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The Impact of the Implementation of Safety Measures on Frontline Workers' Safety Accountability: A Saudi Arabian Case Study of a Well Intervention Business Model

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Abstract: Even in the best-case scenarios, working in the energy sector is tough because of the numerous possible risks that can arise during routine tasks. Therefore, the top priority of firms' management is their responsibilities for their employees' safety as they undertake various roles. In this study, the researchers investigated the effect of safety measures on the safety accountability (SA) of the Saudi Arabian Aramco Company's frontline workers. The researchers used a quantitative approach and collected data through a survey questionnaire. We applied a random sampling technique to target the company's frontline workers. Initially, the researchers distributed 450 questionnaires and received back 242 valid samples. This represented a 53% response rate. Next, the researchers applied Structural Equation Modeling (SEM) to assess the directions of the hypothesized paths. This study's findings demonstrate that safety policy (SP), safety training (ST), safety communication (SC), safety commitment (SCT) and safety incentives (SIs) have positive and significant effects on frontline workers' safety accountability (SA). In addition, this study's findings provide guidelines to policy makers, government authorities and company heads to implement further initiatives that adopt precautionary and safety measures to protect their frontline workers' lives. Further, this study's findings show the benefits of opening avenues of research to concentrate on safety measures such SP, ST, SC, SCT and SIs in order to create the frontline workers' responsibilities for safety accountability (SA). Finally, the empirical evidence, which the researchers obtained from the Aramco Company's frontline workers, adds to the depth of knowledge on this subject; validates the environmental science and management literature; and provides road maps for other companies to investigate safety challenges

Keywords: safety measures; safety policy (SP); safety training (ST); safety communication (SC); safety commitment (SCT); safety incentives (SIs); safety accountability (SA); frontline workers

Citation: Al-Arnous, A.B.; Abdelwahed, N.A.A. The Impact of the Implementation of Safety Measures on Frontline Workers' Safety Accountability: A Saudi Arabian Case Study of a Well Intervention Business Model. *Safety* **2022**, *8*, 82. https://doi.org/10.3390/safety8040082

Academic Editor: Raphael Grzebieta

Received: 21 October 2022
Accepted: 8 December 2022
Published: 9 December 2022

1. Introduction

Safety is a significant constituent of any firm's activities [1]. A safe workplace ensures that safety measures are at the forefront of all such activities. Through advanced safety measures, the firm can minimize accidents at work, injuries, death and, also, medical illnesses [2]. Accountability begins with the firm's management leading by example and, to this extent, the tone set by the top management. A significant flow of information enables the frontline workers to understand the firm's activities and their responsibilities in carrying out tasks.

The firm's management is responsible for informing the frontline workers of their performance (positive or negative) in carrying out their tasks and their perceptions about either the ease or comfort of their workplace [3]. By creating an environment where employees feel safe to be themselves, they can carry out their work and perform as well as they can [4,5]. Although energy firms consider safety to be their top priority, accidents and injuries in this field remain a particular concern. Globally, every oil and gas industry

faces the challenge of addressing such risks. More particularly, Saudi Arabia's oil and gas industry is a relatively new industry with less than 100 years' experience. Most Saudi Arabian energy companies make safety their top priority since this is monitored closely by the Saudi Arabian Government's Ministry of Energy. A minority of Saudi Arabian energy companies are inclined to marginalize this message rather than putting in place plans to benefit their employees. This is despite effective management being helpful in reducing the commonplace fatal accidents suffered by their workers. However, to increase their employees' safety, the Saudi Arabian energy firms must standardize employee training; evaluate all potential risks to their frontline employees; and establish a safety culture [6]. Some ways in which the energy firms' management can reduce the workplace risks to their employee risks include the evaluation of the potential risks and ensuring the fulfillment of their employees' training needs. Since Saudi Arabia's energy industry is a fast-moving sector that is challenged by newly introduced technologies and safety policies, it is imperative that the energy firms implement changes quickly in how they manage their frontline employees and that these include carrot and stick approaches.

In the literature, various scholars have suggested that different factors, such as government support, safety policy (SP), safety training (ST), safety communication (SC), safety commitment (SCT), safety incentives (SIs), safety measures and behaviors, safety climate and supervisory, engagement and policies related to risk assessment and employees' competencies, improve the frontline workers' safety accountability (SA), performance and responsibilities towards safety [7–13]. However, the above literature shows that despite being Saudi Arabia′s leading national oil company and contributing massively to the development of the country's socioeconomic infrastructure [14]. Aramco has not paid sufficient attention to its safety procedures and its accountability towards its frontline workers.

Frontline workers in Saudi Aramco′s well intervention business model are the employees who deal directly with well intervention operations in the field. These are reflected in the job titles of operators, senior operators, site foremen and field superintendents. Frontline workers are the primary line of employees to deliver the organization's product (well intervention jobs) via operating equipment, controlling field operations and supervising contractors. Aramco′s frontline workers are engaged in operations such as refining, drilling, exploration, oil creation and marketing [15]. They are observed to be frequently at risk because of the safety issues and uncertainties of working in such an environment [16]. Therefore, in the workplace, the most challenging and difficult factor is the workers′ safety because it is associated with the threat to life. Consequently, in this study, to investigate the measures of safety accountability and safety guidelines and the site rules on drilling operations, the researchers devised the following research questions:

> *What is the impact of safety measures on the Saudi Arabian Aramco frontline workers′ safety accountability?*

The researchers consider that, by illustrating safety measures in different paradigms, this study's findings can improve safety measures within Saudi Arabia's energy sector. This study focuses on the factors that elevate the accountability of the industry's frontline workers in creating a safety culture that consistently promotes safety and vastly reduces the number of injuries among frontline workers. Therefore, the examination of the relationships between safety measures, such as SP ST, SC, SCT and SIs and safety accountability (SA), helps to improve the energy sector's workplace safety. More specifically, ore extant, this study's findings aim to provide proposals and recommendations to help senior management and decision makers within Saudi Arabia's energy industry and, more generally, other parts of the world which are encountering similar circumstances. By concentrating on SP ST, SC, SCT and SIs, this study focuses on the elevation of frontline workers′ SA accountability in these respects. This study' findings provide decision makers with insights to enable them to create robust communication protocols, clear operational policies, risk-based training matrixes and key performance indicators that demonstrate management commitment towards safety.

