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Unveiling the Impact of Shipmasters' Leadership Style on Safety Climate: A Comprehensive Study

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Abstract

Maritime transportation is an industry where, due to high risk levels, safety is a top priority to ensure seafarers' well-being and operational efficiency. This study explores the effect of shipmasters' leadership styles on fostering safety awareness and shaping the safety climate. The research has two primary objectives: (1) to reveal the relationship between shipmasters' leadership styles and the safety climate perceptions of ship personnel, excluding shipmasters, and (2) to investigate the dimensions mediating this relationship. A mixed-method approach was adopted. The quantitative phase involved a survey of 198 seafarers with unlimited certificates, while the qualitative phase included in-depth interviews guided by a semi-structured protocol with seven shipmasters. A qualitative content analysis approach was employed to interpret the collected data. Findings indicate a moderate positive correlation between transformational leadership and safety climate perception. Transactional leadership showed a weak positive relationship, while laissez-faire leadership exhibited a weak negative one. Qualitative data reveal shipmasters' preference for transformational leadership, emphasizing themes such as: "safety" and "safety management and scope", which are echoed in safety climate dimensions. Survey results highlight the strongest link between transformational leadership and the "safety management and scope" sub-dimension.

Keywords: Leadership style, safety climate, shipmaster, seafarers

1. Introduction

Maritime transportation represents a complex socio-technical system governed by the interplay of four independent factors: technology, environment, human factors, and organizational structure. These factors exert both direct and indirect influences on maritime accidents. Over the past three decades, numerous studies have consistently identified the "human factor" as the primary reason of maritime accidents [1,2]. Despite its critical role, the human factor is widely regarded as the weakest link in ensuring maritime safety [3]. Evidence suggests that the proportion of accidents attributed to human error has risen steadily, now accounting for over 80% of maritime incidents [4-7]. One of the leading contributors to human error is the insufficient training of ship crews. In response, recent years have seen a shift toward strategies that emphasize "adapting humans to technology" to mitigate such errors [8,9]. Although various factors such as effective human resource strategies [10], management, safety systems, risk, work pressure, competence, and rules/procedures [11], management commitment, the priority of safety, general safety policies, procedures, and practices, safety training, safety communication, reporting, and employee safety involvement [12], have been shown to influence the formation of a safety culture, this study focuses primarily on leadership, which stands out as a central element in the creation, transmission, and continuous development of such a culture. Within this framework, the necessity of "effective leadership" emerges as one of the pivotal factors in cultivating and sustaining a "safety culture" that aligns the efforts of workers and management toward the shared objective of "ensuring navigational safety" [13-15].

In maritime transportation, shipmasters play a central role in directing ship operations and shaping the behavior of ships' crews. Their leadership is influenced by the

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interplay of national, professional, and organizational cultures, which collectively govern safety-related behaviors [8,16]. Therefore, the leadership styles of shipmasters are regarded as a crucial factor in promoting safety awareness and improving the safety climate, while also addressing key challenges in maritime operations.

When reviewing national and international literature, we found no exploratory studies that simultaneously discuss the relationship between safety climate and leadership. Given the complex nature of the industry, we believe that more effective results can be achieved with the support of exploratory research.

Accordingly, an initial survey was conducted to test the relationships between the leadership styles experienced by seafarers, the sub-dimensions of these leadership styles, and the perception of safety climate, based on the seafarers' opinions. Subsequently, a holistic perspective was sought by thoroughly discussing this relationship and other dimensions that might influence safety climate perception, with shipmasters who are powerful actors in establishing safety climate.

Indeed, the unique value of this study lies in examining these relationships within the Turkish context by including key stakeholders from the industry using a mixed-methods approach.

1.1. Leadership Styles and Safety Climate on Ships

The relationship between styles and safety climate will be addressed in this section.

1.1.1. Leadership styles

Leadership in organizational settings has been conceptualized through various styles, prominently including laissez-faire, transformational, and transactional leadership, as introduced by Burns [17] and further developed by Bass [18]. These styles distinctly influence team dynamics, organizational climate, and safety outcomes.

Laissez-faire leadership is characterized by minimal intervention, where leaders allow team members to operate independently with limited guidance or oversight. This "hands-off" approach, often termed "let them do as they wish" leadership [19], is marked by delayed decision-making, lack of accountability, and weak communication of expectations [20-22]. Although this style may promote autonomy, its ineffectiveness in safety-critical environments is well-documented [23,24].

Transformational leadership emphasizes inspiring and motivating team members to exceed standard expectations by fostering a shared vision and goals [17,20]. It is structured around four essential dimensions that define its core.

- Idealized influence: Leaders position themselves as ethical and visionary figures, thereby earning the respect and confidence of their followers [25].

- Inspirational motivation: Through compelling narratives and a clear sense of purpose, leaders instill enthusiasm and commitment in their teams.

