financial health, operational integrity, and overall business success.

4.1.2.Impacts on the Natural Environment

In this aspect, regulatory non-compliance can have severe impacts, particularly concerning the management of hazardous substances and waste/discharges. When companies fail to adhere to environmental regulations, the improper handling and disposal of hazardous substances can lead to significant contamination of soil and water resources (Ghulam & Abushammala, 2023). This study revealed that such contamination not only posed immediate risks to local ecosystems and biodiversity, but scholars also noted that it threatened the health and livelihoods of nearby communities that depended on these natural resources (Sam et al., 2024). Moreover, inadequate waste and discharge management can result in the release of toxic chemicals and pollutants into the air and water bodies, leading to long-term environmental degradation and the disruption of marine and terrestrial habitats (Kolawole & Iyiola, 2023). Such non-compliance undermines efforts to maintain environmental sustainability and can lead to costly clean-up operations, legal penalties, and a loss of public trust (Chapman et al., 2016; Groh & Möllendorff, 2020; Volchkov & Prusenko, 1994).

The relevance of sustainable development concepts here is evident, as emphasised by Brundtland (1987), which advocates for practices that do not compromise the ability of future generations to meet their needs. Environmental justice theory (Bullard, 1998) also highlights the disproportionate impact of environmental hazards on vulnerable communities. Ensuring strict regulatory compliance is therefore crucial in minimising environmental harm and promoting sustainable practices within the O&G industry in Malaysia.

4.1.3.Impacts on the Safety and Health of Personnel

This study emphasised the importance of safety measures, adherence to industry standards, and preventive actions to avoid accidents and legal issues. The impacts on the safety and health of personnel were significant and multifaceted, encompassing a range of injuries, incidents, and risks (Fahmi et al., 2023; Gessoni et al., 2020; Harres et al., 2018). This study found that workers frequently faced hazardous conditions that could lead

to physical injuries, such as burns, cuts, and fractures, often due to the handling of heavy machinery, exposure to toxic substances, and the high-pressure environment typical of O&G operations. Moreover, incidents were not uncommon and included accidents like spills, explosions, and equipment failures, all of which posed severe threats to the safety of the workforce (Jaderi et al., 2019; Kraidi et al., 2021). So, the persistent risks associated with long-term exposure to harmful chemicals and the potential for catastrophic events underscored the need for stringent safety protocols and comprehensive health monitoring to protect personnel in this high-risk industry (Kozlov & Kozlov, 2002).

The human capital theory (Becker, 2009) emphasises the value of a healthy workforce as a critical asset for organisational productivity and effectiveness. Additionally, the high-reliability organisation theory (Weick & Sutcliffe, 2001) suggests that in high-risk industries like O&G, maintaining robust safety practices is essential to prevent catastrophic events. This study underscores the need for stringent safety protocols and comprehensive health monitoring to protect personnel in this high-risk industry.

4.1.4. Impacts on the Operational Activities and Work Progress

Regulatory non-compliance can significantly disrupt operational activities and work progress across various facets. In terms of production planning, non-compliance may necessitate sudden alterations to production schedules and resource allocation, leading to inefficiencies and delays (Abdelmaguid & Elrashidy, 2019; Jo et al., 2018). Also, regulatory violations often prompt immediate corrective actions or investigations, diverting resources away from planned tasks and causing scheduling conflicts (Elmi, 2023; Iroha et al., 2024). Moreover, non-compliance can compromise work quality, as rushed or improvised solutions may be implemented to address regulatory issues, potentially leading to errors (Mamudu et al., 2020; Zhang et al., 2020). Additionally, unnecessary and recurring tasks may arise because of non-compliance, such as repeated inspections or rework to rectify violations, further impeding the smooth progression of operations (Bayat et al., 2023; Bumatay et al., 2006).

Operational excellence (Peters & Waterman, 1982) emphasises the importance of streamlined processes and adherence to regulations to ensure smooth and efficient operations. Contingency theory (Fiedler, 2015) also supports the need for flexibility and adaptive strategies to manage unexpected disruptions effectively. After all, this study highlighted that regulatory non-compliance in Malaysian O&G operations can disrupt production planning, compromise work schedules and quality, and introduce unnecessary tasks, highlighting the critical importance of adherence to regulations for maintaining operational efficiency and effectiveness.