2. Literature Review and Formulation of the Hypotheses

Despite the efforts of firms' management, the energy firms' frontline workers are seen typically as being responsible for their own safety. Nevertheless, the energy firms' management need to ensure that the frontline workers operate in safe environments [17]. On the one hand, some of the factors, which tend to risk employees' safety, include the management's disregard in ensuring employees' safety. On the other hand, the frontline employees' lack of adequate knowledge of what is essential and should be prioritized also seem to be one of the reasons why these employees do not adhere to their firms' safety rules. The energy firms' poor management also tends to cause frontline employees not to follow workplace safety rules. Therefore, energy firms' management should provide adequate training and education to their employees. According to [11], training and education sessions help the employees to be aware of and know the need for workplace safety they carry out their various tasks.

According to [7], the Saudi Arabian Government must support programs to expand safety and SA. More attention has been paid to these initiatives towards achieving a dramatic shift in the measurement of safety practices. In a construction company, [9]'s seminal work explores the interface between the impacts of safety management and the reasons for the safety climate moving towards safety performance. The study's findings demonstrate that safety incentives and robust and meaningful roles in enhancing safety performance result in the SA of safety management systems. Similarly, Wang, et al. [13] encompass the notion of safety stressors at the team level and highlight the contribution that team safety stressors make to workplace safety. Their study findings demonstrate the safety responsibility and affective commitment in developing the connection between proactive safety behaviors and team safety stressors. In South Africa, a quantitative assessment shows that a supervisor's tendency to make both herself and her team accountable is associated with good safety behaviors. The relationship between safety climate and supervisory accountability and engagement is the strongest predictor of safety behaviors. Moreover, the safety climate is a significant analyst of safety behaviors [12]. In Brazil, programs promote the safety culture at both the national and large-scale levels. The optimization of the safety culture affects large-scale programs and needs active multi-level empowerment and capitalization to stimulate the productive capacity at both the national- and local-level stimuli; [18,19] recommends that coal mine accidents are extremely distressful in terms of individuals' safety and social improvement. The intelligent mines have upgraded their environments to help with safety related production. Nevertheless, safety management requires new variations and greater needs to match and the safety circumstances. In the United Kingdom's (UK) coal mining operations, there is full concentration on standards-based safety management systems of [8].

In oil and gas companies, the core assumptions of safety management are standardization and advance planning. Major companies implement initiatives towards maintaining and enhancing standardization [20]. According to [21], integrity management program components, such as responsibilities, training, organizational roles, commitment, policy and risk assessment and competency, have a positive and significant influence on the level of maturity of the safety culture. In terms of oil and gas companies' operations, they face a huge challenge in overcoming the numerous human, cultural, technical and operational restraints to develop a conducive environment. Moreover, it is a grim task to implement safety management systems [22]. The findings of a literature-based investigation concerning the Petrobras Company shows that the two fundamental problems are the lack of uniformity in safety management systems and weak enforcement. In different industries, the improvement of sustainable performance is one way to develop an environment to benefit the firm's operations. In the offshore oil and gas industry, the use of possibly hazardous materials and having to operate under increasingly hostile environments increases the risk of significant accidents [23]. Related to the same domain, [10]'s findings posit that a measurement of occupational health and safety depends profoundly on lagging metrics, such as workplace injury reports. At the same time, these measures offer practical feedback

on flaws and safety incidents happening in the oil and gas industry. Having conducted safety climate surveys in 13 offshore oil and gas installations, [24]'s findings show that there is an association between management practices and self-reported accidents. Moreover, in a few safety management practices, there is a correlation between the lower ratios of official accidents and fewer participants reporting accidents. In view of the association of its activities with the danger to human lives, the oil and gas industry needs to make strenuous safety efforts. Therefore, a predominant requirement of every industry is the maintenance of the SA. Consequently, the above-mentioned literature demonstrates in different aspects the significance of safety and that it is a robust challenge for all firms.

In the literature, SA is predicted through different factors such as SP, ST, SC, SCT, SIs, safety behaviors, lagging metrics, workplace injury reports, social developments and policies related to safety [7,9,12,18,19]. However, previous studies have focused mainly on companies, such as Petrobras, and have not investigated Saudi Arabian Aramco's frontline workers [10,23,24]. Therefore, to fill the gaps based on SP's, ST's, SC's, SCT's and SI's predictive powers towards SA, the researchers developed Figure 1 below to assess the SA of Aramco's frontline workers.

