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Incidents and Disaster Avoidance: The Role of Communication Management and the Organizational Communication Climate in High-Risk Environments

Shahrina Md Nordin ^{1,*}, Ammar Redza Ahmad Rizal ², Rafidah Abd Rashid ¹, Rohayu Che Omar ³ and Unggul Priyadi ⁴

¹ Centre of Social Innovation, Universiti Teknologi PETRONAS, Bandar Seri Iskandar 32610, Malaysia; rafidah_20002048@utp.edu.my

² Faculty of Language and Communication, Universiti Malaysia Sarawak, Kota Samarahan 94300, Malaysia; araredza@unimas.my

³ Department of Civil Engineering, Universiti Tenaga Nasional, Kajang 43000, Malaysia; rohayu@uniten.edu.my

⁴ Faculty of Economics, Universitas Islam Indonesia, Yogyakarta 55584, Indonesia; unggul.priyadi@uii.ac.id

* Correspondence: shahrina_mnordin@utp.edu.my



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Abstract: Health, safety and the working environment are of paramount importance, especially in the high-risk environments found at facilities in the oil and gas industry, where hazards are inevitable and accidents may lead to regrettable situations such as explosions, oil spills and other disasters. The high number of accidents and disasters at such facilities bring safety-related matters to the fore. The complexity of the communication process is very often underestimated, where failures in communication could lead to major disasters. This paper investigates the role of communication management and the organizational communication climate and their impact on incidents and disaster avoidance. This study embarks on a quantitative approach involving 260 personnel from high-risk workplaces at oil and gas facilities, based on purposive sampling. Hypotheses were tested using PLS-SEM to identify causal relationships and for mediation analysis. The findings of this study show that communication management and the organizational communication climate have a significant impact on disaster avoidance. The organizational communication climate is also found to be a significant mediator for the relationship between communication management and disaster avoidance. Communication management and the organizational communication climate need to be enhanced and to be integrated with other technology and innovation to improve safety regulation adherence in the oil and gas industry.

Keywords: safety communication; organizational communication climate; high-risk environment; disaster avoidance; leader-member exchange; safety commitment; oil and gas; workplace accident; hazardous

1. Introduction

The oil and gas industry is one of Malaysia's primary commodities; their contribution to the Malaysian economy comprises about 20 percent of Malaysia's GDP [1]. Malaysia offers the fourth-highest oil reserve and the third-highest natural gas reserve in the Asia-Pacific region. It is not an understatement that the workers in the oil and gas sector are the "unsung heroes" of the Malaysian nation. This workforce, however, faces risks daily due to their highly hazardous work environment, in which the likelihood of incidents and injuries is high [2]. The employees face the risks of fire and explosions that could be caused by the ignition of flammable gases at the plants.

The fatality rate due to workplace accidents among oil and gas employees is seven (7) times higher compared to those in other industries. Hence, it is vital that companies in this sector ensure a safe working environment to minimize the risks of operational hazards.

Past studies over the last few decades indicate an increase in incidents at workplaces around the world [2,3] including the oil and gas work environment [4]. Incidents at oil and gas plants could have numerous probable causes, especially during emergency management, start-ups, or shutdowns. The most common indicator of safety levels in a workplace is the number of injuries and fatalities; hence, companies strive for “zero lost-time injury” (LTI) [5]. It is however cautioned that zero lost-time injury (LTI) may be misleading, as it often encourages the assumption that major hazards at the plants are well managed, without further due diligence being performed. Complacency could eventually lead to an oversight regarding occupational hazards [6].

For this reason, continuous enhancement programs to ensure safety in the workplace environment are imperative, which highlights the importance and role of effective communications to avoid oil and gas incidents. For instance, effective communication during a shift handover could prevent major incidents [7,8]. The findings reported in this study specifically focus on communications management and disaster avoidance in oil and gas processing plants in Malaysia.

In Malaysia, the Occupational Safety and Health Act (OSHA) was passed on 25th February 1994. The enactment of the OSHA has significantly improved the health and safety environment in Malaysia [9]. Organizations in the oil and gas industry must comply with OSHA legislation to avoid accidents or near-misses [10]. Other safety indicators are derived from, for example, the American Petroleum Institute (API) and the International Association of Oil and Gas Producers (IOGP).