4.1.5. Impacts on the Local Society of the Area

Also, regulatory non-compliance can have profound and devastating effects on the local society of the area. One of the most tragic impacts is the potential loss of family members due to accidents or environmental disasters resulting from non-compliance. These incidents not only cause immense grief and suffering for the affected families but also disrupt the social fabric of the community, leaving lasting scars on individuals and collective morale (D'Antoine et al., 2023a; Didla et al., 2007). Additionally, non-compliance can jeopardise the career security of residents who rely on the O&G industry for employment opportunities. Layoffs, job instability, or closures of operations due to legal repercussions or safety concerns can result in economic hardship and increased social inequality within the community (Asiago, 2016; D'Antoine et al., 2023b). Therefore, ensuring strict adherence to regulations is paramount not only for safeguarding the safety and well-being of residents but also for preserving the social and economic stability of the area surrounding O&G operations (Beecher & Brown, 2018; Shafiee et al., 2018).

Social contract theory, Laskar (2013) suggests that organisations have a responsibility to the communities in which they operate, highlighting the ethical imperative to adhere to regulations to safeguard community well-being. Corporate social responsibility (CSR) concepts, Carroll (2015) further emphasise the importance of organisations contributing positively to society and ensuring economic stability. This study underscores the

importance of strict regulatory adherence to protect the safety and well-being of residents and preserve the social stability of areas surrounding O&G operations.

Therefore, at this stage, it's crucial to identify all potential factors contributing to project risks and their consequences. Participants in this analysis were aware of the importance of regularly considering risks in the Malaysian O&G industry. Most participants emphasised the critical need to identify contributing factors shown in the table above. Respectively, enabling a proactive response to emerging risks allowed project managers to navigate difficulties and ensure project success. In the following section, the interview questions emphasised the limitations of regulatory compliance in the current industry landscape. To systematically address the analysis, the next section deliberated according to the themes that emerged from the preliminary findings.

4.2. Limitations of Current Regulatory Compliances

This section was structured to identify the limitations that may have hindered compliance with these policies and affected their comprehensive implementation. The second part of the interview questions resulted in patterns emerging from the data, as illustrated in Figure 2.

The findings indicated that most participants were aware of the existence of regulatory policies and understood their importance for an organisation. Participants also agreed that adhering to the policies correctly would enhance organisational performance. Respectively, Table 2 below defined the factors recognised by participants as barriers to effectively managing operational risks. The factors listed in the subsequent table were considered important as they commonly emerged in participants' answers during the interviews.

Table 2. The Limitations of Regulatory in Risk Minimisation

No.	Themes	Contributing Factors
i.	The organisation and its business	Non-standards regulations
ii.	The natural environment	Unpredictable working environment
iii.	The operational activities and work progress	Time urgency
iv.		Too many/lengthy
v.		Technology improvement
vi.	All five themes	Attitude/Ethics
vii.		Communications
viii.		Complicated
ix.		Lack of awareness
x.		Lack of compliances
xi.		Less government monitoring
xii.		Too many parties involved

According to the results, all participants corresponded that regulatory policies could positively affect project or operational execution performance. However, they also addressed issues of non-compliance with standards in practice, which might have been due to several factors. These included the unique nature of each project since not all projects could be executed in the same way; miscommunication among team members, as adherence to policies depended on the workforce; and the need to simplify the review and approval process, as well as the implementation of policies to facilitate faster execution activities.