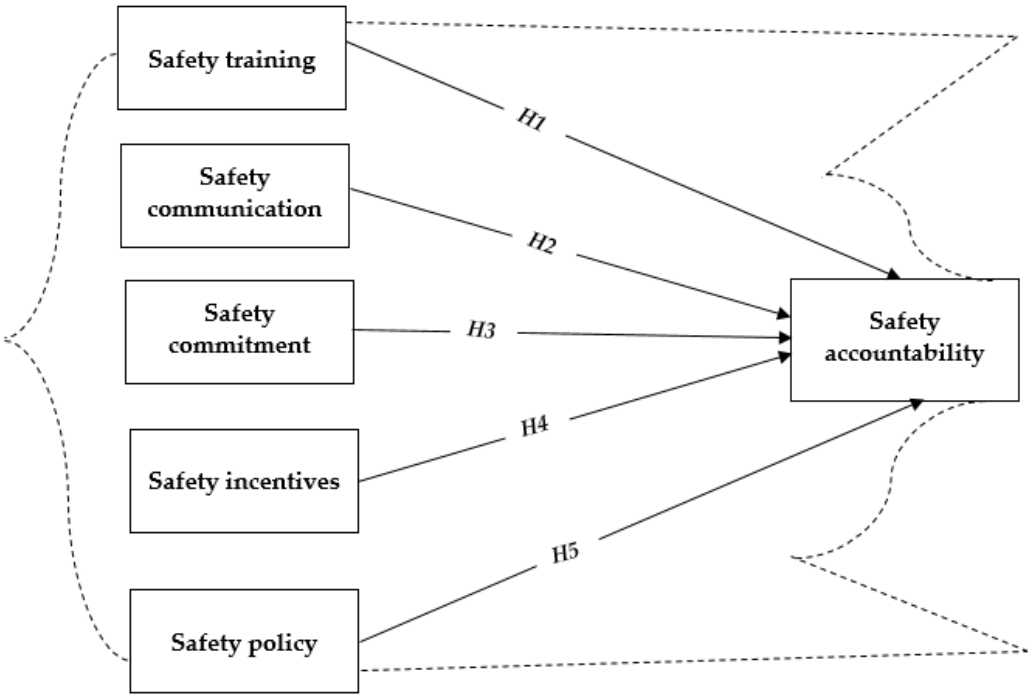

Figure 1. Conceptual Model. Source: Developed by the researchers.

2.1. Safety Training (ST) and Safety Accountability (SA)

Safety training (ST) prevents injuries and enhances the frontline workers' abilities, aptitudes, and skills; [25–27] states "instruction and practice for acquiring skills and knowledge of rules, concepts, or attitudes necessary to function effectively in specified task situations." ST is "instruction in hazard recognition and control measures, learning safe work practices and proper use of personal protective equipment, and acquiring knowledge of emergency procedures and preventive actions." In the current era, ST highlights a significant organizational difference between firms with beneficial safety programs from those with none. ST is a valuable tool that has a good reputation for enhancing frontline workers' workplace knowledge and safety skills [28].

According to [29], ST is planned to educate workers from different backgrounds to overcome workplace challenges and accomplish various tasks. A requirement of ST to circulate materials and to adapt their teaching smartness to outfit the necessities of each is that it matches the specific needs of every trainee. Several scholars, such as [26,30–32],

have investigated ST as a core aspect which maintains and develops the workers' safety attitudes. In the mining industry, [33]'s regression analysis demonstrates SC's positive role in enhancing SA and safety performance through its associations with SP, ST, SCT and SIs.

Similarly, [34]'s findings underline SA's influence on effective training through, when compared to unaccountable subjects, accountable subjects learning more and acquiring more notes during training. Consequently, as proven in different contexts and at different times, ST makes a vital contribution to SA. However, there is a need to further investigate the training perspectives of Aramco's frontline workers in relation to their SA. Therefore, the researchers formulated the following hypothesis:

H1. *ST plays a positive and significant role in creating SA among frontline workers.*

2.2. Safety Communication (SC) and Safety Accountability (SA)

Safety communication (SC) helps to inform the frontline workers about the workstation, its likely hazards and how best to eliminate them [26]. Technical communication is the best means of informing frontline workers about safety concerns [35]. According to [9], safety management systems can improve safety performance. Moreover, there is a positive correlation between SC, SIs and SA and safety performance. It is recognized that sometimes energy firms' frontline workers do not follow the safety rules. However, safety includes creating the most appropriate work environment where the frontline workers can be safe [36]. To achieve effective SC with their frontline workers, firms employ different modes and methods such as performance evaluations, group meetings, information memos and standard operating procedures and processes [37].

In a similar aspect, [38] investigated the Supreme Audit Institutions' (SAIs) communication strategies with the core objective of improving transparency among the frontline workers' SA. This study's findings demonstrate that a communication strategy plays a positive and significant role in achieving transparency and SA. More significantly, in the context of Saudi Arabia, the literature provides evidence of the positive connection between SC and SA, which was not investigated by previous studies. Therefore, the researchers formulated the following hypothesis:

H2. *SC plays a positive and significant role in creating SA among frontline workers.*

2.3. Safety Commitment (SCT) and Safety Accountability (SA)

Perceptions of frontline workers' SCT influence safety outcomes [39]. Among energy firms, frontline worker safety and performance of the assigned tasks are essential requirements if they are to meet their objectives and goals and those of their stakeholders. Globally, it is recognized that frontline workers' safety is of paramount importance [40]. One of the common reasons why frontline employees do not follow the safety rules is the lack of management commitment toward their safety. In some instances, uncaring attitudes and disinterest towards the frontline workers' welfare of the employees often originates from a total disregard for employee safety in the workplace. Some workplaces tend to expose the energy firms' management's recklessness in not caring about employee safety. The construction of such firms tends, globally, to disregard and dehumanize the safety of their frontline workers [41]. Accordingly, this leads the frontline workers to question their management's motives and commitment towards their safety. According to [42], frontline workers who ask their employers about their safety fuels disinterest in opening opportunities and doors for them to work in safe environments. Similarly, the findings of [33]'s empirical investigation indicates that SP, ST and SC with feedback and SIs promote frontline workers' safety behaviors. From the medical point of view, the lack of accountability and management creates barriers to decision making [43]. The findings of [44]'s investigation posit that there is a direct link between safety risk management and flight safety performance. In realizing the importance of SCT toward SA, the researchers formulated the following hypothesis:

H3. *SCT plays a positive and significant role in creating SA among frontline workers.*

2.4. Safety Incentives (SIs) and Safety Accountability (SA)

Safety incentives (SIs) reassure frontline workers to participate in safety and health practices. SIs are created to boost the workers' safe behaviors and to inspire their decision making through rewards and punishments and by enquiring about their well-being at the workplace site [45,46]. SIs are the protagonist determinant which motivates frontline workers to behave effectively on site and smoothly to adhere to safety regulations [47,48]. Ref. [49] suggests that managers frequently use four intervention strategies to either promote or discourage workers' specific behaviors. The strategies comprise positive and negative reinforcement, rewards and punishments. These (positive and negative) reinforcements provide frontline workers with rewards or punishment for displaying the desired and undesired behaviors. Regarding [50]'s theory, management may offer incentives, such as promotions, monetary rewards and praise, to motivate the frontline workers to fulfil their job responsibilities in a safe and effective manner. On an industrial site, when a worker constantly disobeys safety regulations, they may be dismissed from their employment to curtail such unsafe practices. In this way, the SIs are necessary tools to bring about SA among Aramco's frontline workers. In considering if SIs are the best predictors of SA, the researchers formulated the following hypothesis:

H4. *SIs play a positive and significant role in creating SA among frontline workers.*

2.5. Safety Policy (SP) and Safety Accountability (SA)

Safety policy (SP) sets the specific business goal which comprises the firm's commitment to safety. Traditionally, SP sets specific goals related to guidelines and instructions regarding health and safety issues and health on site [24,51]. According to [52], serious concerns about dam failure can lead to the safety of catchment basins being endangered. The potential for such failure is a reflection on the use of resources and land use planning policy and results in insufficient growth and is due to the lack of an assurance policy and accountability associated with water storage. The formation of best-practice policy for the use of resources is the preeminent practice for accountability of dam safety. Similarly, despite significant uncertainties about the costs and benefits of unsafe practices, the precautionary method is the best fit and most suitable basis for policy [53]. Through interviews, [54] investigated perceptions about the adequacy of dam safety policy in respect of Vietnam's ten dams. This study's findings demonstrate poor implementation of accountability and responsibility for dam safety. Further, the findings posit that Vietnam's dam safety assurance and accountability policies do not meet international benchmarks. Among South Korean frontline employees, there is a positive correlation between Corporate Social Responsibility (CSR) and frontline workers' sustainable safety behaviors. Moreover, the SP creates entirely the frontline workers' SA [55]. Consequently, an effective SP is a powerful instrument to save frontline workers' lives and to make them accountable for adopting such policies in their workplaces. In realizing the importance and significance of SP, the researchers decided to observe its efficacy among Aramco's frontline workers. Therefore, the researchers formulated the following hypothesis:

H5. *SP plays a positive and significant role in creating SA among frontline workers.*

3. Methods

3.1. Research Approach

In this study, the researchers aimed to explore the effect of safety measures on safety accountability (SA). Therefore, this study captures the frontline workers' attitudes and behavioral responses. The researchers applied a quantitative approach since it is a validated and scientific technique which guarantees the respondents' integrity and confidentiality [56,57]. This practical technique also helps the researchers save time and resources [58,59]. This approach is scientific and helpful to the respondents because it offers them a wide range of answer choices. In particular, when combined with a five-point Likert scale, this ensures that the estimation of reliability and validity is conducted in a satisfactory man-

ner [60]. From a time horizon point of view, the study is cross-sectional data or a short-term analysis involving data collection at a specific time. Moreover, various scholars, such as [9,33,42–44,61], have applied the same strategy when investigating safety and environmental issues in the oil and gas fields.

3.2. Context and Respondents

This study focuses on collecting information from the Saudi Arabian Aramco Company's frontline workers. Aramco is known as Saudi Arabia's national oil company and is a valuable agent in the development of Saudi Arabia's socioeconomic infrastructure [14]. Aramco is a fundamental contributor to the Saudi Arabian economy and workers' well-being [15]. Aramco employs over 65,000 employees in its different operations in oil creation, refining, exploration, marketing and international shipping [15]. Over the years, it has developed high-standard safety guidelines and rules governing any of its good interventions, well sites and drilling operations [62]. Aramco has invested heavily in its frontline workers' health and safety pay offs, such as productive performance [63]. Aramco believes in initializing new programs and initiatives to change the existing culture towards the achievement of excellence in environment, safety and health matters [64].

In view of the importance of safety, the researchers decided to collect information about Aramco's safety measures and their role in the frontline workers' accountability among of Aramco. The frontline workers are always at risk and are faced with safety issues and an uncertain environment [16]. Despite the introduction of initiatives concerned with safety standards and equipment, the fatality rate among the oil and gas industry frontline workers remains higher than in other industries [65]. According to the Dräger survey, only one-third of safety managers maintain strong safety measures and nearly 62% rate the quality of safety-oriented education and training as being "not satisfied" or "somewhat satisfied" [65].

3.3. Response Collection Method and Sample Size

In the context of Daudi Arabia, the researchers applied quantitative methods to capture valuable acumens practically with the slightest chance of bias [66]. The researchers visited the sites and applied an online survey questionnaire to collect the frontline workers' responses. The researchers used a random sampling technique to select the frontline workers from the list provided by Aramco. Before distributing the questionnaire, the researchers obtained the frontline workers' permission to participate in the study. The researchers formally obtained the frontline workers' consent after assuring them of the privacy and confidentiality of their responses. The researchers distributed 450 questionnaires and received back 242 valid samples. This represents a 53% response rate. Finally, the researchers used the 242 valid samples to arrive at this study's findings.