The operational condition safety (OTS) model, derived from quantitative risk assessment (QRA), lists communication as one of the performance standards [11]. Despite the OSHA and International Labor Organizations (ILO) which outline comprehensive guidelines, there is an increasing concern about safety performance. Some of the contributing causes to incidents include lack of safety communication [7–9,12], safety leadership [13], commitment to safety and unsafe behavior [9].

Effective communications management is one of the critical factors for ensuring safety in operations at oil and gas plants [7–9,12]. Poor communications regarding the operations at the plant, for example during the shift handover, could have a devastating impact. Past major incidents like Buncefield, Texas City and the Gulf of Mexico occurred largely due to poorly conducted shift handovers and a lack of communication of information [7]. Communication barriers create a challenge for promoting safety in an organization [14], as ensuring clarity, credibility and impact [15] are vital in safety communications.

Barriers to effective communication include a lack of information or knowledge, a lack of attention to detail, selective listening, status prejudice and differing perceptions of risks [16]. The lack of structure and insufficient information are often not well-documented in the shift logbooks, as it was found that 80% of the logbooks in the oil and gas industry’s plants are unstructured and sometimes include unnecessary information with unclear key messages [8].

There is a plethora of research providing empirical evidence that effective communication management could improve work-related safety performance, which translates to disaster avoidance (e.g., [7,17]). However, the study reported in this paper focuses on the Malaysian context of the oil and gas industry. The study was conducted to investigate how an organizational communication climate and good communication management influence commitment to safety for avoiding incidents and disasters in a high-risk workplace environment. Previous studies related to safety communication in the oil and gas industry have focused on describing the current phenomena and investigating the relationship between communication and commitment [18].

There is also a study looking into the role of leader-workers that constitutes a safety-based organizational climate, and its impact on safety commitment [19]. In most of the existing studies, both communication and organizational climate are considered to be important antecedents that led to safety commitment. However, there is a limited study that further investigates the advanced role of or relationship between these two constructs.

Henceforth, this study embarks on investigating whether an organizational communication climate is a mediator when explaining the relationship between communication management and disaster avoidance.

The research questions are as follows: how does communication management impact disaster avoidance and the organizational communication climate in the oil and gas industry? Does the organizational communication climate have a significant impact on disaster avoidance? Does the organizational communication climate mediate the relationship between communication management and disaster avoidance?

This article aims to answer these research questions. First, we will describe and provide arguments from past literature related to disaster and hazards in the oil and gas industry, communication management, disaster avoidance and the organizational communication climate. Based on this discussion, we will develop the framework and hypotheses of this study. In the methodology section, we will identify the method and analysis used to conduct this study and present findings from the pilot study. This will be followed by a presentation of our results and hypotheses testing. The next section includes a discussion based on the findings and testing of our hypotheses. Finally, we will present the conclusion, limitations of the study, and future recommendations.

2. Literature Review

2.1. Hazards in the Oil and Gas Industry

The oil and gas industry is one of the most hazardous industries in the world. The high-risk activities associated with the industry, as well as the possibilities for a single incident to turn into a natural disaster, make safety issues vitally important in the field. Notable examples of such disasters are the Deepwater Horizon rig, the Exxon Valdez tanker and the BP Texas City refinery. As such, the discussion of hazards in the oil and gas industry always includes elements such as safety measures. Multiple studies have been conducted addressing the issues of hazards and safety in the oil and gas industries. Lilburne, Lant and Hassal [20] identified that experience plays an important role for workers when making a decision related to safety issues. They further suggested that the workers would benefit from more information, in which regard communication would be the crucial facilitator. In another study, it was shown that there is a conflict between risk and safety perceptions and production demand. In a study on oil and gas workers in Russia, Korneeva and Simonova [21] showed that factors such as production targets and the competencies expected of them affect workers' perceptions of a hazardous action. Table 1 shows a structured review of studies related to hazardous incidents in the oil and gas industry.

2.2. Safety Communication

Safety communication guides and motivates workers to commit to safety and reduce the chances of incidents in the workplace [25]. Acar and Acar [26] emphasize that safety communication procedures help to improve workplace safety practices. Safety rules and guidelines, for example, are considered as written communications for employees [27]. Vatanparast, [8] for instance, found that every incident in the industry has been related to communication errors that occurred during shift handovers. Safety communication procedure during the shift handover is crucial [7], as it could be a contributing factor to major incidents. A study reported that even though startup, shutdown and changeover comprise less than 5% of the activity at the plants, 40% of the recorded incidents take place during this time [8]. Besides this finding, in a study conducted to investigate safety challenges in the Oman water sector, it was identified that despite the fact there are regulations related to safety, the workers do not always put safety first during production and operation [28]. Thus, there is a definite need for proper safety communication.