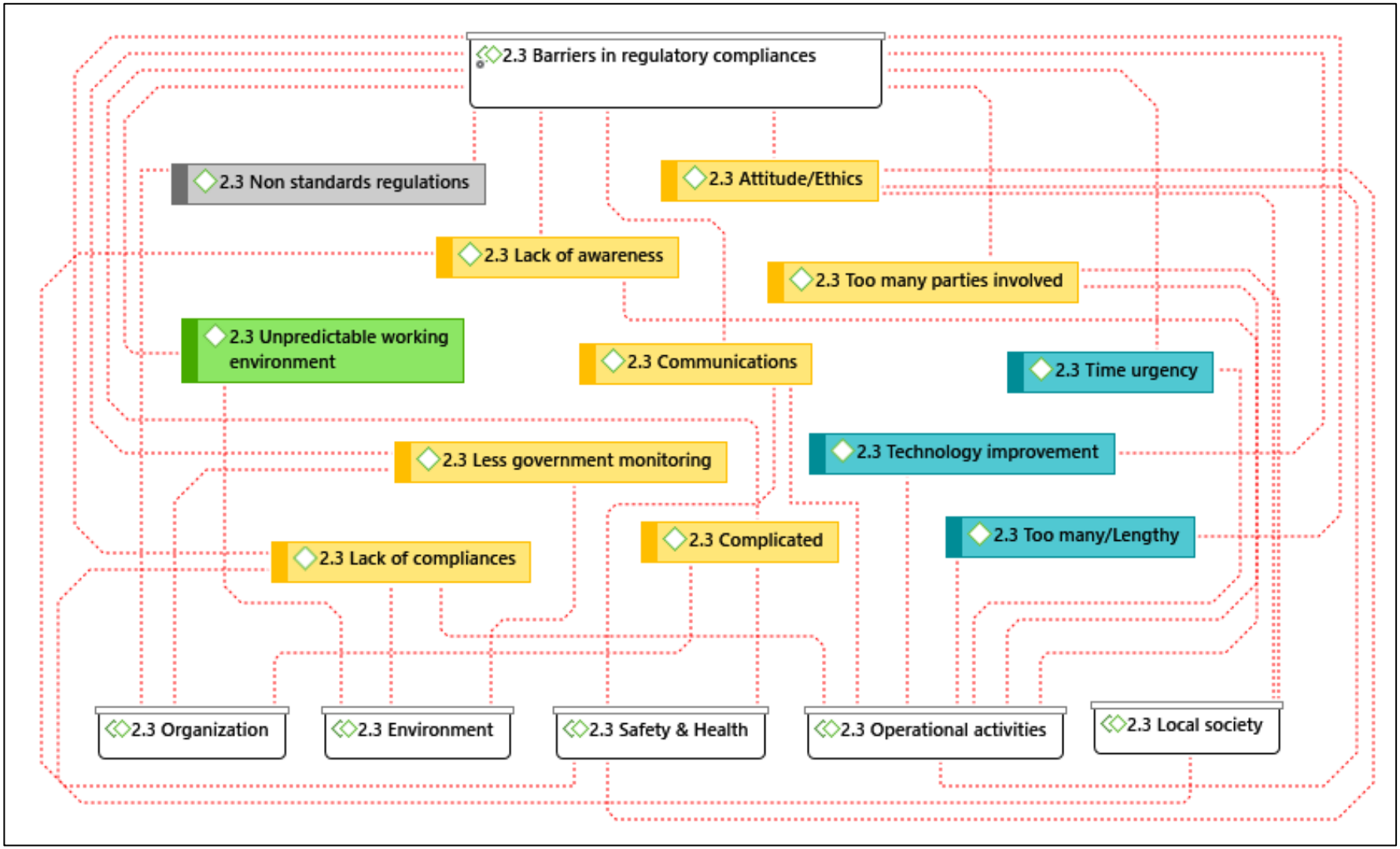

Figure 2. The Participants' Answers Pattern**.**

4.2.1.Limitations Related to The Organisation and Its Business

Most participants identified several factors hindering effective job-related risk management, including non-standard regulations, unpredictable working environments, worker attitudes and ethics, communication challenges, lack of awareness, non-compliance, insufficient government monitoring, time urgency, and extensive procedures. These findings align with existing literature, which emphasises that regulatory compliance is essential for managing risks in the O&G industry but also highlights several limitations that complicate effective implementation (Ghani et al., 2017; Ishak et al., 2018; Jalaei et al., 2023; Rahman et al., 2019).

One significant limitation is the complex and constantly changing nature of regulations. From a theoretical perspective, these findings highlight the limitations of institutional theory, where the non-standard and frequently changing nature of regulations creates a challenging environment for O&G companies to maintain consistent compliance. This aligns with scholars' findings that the regulatory requirements vary across different regions and are frequently updated (Acevedo & Lorca-Susino, 2021; Asad et al., 2019). This variability makes it difficult for project teams to stay current and ensure compliance, leading to potential misunderstandings and missed risk management steps.

Additionally, the lack of clear guidance or standardisation in regulations, as discussed by Cortes and Contreras (2015) and Taylor et al. (2020), results in inconsistent interpretations and implementations across projects. This inconsistency weakens risk management efforts, as noted by Othman et al. (2015) and Yaakob & Abdullah (2019). The concept of regulatory capture, where regulatory agencies may be influenced by the industries they oversee, further exacerbates these challenges, reducing the effectiveness of government monitoring and enforcement (Dal Bó, 2006).

In addition to regulatory challenges, internal organisational factors such as "in-house rules" that vary between platforms require personnel to be aware of specific rules before starting work. This variation can create confusion and inconsistencies in compliance efforts, further complicating risk management.

4.2.2.Limitations Related to The Natural Environment

The limitations of regulatory measures to minimise risk to the natural environment were evident, specifically found in this study, due to the unpredictable working environment inherent in this sector. The dynamic and often volatile nature of oil and gas extraction and production activities made it challenging for existing regulations to fully address and mitigate environmental risks (Zhou et al., 2017). Despite regulatory frameworks aimed at controlling emissions, waste disposal, and accidental spills, unpredictable weather conditions, geological variations, and operational complexities frequently lead to unforeseen environmental impacts (Cristina et al., 2020; Liu et al., 2017). These included unanticipated oil leaks, gas flares, and contamination of water sources, which regulations struggled to prevent or manage effectively (Ismail et al., 2019).