3.4. Measures

In adopting the questionnaire from the related literature, as suggested by [9,61], the researchers focused on the dimensions of safety management systems such as safety training (ST), safety communication (SC), safety commitment (SCT), safety initiatives (SIs) and safety policy (SP), Table A1. The researchers adopted all the scale items from [61]'s empirical investigation that were utilized by [9], where ST is measured on eight items with the sample item "Training actions continuous and periodic, integrated with a formally established training plan". Likewise, the SC factor is measured on four items. The tester item is "Safety is everyone's responsibility". The sample item of the scale is "There is fluent communication in periodic and frequent meetings, campaigns or oral presentations to transmit principles". SCT is measured on three items, with the tester item "Management places high commitment on safety". Furthermore, we applied four items to gauge the SIs with sample item "Incentive are given to workers who consider well the safety management aspects in their task". The final predictor (SP) is measured on four items with sample item "Safety policy contains a commitment to continuous improvement, attempting to improve

objectives already achieved". Finally, the researchers used four items to measure the dependent variable, Safety accountability (SA). The researchers applied a five-point Likert scale with the categories of strongly agree (1), agree (2), neutral (3), disagree (4) and strongly disagree (5). The Appendix A provides details of all the items.

4. Analysis

4.1. Demography

The researchers focused on three demographic indicators: age; workers' experience in the oil and gas industry; and their present position. The researchers noted that most respondents (47.93% or n = 116) were 36–45 years of age; 31.40% (n = 76) were 25–35 years of age; 29 (11.99%) were above 40 years of age, and a small number (n = 21 or 8.68%) were under 25 years of age (see Table 1). In terms of their experience in the oil and gas industry, most respondents (50.41% or n = 122) were well experienced, with 11–16 years of experience; 25.62% (n = 62) had 5–10 years of experience; 14.88% (n = 36) had above 16 years of experience; and only 9.09 % (n = 22) had less than five years of experience (see Table 1). Turning to their present positions, a large number (n = 80 or 33.06) of respondents were supervisors/foremen; 22.31% (n = 54) were senior operators; 18.18% (n = 44) were engineers; 14.88% (n = 36) were operators. The researchers noted that 6.61% (n = 16) were division heads and a small number (4.96% or n = 12) were managers (see Table 1).

Table 1. Respondents' Profiles.

	Category	Frequency	%
Age (years)	<25	21	8.68
	25–35	76	31.40
	36–45	116	47.93
	>45	29	11.99
	Total	242	100.0
Experience in oil and gas industry (years)	<5	22	9.09
	5–10	62	25.62
	11–16	122	50.41
	>16	36	14.88
	Total	242	100.0
Current position	Engineer	44	18.18
	Operator	36	14.88
	Senior operator	54	22.31
	Supervisor/foreman	80	33.06
	Section/division head	16	6.61
	Manager	12	4.96
	Total	242	100.0

4.2. Descriptive Statistics and Correlation Coefficient

As is the frequent practice of social, business and management researchers in terms of central tendency [67], the researchers observed the descriptive statistics showing the frequency trends of the respondents. In this way, the researchers noted a maximum mean score (3.791) for SIs and a minimum (3.278) for the SP variable. Likewise, they noted maximum scores of standard deviation (1.700) for SCT and a minimum (1.080) for the SA construct (see Table 2). In addition, the researchers observed the Pearson correlation coefficient to gauge the power of linear relationships among all the model variables [68]. Consequently, their findings show all the variables with robust and acceptable correlation with one or two asterisks, This confirmed a strong level of correlation (see Table 2).

Table 2. Descriptive Statistics and Correlations.

S.No.	Constructs	Mean	Std. Deviation	1	2	3	4	5	6
1	SA	3.672	1.081	—					
2	ST	3.509	1.110	0.378 **	—				
3	SC	3.400	1.699	0.321 **	0.210 *	—			
4	SCT	3.690	1.700	0.402 **	0.433 **	0.482 **	—		
5	SIs	3.791	1.130	0.311 **	0.419 **	0.316 **	0.376 **	—	
6	SP	3.278	1.102	0.382 **	0.301 **	0.302 **	0.392 **	0.190 *	—

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). Note(s): SA = safety accountability; ST = safety training; SC = safety communication; SCT = safety commitment; SIs = safety incentives; SP = safety policy.

4.3. Measurement Model

The researchers observed the prearrangement of the measurement items by noting the association between item and the construct level [69]. The researchers applied Structural Equation Modeling (SEM) for a healthier resolution in measuring the validity of statistical facts [70]. This technique is most important in reducing model error [71]. The researchers conducted the measurement model to ensure the correlation and relevancy of the items with their respective factors. At the initial stage, they observed the validity following the suggestions of prominent scholars, such as [71,72]. While conducting the factor loadings, we followed most items with excellent correlations and consistency with their factors [70] between the range of loading scores [0.782 (sc3) to 0.889 (sct1)]. These values ensured the acceptance of scores above 0.70. This provides the contemporary statistical significance and high convergence on a common theme [73]. However, only two items, st3 and st6, did not match with the above endorsed values, i.e., 0.70. Therefore, the researchers excluded them from further analysis. Furthermore, we observed Composite Reliability (CR) values ranged from 0.792 (SCT) to 0.871 (SP). This result emphasized the exceptional internal consistency among the constructs (>0.70) [71].