Table 1. Structured review on studies related to hazardous incidents in the oil and gas industry.

Place of Study	Subject of Study	Summary Key Findings	Sources
South and North Russia	Employee psychological safety features	Psychological features related to safety are subjected to geographical region and the location of the oil and gas operation	[21]
Offshore within the Arctic Region	Case study on past hazardous incidents related to oil and gas operation	Natural hazards are one of the major problems in the Arctic region. Safety management is one of the strategies to ensure a “zero accidents” policy can be achieved	[4]
Oil and gas utility companies in Pakistan	Behavior-based safety in reducing hazardous accidents.	The workload is a major factor associated with safety negligence. Employee knowledge associated with safety measures can be improved through proper programs and courses	[22]
Iranian petrochemical companies	Unsafe work behavior	Workers who are exposed to condescending safety supervision and workplace bullying are more likely to engage in risky and unsafe behaviors, which leads to a high probability of hazardous incidents	[23]
Malaysia oil and gas companies	Non-compliance with safety regulation	Financial limitations, an insufficient workforce, and lack of supervision might contribute to safety negligence and hazardous incidents	[24]

According to Shohet et al. [29], there is a need to integrate communication approaches in managing safety among employees. Besides using a technological approach, such as integrated communication devices in various forms to enhance communication capacity and capability [29,30], the management of safety communication is also crucial. Well-developed communications management systems should entail safety communication in a paramount position, from which communication should encourage the process of exchanging information between personnel [31]. Furthermore, communications management provides a space for interaction and a discussion platform for changing ideas and discussing safety issues. Thus, the first hypothesis of the study is:

Hypothesis 1 (H1). *Communication management has an impact on disaster avoidance.*

However, the issue encapsulating safety communication revolves around the direction of communication in the organization. In a common communication direction, the management will oversee and supervise the adherence to safety regulations. Despite that, studies have shown that there is a possible conflict between management policy and management actions [32]. This conflict could undermine employee trust and thus lead to incompletion with safety regulations in the organization. Therefore, in nurturing a balanced and comprehensive safety climate, attention should be given to improving communication management and capacity.

For instance, in a study conducted in Saudi Arabia, it was found that communication is an essential influencing factor that contributes to a better safety climate in the construction industry [33]. Moreover, it was argued that a dynamic internal communication system is vital in a high-risk industry such as oil and gas, as it will allow a lower attrition rate among the workers [34]. Hence, it is important for an organization's climate to have a proper communication mechanism. The communication mechanism will facilitate the flow of information as well as the resolution of disputes related to safety and disaster avoidance. Thus, the second hypothesis of this study is:

Hypothesis 2 (H2). *Communication management has an impact on the organizational communication climate.*

2.3. Organizational Communication Climate

The definition of an organizational climate refers to the “relatively enduring quality of the internal environment of the organization that (a) is experienced by its members, (b) influences their behavior, and (c) can be described in terms of values of a particular set of characteristics (or attributes) of the environment” [35]. The internal environment plays an important role in the relationship between the organization leaders and the other organization members. Effective communication between these two parties is argued to nurture the development of a collaborative communication climate, in which its role is significant to enhance compliance with safety regulations [18]. The leader’s role is essential in this area. According to a study conducted among workers in the United States, supportive communication from leaders toward the workers stimulates symmetrical communication in the organization [36]. Symmetrical communication is required to foster and improve communication mechanisms in the organizational climate. The findings from the study further indicated that a well-equipped communication mechanism leads to employee creativity [36]. A similar organizational communication climate could be applied in terms of safety commitment and disaster avoidance.

Apart from the communication mechanisms, leaders play a significantly important role in directing employees for safety improvement practices. The leaders need to motivate workers to accomplish safety tasks and meet the challenges, to maintain safety commitment [37]. Leadership commitment is a process of communication and interaction between the leaders and the workers, by showing concern for their welfare, to attain the highest level of safety commitment in avoiding incidents and disasters [38]. Opening up the climate to two-way communication could, however, be a major challenge to an engineer when assuming a managerial role [39].