The ecological modernisation theory, which suggests that economic development and environmental protection can be mutually reinforcing through technological innovation and regulatory frameworks (Spaargaren & Mol, 2013), faces practical limitations in the O&G industry. The rapid pace of technological advancements and the continuous expansion of exploration activities outpaced regulatory updates, leaving gaps in environmental protection and enforcement (Cristina et al., 2020; Dobossy et al., 2011). After all, these highlighted the need for more adaptive and robust regulatory mechanisms that could better respond to the inherent uncertainties of the oil and gas industry, ensuring a higher level of environmental safeguarding (Nxumalo et al., 2013; Sarwar et al., 2018). These findings suggest that regulatory frameworks must evolve to incorporate real-time monitoring and adaptive management strategies to enhance their effectiveness.

4.2.3.Limitations Related to The Operational Activities and Work Progress

In the interview findings, all participants agreed that regulatory policies positively influenced project and operational performance. However, they also specifically identified challenges related to non-compliance with quality standards, citing issues such as the unique nature of projects, miscommunication among team members affecting policy adherence, and the need to streamline review and approval processes. Addressing these concerns was crucial for expediting operational activities and ensuring effective policy implementation across diverse project scenarios.

The principal-agent theory, which addresses the relationship between principals (regulators) and agents (companies), highlights the difficulties in ensuring compliance when agents have more information about their activities than the principals (Eisenhardt, 1989). Time urgency often pressured companies to prioritise swift project completion over stringent safety and environmental protocols, leading to potential oversight and increased risk (Brown et al., 2017; Danner & Schulman, 2019). The regulatory framework, while comprehensive, this study also found that it involved numerous and often lengthy processes. It could delay operations and create bottlenecks, frustrating both compliance and efficient progress (Almohammad et al., 2019; Hileman et al., 2021).

Moreover, the continuous improvement and introduction of new technologies in the oil and gas sector outpaced regulatory updates, resulting in outdated or inadequate guidelines that failed to address the latest operational realities and associated risks (Kazemi et al., 2020; Laskar, 2017). As a result, these regulations often fail to address new risks, leaving project managers without clear guidance while accommodating the industry's need for timely and efficient operations (Ali Shah et al., 2022; Khan et al., 2008).

4.2.4.Limitations Related Over All Aspects

There also limitations of regulatory compliance in minimising risk significantly affected all the categorised themes of this study. The non-compliance attitude and ethical stance of every personnel played a crucial role, where such ignorance mostly happened due to discomfort with adjusting to new rules (Groeneweg & Ter Mors, 2016). This issue was worsened by poor communication across multiple layers of involved parties, resulting in misunderstandings and inconsistent enforcement of safety and environmental standards (Haddon et al., 2013; Hileman et al., 2021). The cultural theory of risk, Slovic (2000) suggests that risk perception and compliance behavior are influenced by cultural biases and social structures. The complexity of the regulatory framework itself posed a challenge, as digitalisation and extensive documentation made it difficult for companies to fully understand and implement the regulations effectively, leading to non-compliance and increased risk (Acheampong & Akumperigya, 2018; ØstebØ et al., 2018).

Additionally, there was a significant lack of awareness and obedience regarding regulatory requirements which further hindered compliance efforts (Fu et al., 2020; Ismail et al., 2014). This lack of awareness was often accompanied by a general disregard for compliance, stemming from a culture that was unaware of the threats and the need for proper handling due to long working hours (Gessoni et al., 2020; Yaakob & Abdullah, 2019). The involvement of too many parties, including various governmental and non-governmental organisations, created a fragmented regulatory environment where responsibilities were unclear, and coordination was poor (Finney & Witchalls, 2005; Sohrabi & Noorzai, 2023). This fragmentation led to gaps in oversight and enforcement, ultimately undermining efforts to minimise operational risks in the oil and gas sector. The network theory, Borgatti & Foster (2003) supports the idea that stronger inter-organisational networks and communication can enhance regulatory compliance and risk management.

5.0 CONCLUSION

While the study's findings showed that regulatory policies could positively impact project and operational performance, they also highlighted issues of non-compliance with standards in practice, which stemmed from several factors. It primarily identifies five common themes: the organisational factors, the natural environment, the safety and health of personnel, operational activities, and societal impacts. As participants acknowledged that adhering to appropriate regulations improves organisational performance, they also identified many barriers to efficient risk management, including non-standard regulations, communication issues, and technological changes.

Moreover, findings proved that while regulatory policies positively influenced project and operational performance, challenges related to non-compliance with regulations were significant. Issues included the unique nature of projects, miscommunication, and the need to streamline processes. Participants stressed the need for thorough risk assessment, specifically in the Malaysian O&G industry, to ensure safety and long-term project success. Streamlining regulatory approaches and providing clearer guidance were suggested to improve project risk management in the industry.

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