Additionally, the researchers noted the items' reliability through the average variance extracted (AVE) ranged from 0.770 (SIs) to 0.882 (ST). This was higher than 0.50 and specified an acceptable convergence [69,70]. Finally, Cronbach's alpha of all the variables of the study appeared to be satisfactory (>0.70) [74]. Since it kept on 0.788 (SP)–0.890 (ST) (>0.70), this confirmed the acceptability and high reliability of model substantiation (see Table 3).

4.4. Structural Model

The researchers used Analysis of Moment Structures (AMOS) IBM version 26.0 to estimate the model fitness and to assess the hypotheses. The researchers noted all the goodness-of-fit indices (i.e., caption of Figure 2) were within the model's fitness ranges with the data. As shown in Table 4 and Figure 2, by applying the critical ratio, we observed ST's positive and significant effect on SA (H1 = 5.328 ***; $p < 0.01$). Therefore, hypothesis H1 is accepted. Similarly, the path coefficient ensured that SC's positive and significant effect on SA (H2 = 4.666 ***; $p < 0.01$). Therefore, hypothesis H2 is accepted. Turning to SCT's impact on SA, the analysis supports these positive effects by showing the significant paths (H3 = 5.672 ***; $p < 0.01$). Therefore, hypothesis H3 is accepted. Moreover, the findings show that SIs have a positive and significant predictive capacity on SA (H4 = 6.023 ***; $p < 0.01$). Therefore, hypothesis H4 is accepted. Finally, SP has a positive and significant effect on SA (H5 = 5.889 ***; $p < 0.01$). Therefore, hypothesis H5 is accepted. Table 5 summarizes the decisions on the hypotheses.

Table 3. Measurement Model.

Factors	Item Code	Loading Score	CR	AVE	Cronbach's Alpha (α) Reliability
Safety training (ST)	st1	0.856	0.856	0.882	0.890
	st2	0.841			
	st4	0.839			
	st8	0.822			
	st7	0.810			
	st5	0.792			
Safety communication (SC)	sc1	0.841	0.804	0.871	0.844
	sc2	0.833			
	sc4	0.800			
	sc3	0.782			
Safety commitment (SCT)	sct1	0.889	0.792	0.819	0.871
	sct2	0.872			
	sct3	0.862			
Safety incentives (Sis)	sis1	0.872	0.866	0.770	0.820
	sis4	0.870			
	sis3	0.840			
	sis2	0.817			
Safety policy (SP)	sp1	0.862	0.871	0.802	0.788
	sp2	0.846			
	sp3	0.816			
	sp4	0.799			
Safety accountability (SA)	sa1	0.862	0.825	0.833	0.791
	sa3	0.855			
	sa2	0.831			
	sa4	0.807			

Note(s): CR = composite reliability; AVE = average variance extracted; α = Cronbach's alpha.

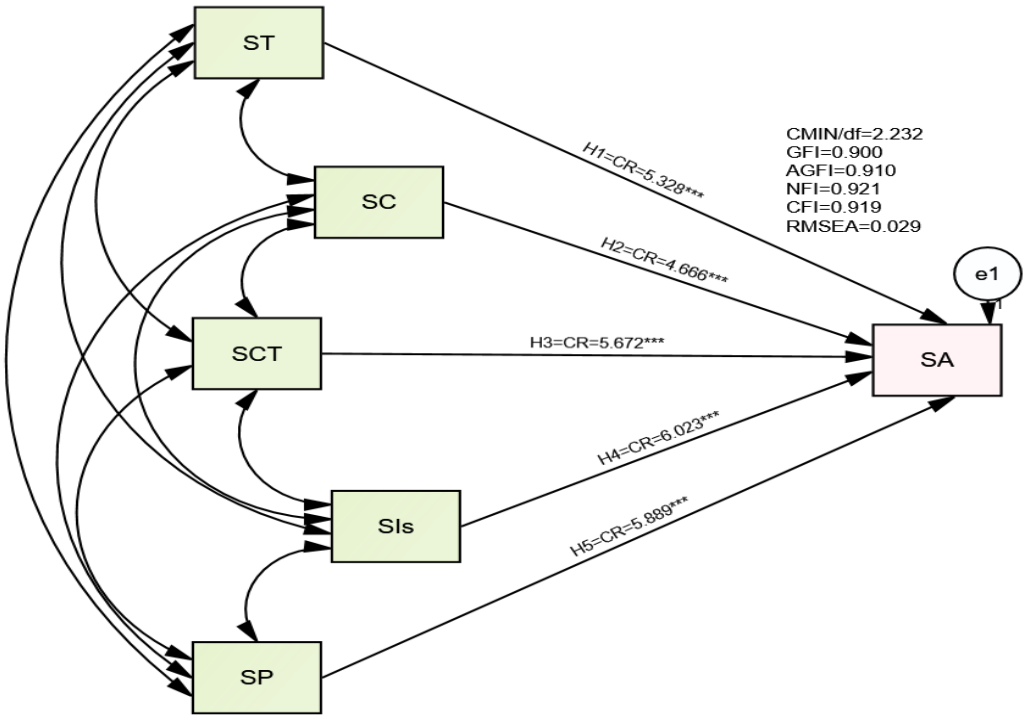

Figure 2. Path Analysis. Source: Authors' own estimation. Note: CR = critical ratio; *** p = significance level at <0.01. Note(s): ST = safety training; SC = safety communication; SCT = safety commitment; Sis = safety incentives; SP = safety policy; SA = safety accountability.

Table 4. SEM Estimations.