As engineers are trained to be task-oriented and highly technical, training such employees in people skills, i.e., communication skills, can be challenging, especially when managing safety-related matters and conflicts among the employees, and across the departments, to maintain a supportive climate. This is especially necessary when communicating with personnel from various levels and specialisms, i.e., management, executives, non-executives and technical staff. Employees in the oil and gas industry must put safety as a top priority. Failure and ineffective communication could be fatal, resulting in loss of life and manpower [8].

Safety-related communication management between leaders and employees can hence have a significant impact on an employee’s safety commitment [40] to avoiding disasters and incidents. Safety communication management comes in varying forms, including policies and procedures, performance statistics, hazard and incident reports, workplace inductions, risk assessments, and training. The information must be presented by the organization leaders and management in a manner that recipients can understand [15]. Recognizing language implications at such levels of communication is also essential, to ensure that all employees have a shared mission and vision of the organization [41,42]. Therefore, the third hypothesis for this study is:

Hypothesis 3 (H3). *The organizational communication climate has an impact on disaster avoidance.*

The choices and the usage of words in communication shape the perceptions formed by individuals [43]. Such choices of language and words have a profound influence on the outcome of safety communications [16]. Specifically, communication strategies are employed by speakers, particularly when communication breaks down [44,45]. The choice of language and words can have a profound influence on the outcome of safety communications. The management teams of the organization and at the plants have the primary responsibility for the establishment of a positive communication climate within the organization. “Climate” is a well-established term in the field of communication that

has long been defined as the “relatively enduring quality of the internal environment of the organization that is experienced by its members, [. . .] influences their behavior, and [. . .] can be described in terms of values of a particular set of characteristics (or attributes) of the environment” [46].

The climate thus sets an atmosphere in the organization that either encourages or discourages communication. Organizations with supportive environments encourage worker participation, the free and open exchange of information, and constructive conflict resolution. In organizations with a defensive climate, employees keep their views to themselves, make only guarded statements, and suffer from reduced morale. Thus, effective communication is important for the establishment of a collaborative communication climate.

Safety commitment is essential to avoid incidents and disasters and requires the involvement of every individual employee. Commitment to incident and disaster avoidance could improve workplace safety if every individual followed the organizational safety goals and was willing to improve safety performance [47]. Safety commitment is vital, which contributes to the intensity of employees to determine company initiatives and develop personal approaches toward workplace safety [48]. Safety commitment in the workplace at the individual level is associated with behavior and attitude [19]. The leadership way of communication influences employees’ motivation to maintain safe practice. Numerous studies have discussed the importance of safety commitment for workplace safety performance [14]. Hence, the fourth hypothesis of this study is:

Hypothesis 4 (H4). *The organizational communication climate has a mediating impact on the relationship between communication management and disaster avoidance.*

The framework of this study is shown in Figure 1 below.

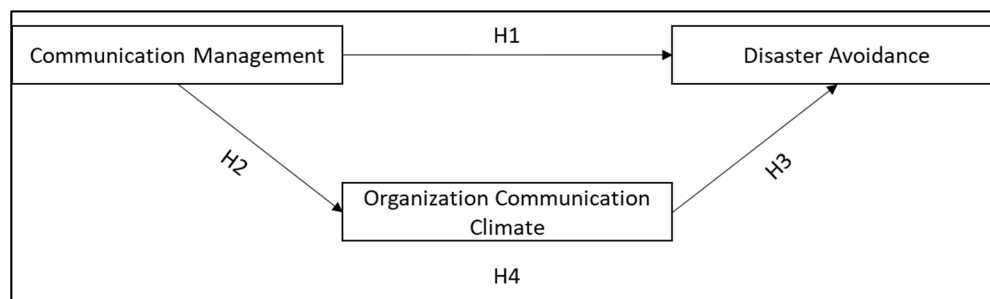


Figure 1. Conceptual framework of the study.

3. Methodology

This study is based on a quantitative research design in addressing the developed research questions. As the context of this study is on disaster avoidance in oil and gas plants, the respondents were the technical employees, executives, and management personnel of oil and gas industry facilities in Malaysia. Questionnaires were disseminated as an instrument for data collection in this study. The following section discusses the items used in the instrument.

3.1. Measurement

The questionnaire used in this study was designed based on a number of studies conducted on organizational communication climates, communication management and disaster avoidance. The questionnaire employed a 5-point Likert scale to record the responses given by the respondents. There are 7 items to measure communication management, which were adapted from Vinodkumar and Bhasi [49], 7 items to measure the organizational communication climate, which were adopted from Micheal et al. [50], and the final 7 items were adopted from Sodarni [51] to measure the disaster avoidance construct.

3.2. Sampling

Based on the calculation of a sample size to meet the statistical power requirement, as assessed by the G-power sample size calculation software, the minimum sample required is 217 [52]. However, 260 respondents were involved in the study. Purposive sampling was employed, as this study required specific technical skills, and the respondents had to be active workers in the oil and gas industry. The study was conducted at several oil and gas facilities across several companies in Malaysia. Purposive sampling was employed to ensure that the respondents fulfilled the research requirement.

3.3. Pilot Study

Prior to full-scale data collection, a pilot study was conducted to test the reliability and validity of the questionnaire used. 50 respondents who have experience of working in oil and gas facilities were involved in this pilot study. The Cronbach's alpha score and composite reliability score were used as a measurement for identifying the internal consistency among the items used. Each construct showed a reliability score of more than 0.7, indicating that the instrument used was reliable [53].

3.4. Data Analysis

The responses collected from the respondents were first screened for missing data. The data were then analyzed for demographic and descriptive findings using descriptive statistics. For this study, we used partial least square—structural equation modeling (PLS-SEM) for inferential statistics and hypotheses testing [54,55]. Before the hypotheses testing, which comprised structural model assessment, we evaluated the needs of the measurement model. There were three required assessments: internal consistency reliability, convergent validity, and discriminant validity [56]. Findings from the first and second assessments are shown in Table 2.

Table 2. Cronbach's alpha, composite reliability and average variance extraction (AVE) for each construct.

Construct	Composite Reliability	Reliability (Cronbach Alpha Score)	Average Variance Extraction (AVE)
Communication Management	0.834	0.862	0.673
Organizational Communication Climate	0.853	0.837	0.612
Disaster Avoidance (Safety Commitment)	0.734	0.734	0.706

All constructs show a composite reliability score between 0.7 and 0.9, indicating internal consistency and an average variance extraction (AVE) score of more than 0.5, indicating that the construct explains 50% of the variance of its item [57]. Additionally, the heterotrait–monotrait (HTMT) test was conducted to assess the discriminant validity of the instrument, obtaining a score of less than 1 for each construct, indicating high discriminant validity [56].

We also included academic qualifications as the control variable in this study. We tested the relationship between academic qualifications and both the organizational communication climate and disaster avoidance. The findings showed that academic qualifications did not have a significant relationship with the organizational communication climate ($\beta = 0.031$, t -test = 0.63, $p = 0.191$) and disaster avoidance ($\beta = 0.082$, t -test = 0.103, $p = 0.167$).

4. Results

4.1. Demographic

The demographical analysis shows that the majority of the respondents were male (95%). The majority of them were also in the age group between 30 and 50 years old (72.7%). Furthermore, 60% of the respondents had been working for more than 10 years in the oil and gas industry. If we turn our attention toward workplace accidents, more

than 80% mentioned that they had never encountered workplace accidents. However, 40% of the respondents acknowledged that there were near-miss cases that happened at their workplace. Details on the demographic study are shown in Table 3.

Table 3. Demographic statistics of respondents ($n = 260$).

Category		Percentage (%)
Gender	Male	95
	Female	5
Age	20–29	18.8
	30–39	38.5
	40–49	34.2
	50 and above	8.5
Highest Academic Qualification	Certificate	56.9
	Diploma	23.1
	Bachelor's degree	17.3
	Master's/Ph.D.	2.7
Current Designation	Executive	22.3
	Non-executive	77.7
Working Experience (Years)	Less than 2	4.2
	2–5	9.6
	6–10	26.2
	11–15	14.6
	More than 15	45.4
Workplace Accident	No	80.8
	1–2 times	12.3
	3–5 times	5
	More than 5 times	1.9
Near Misses Incident	Yes	40.4
	No	59.6

4.2. Descriptive Analysis

Table 4, presented below, shows the mean scores, standard deviation, and factor loadings for all the items used in the study. Overall, the findings suggest that the respondents were satisfied with communications by the management (mean = 4.01, SD = 0.539). Specifically, it shows that management always communicated well about safety and health issues that were practically relevant to the organization (mean score = 4.21), especially in meetings (mean score = 4.28), and the respondents could obtain safety information from the company (mean score = 4.10).