S.No.	Independent Variables	Path	Dependent Variables	CR	*p*-Value
H1	ST	→	SA	5.328	***
H2	SC	→	SA	4.666	***
H3	SCT	→	SA	5.672	***
H4	SIs	→	SA	6.023	***
H5	SP	→	SA	5.889	***

Note: CR = critical ratio; *** *p* = significance level at <0.01. Note(s): ST = safety training; SC = safety communication; SCT = safety commitment; Sis = safety incentives; SP = safety policy; SA = safety accountability.

Table 5. Summary of Decisions on Hypotheses.

S.No.	Hypotheses Detail	Decision
H1	ST positively and significantly creates SA among frontline workers.	Accepted
H2	SC positively and significantly creates SA among frontline workers.	Accepted
H3	SCT positively and significantly creates SA among frontline workers.	Accepted
H4	SIs positively and significantly create SA among frontline workers.	Accepted
H5	SP positively and significantly creates SA among frontline workers.	Accepted

5. Discussion

Safety is a significant challenge, and almost all energy, oil and gas and other concerned firms face possible risks when undertaking onsite working. Therefore, their top priority is to ensure their sites are safe and secure.

Accordingly, the purpose of this study was to use the empirical evidence to specifically explore the effect of safety measures on the Saudi Arabian Aramco Company's frontline workers' SA. In this regard, the researchers applied quantitative methods in this study to arrive at the findings. To this end, the researchers used a questionnaire as the primary tool to collect information from the frontline workers. Consequently, we obtained 242 valid samples to which we applied SEM analysis.

This study's findings confirm that all the hypotheses are accepted (see Table 5) and these findings are consistent with those of previous studies by scholars such as [9,26,30,31,33,34].

This study's findings prove that Aramco's frontline workers realize that ST averts injuries and that it enhances their abilities to deal with the challenges of workplace safety. ST helps the frontline workers to recognize the hazards and to put in place control measures; to use proper personal protective equipment; and to take preventive actions. Adoption of such new techniques leads to better ST, and the frontline workers accept the need for SA. Effective ST, which builds on their preventive abilities from work procedures and practical training, boosts the frontline workers' confidence to be mindful in taking the necessary measures to ensure safety.

This study's findings show that SC has a positive and significant positive effect on SA (therefore, hypothesis H2 is accepted). Equally, this study's findings are consistent with those of previous studies [9,26,35,36] in demonstrating SC's considerable impact on the frontline workers' performance and their SA These positive findings reinforce that SC assists frontline workers in their workplaces and is the best solution to overcoming the onsite hazards [26]. More specifically, technical communication is the best means of better addressing the frontline workers' safety anxieties and vulnerabilities [35]. The frequent communication meetings, oral presentations and campaigns are important in informing the frontline workers of these values and the appropriate courses of action. In addition, there are written circulars to remind them of the risks in their workplaces and how to avert accidents.

By showing SCT's positive and significant effect on SA, the SEM analysis confirmed the acceptance of hypothesis H3. These findings are consistent with previous findings by [33,41–44]. Among Aramco's frontline workers, SCT insights have a significant effect on the safety outcomes. Frontline workers perceive that their management colleagues are highly committed to their safety. This demonstrates that Aramco's management provides the frontline workers with excellent safety initiatives and that the company's top priority is the safety of its frontline workers.

Similarly, the path analysis shows that SIs have a positive effect on SA and, therefore, hypothesis H4 is accepted. These findings are consistent with those of previous studies by [45–50]. Accordingly, SIs encourage frontline workers to contribute to health and safety practices and, thereby, can increase safe behaviors and inspire decision making by keeping in mind awareness of the rewards and punishments relating to workplace safety. On the one hand, the incentives given to frontline workers means that they are more conscious of the aspects of safety management and are less inclined to take risks. On the other hand, Aramco warns the frontline workers about the financial punishment which results in a salary deduction if the frontline worker does not follow the company's safety guidelines.

The path analysis also shows that SP has a positive and significant effect on SA and, therefore, hypothesis H5 is accepted. In this respect, this study's findings are consistent with those of previous studies [9,24,52,54,55]. Aramco organizes its health and safety policies along with other HR policies to affirm the company's commitment to the well-being of its frontline workers. All such workers have access to a written declaration communicating the management's concerns that they always maintain safety principles in the course of their work. In its written guidance about safety matters, Aramco's management have reminded the frontline workers that the company's SP provides a commitment to ongoing development, that builds on the objectives previously accomplished.

In summary, when an employee joins a company or changes role or uses a new technique, they need to receive adequate and practical training. The company should have in place a properly defined training program with distinct features that can be chosen in conjunction with the employee's responsibilities. The company may hold frequent meetings, campaigns or oral lectures to spread safety ideas. In placing a strong emphasis on the company's commitment to workplace safety, the management may also plan meetings to educate frontline employees about the dangers of their jobs and how to avoid accidents. As incentives, frontline workers who carefully evaluate the safety management components of their tasks may receive rewards. In addition, the company may create policies to assure the frontline workers of its dedication to their welfare. More specifically, supervisors may place a high priority on safety precautions which must always be taken.

Recommendations

In the oil and gas industry, ST may offer constant evolution in underscoring the necessity for continual education and training to certify the appropriate and safe use of safety equipment and a greater thoughtfulness when responding to a life-threatening incident. This study's findings are beneficial for the company's management to monitor frontline workers, who regularly do not follow the required safety procedures behaviors, to ensure that safety levels are maintained daily. This study's findings may help the development of SC among oil firms' frontline workers since they all need to make others aware of safety concerns. The study may provide some inspiration to shift digitization to ensure that frontline workers remain safe in their oil and gas workplaces. The researchers recommend that the implementation of this study's findings would improve the Saudi Arabian energy firms' safety perspectives and, at the same time, similar actions could be taken in respect of a diverse range of paradigms including mining, digging and drilling rigs. More specifically, the researchers recommend that Saudi Arabian companies concentrate on SP, ST, SCSCT and SIs to raise frontline workers' SA in the various industries to generate and encourage a consistent safety culture that leads to reductions in the numbers of injuries. Finally, the researchers consider that this study's findings add to the existing

empirical literature by demonstrating, in the context of Saudi Arabia, that the country's policy makers are developing plans to strengthen the current safety measure to create safer workplace environments.