Furthermore, regarding the organizational communication climate, the findings indicated that the respondents knew how they could communicate with their supervisors (mean score = 4.00). Regarding disaster avoidance, our study found that the respondents agreed that it was very important to work in a safe environment (mean score = 4.54). They were very cooperative with their supervisor/manager about safety issues (mean score = 4.45). Besides these findings, the respondents cared about the safety rules and regulations in their workplace (mean score = 4.26) and were willing to obey the regulations to keep their workplace safe (mean score = 4.35).

Table 4. Descriptive analysis of the study.

Description/Item	Mean Score	Standard Deviation	Factor Loading (CFA)
Communication Management			
Safety issues are included in communication meetings.	4.28	0.649	0.834
Relevant safety and health issues are always communicated.	4.21	0.613	0.772
I am informed of the outcomes of safety and health meetings.	3.88	0.731	0.751
I can get safety information from the company.	4.10	0.567	0.803
Management operates an open-door policy on safety issues.	3.85	0.800	0.812
There is sufficient opportunity to discuss and deal with safety issues in my organization meetings.	3.86	0.748	0.771
There is open communication about safety issues in this workplace.	3.88	0.794	0.831
Organizational Communication Climate			
My supervisor communicates with me about my job-related problems and needs.	3.76	0.785	0.882
I know how I can communicate with my supervisor.	4.00	0.593	0.841
My supervisor informs me of my potential.	3.71	0.750	0.912
My supervisor would use all means of communication to help me solve work-related problems.	3.71	0.789	0.843
My supervisor would use all means of communication to “bail me out” even though it was at his/her expense.	3.20	0.895	0.871
I exchange information about my supervisor’s decisions when he/she is not present to do so.	3.63	0.682	0.802
I feel comfortable discussing safety issues with my supervisor.	3.95	0.667	0.825
Disaster Avoidance (Safety Commitment)			
It is very important to work in a safe environment.	4.54	0.604	0.841
I cooperate with my supervisor/manager about safety issues.	4.45	0.704	0.792
I really care about the safety procedures and regulations at my workplace.	4.26	0.602	0.819
I would like to obey the safety regulations in order to keep my workplace safe.	4.35	0.707	0.810
I will ensure the risks are assessed before starting my work.	4.24	0.580	0.738
I always ensure that the safety equipment is working properly before I start a job.	4.37	0.577	0.883
I am willing to put in great effort to achieve safety goals.	4.24	0.589	0.765

4.3. Hypothesis Testing

Three different tests were conducted to test the hypotheses. First, the predictive power of the relationship was measured using R^2 , to measure the variance explained in

each endogenous construct (i.e., the dependent variable). The second test measured the statistical significance of each relationship through bootstrapping [58]. A p -value of less than 0.05, and a T score of more than 1.96, is considered a statistically significant relationship; hence, the hypotheses should be accepted. The details of the findings are shown in Table 5. The findings indicate that communication management has a significant impact on disaster avoidance and the organizational communication climate. The organizational communication climate has a significant impact on disaster avoidance.

Table 5. Construct relationship and hypotheses testing.

Hypotheses	Std Beta	T Statistics (O/STDEV)	p Values	Hypotheses Testing
H1: Communication Management -> Disaster Avoidance	0.531	4.212	<0.001	Supported
H2: Communication Management -> Organizational Communication Climate	0.589	4.705	<0.001	Supported
H3: Organizational Communication Climate -> Disaster Avoidance (Safety Commitment)	0.483	9.431	<0.001	Supported

4.4. Assessment of the Mediation Analysis

The mediation models were tested to examine the indirect effects of the organizational communication climate on the relationship between communication management on disaster avoidance. The bootstrapping analysis has shown that the indirect effects are significant. The mediation assessment is as follows: $\beta_1 = 0.339$ (t -values = 3.685)

The indirect effects (95% Boot CI Bias Corrected: β_1 (LL = 0.156, UL = 0.542) show that each upper level (UL) and lower level (LL) of each relationship do not straddle 0 in between, indicating that there is a mediation in the relationship [56,59]. Table 6 shows the detail of the mediation analysis, while Figure 2 indicates the final findings of the relationship examined in the study. Hence, the fourth hypothesis is supported.

Table 6. Result of the mediation analysis.

Mediating Relationship	Std Beta	p Values (Significance Level)	Hypothesis Testing
H4: Communication Management -> Organizational Communication Climate -> Disaster Avoidance (β_1)	0.339	<0.001	Supported

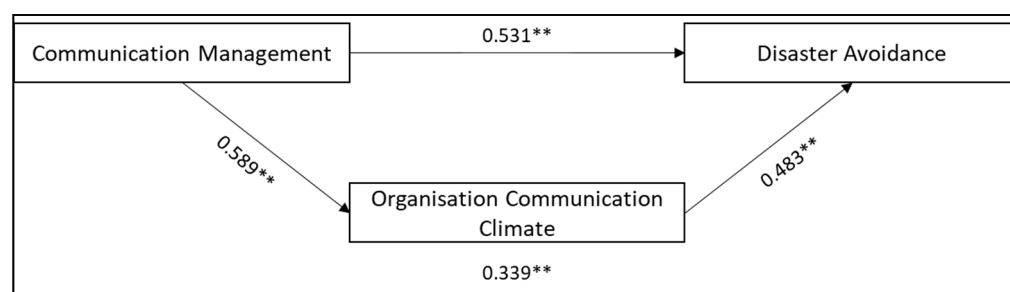


Figure 2. Result of the relationship examined in the study. ** $p < 0.001$.

5. Discussion

This study seeks to investigate the impact of both communication management and the organizational communication climate on disaster avoidance in the oil and gas industry. In achieving that, we developed four hypotheses and tested them. Based on the findings, this indicates that all four hypotheses are supported.

Discussion on H1—Communication management has an impact on disaster avoidance.

The first hypothesis of this study showed that communication management has an impact on disaster avoidance. It indicated that, although safety regulations and preventive measures through a routinized approach are essential, proper communication management is also crucial. Communication, in this case, includes safety information that is disseminated regularly to the workers, of which they are reminded frequently during a meeting, briefing or any other platform.

An ill-equipped communication platform could lead to misinformation that consequently causes disaster, especially in a high-risk environment such as the oil and gas industry. Our findings are similar to those of a study conducted by Dahl and Kongsvik, where they reported that workers in the oil and gas industry are committed to safety practices and disaster avoidance when the management can communicate openly and constantly emphasize the importance of safety regulations in the industry [38].

It also mirrored the findings of safety regulations in other industries. For instance, researchers showed that improved communication management through integration with mobile applications facilitates safety adherence by workers in the construction industry [29]. Hence, it is proven that communication management is crucial as it is the main vehicle for disseminating information relating to safety issues, which is essential for disaster avoidance.

Discussion on H2—Communication management has an impact on the organizational communication climate.

The second hypothesis in which communication management has an impact on organizational communication climate is also supported. The key factor in nurturing a positive communication climate in an organization is having a systematic information flow [60]. Through proper communications management, the process of information circulation within an organization can be streamlined according to its specific objectives or functions.

Consequently, any information barriers can be overcome. Furthermore, noise-related issues that were notorious for hindering information transfer and knowledge-sharing could be reduced [61]. This is crucial, especially in a high-risk work environment such as the oil and gas industry, where disasters and accidents can happen if the information is not properly transmitted among the workers. This has been similarly reported in various other studies where the systematic management of information is highlighted; miscommunication is frequently reported as one of the main causes of accidents in the oil and gas industry [62,63].

Furthermore, previous studies have highlighted the primary function of communication among peers in nurturing an organizational communication climate [61]. Peer communication is also an important part of communication management. The ability of communication management to promote information-sharing, as well as increasing transparency and openness in communication, enables workers to constantly remind each other of issues; this reflects a good organizational climate, especially related to avoiding calamities in the working environment.

Discussion on H3—Organizational communication climate and disaster avoidance.

The third hypothesis of this study has been proven, in that the organizational communication climate does have an impact on disaster avoidance in the oil and gas industry. As discussed earlier, a positive organizational communication climate is indicated by consistent information flow in the organization, bypassing barriers such as noise [60]. Thus, having constant and consistent information is paramount in disaster avoidance. An organization that constantly and consistently emphasizes the importance of information-sharing between workers concerning safety matters, such as work schedule or machinery breakdown, will be able to minimize workplace accidents in even the most hazardous workplace.

This study is in line with the findings from a study conducted in the Canadian oil and gas industry. The study reported that a firm and rule-oriented leadership, which is the main component for a good organizational climate, fostered strong compliance with rules and good safety behavior in the workers [64]. Furthermore, in another study, the researchers

found that strong leaders will influence workers to cultivate positive communication, thus contributing to enhancing workers' commitment in regard to safety and disaster avoidance [18].