6. Limitations and Future Research Agenda

This study's findings are limited due to the researchers using only a random sampling technique to collect data from 242 frontline workers of Saudi Arabia's Aramco Company. The researchers did not use any theory to underpin the study′s conceptualization model.

Consequently, the researchers recommend that future studies use a mixed-method strategy to obtain different valid findings from other oils and gas firms. The researchers recommend, also, that such studies include the concerned theories in the model to underpin its validity and theoretical base. In addition, these should include other factors, such as safety attitudes and intentions, safety precautions, safety performance and any others that are applicable. It is recommended, too, that future studies be extended beyond frontline workers to those other workers who have responsibilities for their firms' health and safety matters. The researchers may extend future investigations to other employees who require safety and risk responsibilities within the organizations.

7. Conclusions

In conclusion, this study′s findings show that SP, ST, SC, SCT and SIs have a positive and significant effect on the SA of the frontline workers working in the different parts of Saudi Arabia's Aramco Company. The findings support that, while workplace safety is everyone′s responsibility, as the onsite personnel, the supervisors are particularly responsible for emphasizing workplace safety. This is because the company's management assign such responsibilities to them. The firm's management assigns safety responsibilities to site personnel. Simply, the SP, ST, SC, SCT and SIs of frontline workers improves the levels of their responsibilities and SA. Therefore, the provision of these safety measures helps them to enhance their work performance.

Author Contributions: Conceptualization, A.B.A.-A. and N.A.A.A.; methodology, A.B.A.-A. and N.A.A.A.; software, A.B.A.-A. and N.A.A.A.; validation, A.B.A.-A. and N.A.A.A.; formal analysis, A.B.A.-A. and N.A.A.A.; investigation, A.B.A.-A. and N.A.A.A.; resources, A.B.A.-A. and N.A.A.A.; data collection, A.B.A.-A. and N.A.A.A.; writing—original draft preparation, A.B.A.-A. and N.A.A.A.; writing—review and editing, A.B.A.-A. and N.A.A.A.; visualization, A.B.A.-A. and N.A.A.A.; supervision, A.B.A.-A. and N.A.A.A.; project administration, A.B.A.-A. and N.A.A.A.; funding acquisition, A.B.A.-A. and N.A.A.A. All authors have read and agreed to the published version of the manuscript.

Funding: This work was supported by the Deanship of Scientific Research, Vice Presidency for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia [Project No. GRANT1652].

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the deanship of scientific research ethical committee, King Faisal University (project number: GRANT11652, date of approval: 1 September 2022).

Informed Consent Statement: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the deanship of the scientific research ethical committee, King Faisal University (project number: GRANT11652, date of approval: 1 September 2022).

Data Availability Statement: Data are available upon request from researchers who meet the eligibility criteria. Kindly contact the first author privately through e-mail.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Survey's elements and its sources.

Factor	Item Description	Source
Safety training [SA]	[sa1]. Worker given sufficient training period when entering company, changing jobs or using new technique. [sa2]. There is follow-up of training needs and of efficacy or repercussion of training previously given. [sa3]. Training actions continuous and periodic, integrated in formally established training plan. [sa4]. Training plans elaborated taking into account company particular characteristics. [sa5]. Specific training plans elaborated according to section or job position job needs. [sa6]. Training plan decided jointly with workers. [sa7]. Company provides workers with in-house-training. [sa8]. Instruction manuals or work procedures elaborated to aid in preventive action. [sc1]. There is a fluent communication in periodic and frequent meetings, campaigns or oral presentations to transmit principles.	[61]
Safety communication [SC]	[sc2]. There is a fluent communication in periodic and frequent meetings, campaigns or oral presentations to rules of action. [sc3]. Written circulars elaborated and meetings organized to inform workers about risks associated with their work and how to prevent accidents. [sc4]. When starting in new job trade, workers are provided written information about procedures and correct way of doing tasks.	[61]
Safety commitment [SCT]	[sct1]. Management places high commitment on safety. [sct2]. Management gives importance to safety initiatives. [sct3]. Safety is important to company	[61]
Safety initiatives [SIs]	[sis1]. Incentive are given to workers who consider well the safety management aspects in their task. [sis2]. Site Personnel will be punished for practicing formulated safety management dimensions. [sis3]. There is consistent punishment in violation from formulated safety management dimensions. [sis4]. Site personnel are thanked for their practicing formulated safety management dimensions.	[61]
Safety policy [SP]	[sp1]. Company coordinates its health and safety policies with other HR policies to ensure commitment and well-being of workers. [sp2]. Written declaration is available to all workers reflecting management concern for safety, principles of action and objectives to achieve. [sp3]. Management has established in writing the functions of commitment and participation and the responsibilities in safety questions of all organization members. [sp4]. Safety policy contains commitment to continuous improvement, attempting to improve objectives already achieved.	[61]
Safety accountability [SA]	[sa1]. Safety is everyone responsibility. [sa2]. Supervisors place high importance on safety. [sa3]. Safety personnel always available at site. [sa4]. Management assign safety responsibilities to site personnel.	[61]

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