In contrast, negligence and information blocks, which reflect a bad organizational communication climate, could lead to potential disasters and accidents. This has been similarly reported in other studies. For instance, lack of information sharing has been blamed for several cases of dust explosions in powder-manufacturing industries in Malaysia and China [65]. Furthermore, an infertile communication climate in an organization has led to improper planning, overlapping schedules and conflict escalation in the workplace [66]. These are among the factors that could contribute to an increase in workplace accidents.

Discussion on H4—Mediating the impact of the organizational communication climate.

The fourth hypothesis of our study regarded identifying the mediating impact of a communication climate, which has been proven to have a statistically significant mediating impact on the relationship between communication management and disaster avoidance. One of the key factors that lead to disaster avoidance is employee compliance and their commitment to safety [51]. In order to cultivate such a working culture, attention needs to be given to promoting communication and information-sharing.

Thus, this study highlighted that the functionality and working mechanisms of communication in promoting worker's safety compliance can be explained by the organization's communication climate. According to Lantera (2019), workers' behavior depends on how information is being delivered to them, especially by their leaders. Information coming from an unprofessional supervisor might not be treated seriously, which portrays a bad organizational communication climate.

Similarly, the inability of the management to emphasize the seriousness and importance of workplace safety can contribute to a non-compliance attitude in workers [61]. Compliance is crucial in a high-risk environment like the oil and gas industry, where the risk of accidents is high. Hence, it is imperative to highlight the mediating impact of a good organizational communication climate when explaining the relationship between communication management and disaster avoidance.

Moreover, the capability of an organizational communication climate depends on the leader-member exchange in the context of this study. As this is proven to be the significant mediator that explains the relationship between communication management and disaster avoidance, the industry should allocate more resources to strengthen its organizational communication climate. Multiple strategies can be adopted, including creating an integrated communication control involving multiple devices and the Internet of Things (IoT). This application has been tested and proven to be beneficial for other industries, such as construction, in promoting good safety behavior among the workers [29]. It can likewise be applied in the oil and gas industry.

6. Conclusions

The findings of this study extend empirical evidence for previous research in the context of disaster avoidance in the oil and gas industry. First, the findings demonstrate that communication management could impact the organizational communication climate. They emphasize elements such as constant information transfer and openness in communication, throughout the whole organizational structure.

These findings reduce the gap in previous studies, where the role of communication management was proven to influence conflict resolution [18,67]. Moreover, this study also reported that the organizational communication climate is the mediating element that explains the relationship between communication management and disaster avoidance in the oil and gas industry. It links the interrelationship between the three elements, which highlights its importance in overcoming man-made disasters and catastrophes in the oil and gas industry.

The findings from this study will not only contribute to the discourse in the context of disaster avoidance and safety management in the oil and gas industry but will also benefit practitioners and policymakers. For instance, this study indicated that an organizational communication climate is important and that it could be enhanced through management and supervisor commitment.

The importance of management and supervisor commitment could be viewed from the perspective of employees' welfare. Communicating with them as a way to achieve safety goals alone is insufficient. The management needs to increase the social relationships and interaction with their employees. One avenue is through conducting social activities, such as team building, and through corporate social responsibility (CSR) programs. In doing so, they could gain the trust, loyalty and cooperation from their employees that will then translate to a better organizational communication climate and disaster avoidance.

7. Limitations and Future Recommendation

The first limitation of this study is its focus on organizational scale, and it does not investigate individual factors, such as reticence, as a hindrance to communication. Several studies have highlighted that, despite working in a positive organizational climate, a person may still choose to be reticent and may tend to be reserved in communication and when sharing information [68,69]. Thus, future studies need to investigate the impact of being reticent about disaster avoidance on the organizational communication climate.

Next, this study does not include working experience as a factor that might affect communication management, climate and disaster avoidance. Having worked too long in an organization or industry might have both positive and negative effects. From a positive perspective, workers tend to be more experienced and familiar with the risks and the related information. However, the workers might become too comfortable with the working environment and take chances. Furthermore, as they already understand the details of the workplace, non-compliance behavior might occur. Therefore, future studies need to investigate the impact of working experience on all communication management, climate and disaster avoidance factors.

In addition, as the communication approach is becoming more advanced in IR 4.0, the introduction of new technology, such as new media, artificial intelligence, and augmented reality, is emerging. These technologies could have an impact on the communication relationship between the organization and its workers. This study does not investigate the capability of such elements. Henceforth, future studies shall explore the impact of technological elements on communication management, organizational climate and disaster avoidance in the oil and gas industry.

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