- Intellectual stimulation: Leaders promote creative problem-solving and innovation.

- Individualized consideration: Leaders provide tailored mentorship and support to team members [20,26].

Through these dimensions, transformational leaders elevate team awareness about the importance of achieving safety-related objectives, thereby fostering a proactive safety culture [27].

Transactional leadership emphasizes setting clear goals, ensuring task alignment, and using rewards to achieve organizational targets [28]. This style is composed of four key dimensions:

- Contingent reward: [29] Leaders enhance the occurrence of favorable behaviors through the provision of rewards tied directly to performance outcomes.

- Management by exception (Active): Leaders implement a proactive performance monitoring system, intervening to rectify deviations before they escalate.

- Management by exception (Passive): [30] Leadership intervention is reserved exclusively for scenarios involving the emergence of critical performance discrepancies.

This leadership style increases compliance with procedures, particularly in regulated environments [31,32].

1.1.2. Safety climate on ships

Safety climate is a collection of perceptions and attitudes of personnel toward safety practices within an organization. As operations rely on coordinated teamwork, safety climate is a critical determinant of overall safety performance on ships [33]. The expression "What is safe for me is safe for others" emphasizes the importance of collective responsibility in maritime safety. Thus, the critical role of leadership in the formation of a well-established safety climate has been established [34,35]. A favorable safety climate acts as a predictive measure for safety performance, providing early indications of potential hazards prior to their manifestation [36]. As shipmasters are considered operational leaders, they significantly influence safety attitudes by fostering compliance with safety regulations, protecting lives and assets, and mitigating environmental risks [37].

1.1.3. Link between leadership and safety climate on ships

The link between leadership styles and safety-related outcomes has emerged as a key topic of inquiry, particularly in efforts to understand how leadership affects both employee conduct and the broader organizational climate in high-risk environments. An expanding body of research underscores the significant influence leaders have in shaping safety culture, with particular emphasis on transformational and transactional leadership models—both of which are considered critical in sectors such as maritime and other safety—sensitive industries.

In a seminal study, Zohar [38] demonstrated that transactional leadership contributes to employees' capacity to execute tasks in a safe and methodical manner. In contrast, transformational leadership was found to instill stronger employee engagement and a willingness to accept more complex and demanding responsibilities.

Building on this foundation, Mullen and Kelloway [39] explored the healthcare context and found that transformational leadership fosters safety-conscious mindsets among staff. Their study revealed that leaders who had received training in transformational practices exhibited greater sensitivity to safety concerns, thereby reinforcing a more forward-looking and responsive safety culture.

Şen and Yaşlıoğlu [40] explored the maritime transportation industry and identified transformational leadership as a critical factor in cultivating an innovation-supportive organizational climate in the public sector. These results are consistent with wider studies that establish leadership approaches as pivotal in the creation of novel safety methodologies.

Sønderstrup-Andersen et al. [41] investigated the connection between leadership and safety climate in a study comprising 3,681 participants across multiple sectors in Denmark. Their research demonstrated that both transactional and transformational leadership styles significantly impact safety climate, particularly in shaping employees' safety priorities.

The correlation between transformational leadership and safety outcomes was further substantiated by the findings of Hoffmeister et al. [42]. Their study of 1,548 employees across various U.S. industries confirmed that all dimensions of transformational leadership positively influence employee safety behaviors.

Similarly, Smith et al. [43] reported that transformational leadership enhances safety climate perceptions among U.S. firefighters, while Shen et al. [44] observed similar effects in the construction sector in Hong Kong, where leader-member interactions were pivotal in shaping safety outcomes.

Lingard et al. [45] added valuable insights from the Melbourne metro tunnel construction project, where the leadership styles and communication patterns of team leaders significantly influenced safety climate and employees' occupational health and safety behaviors. Their findings highlight the varying impacts of transformational and transactional leadership components on safety outcomes.

Within the maritime sector, Beşikçi [46] examined the leadership styles of the shipmasters and chief engineers in relation to ships' crews' motivation. The study found that transactional leadership was the most prevalent style, although transformational, democratic, and charismatic leadership styles exhibited stronger correlations with motivation and safety culture. The findings underscore the importance of integrating leadership training into Bridge Resource Management programs to enhance safety and operational effectiveness onboard ships.

Sulistiana et al. [47] aimed to explore how shipmasters' transformational leadership style affects crew members' engagement in organizational citizenship behaviors. The findings demonstrated a notable and positive association between transformational leadership exhibited by shipmasters and the proactive, voluntary contributions of seafarers, particularly in the context of safety management system practices onboard.

Despite considerable advancements in examining how leadership influences the safety climate, much of the existing research relies on quantitative methodologies and focuses on general industrial contexts. The maritime sector, characterized by its cultural sensitivities and unique operational challenges, remains underexplored. A mixed-methods approach that includes perspectives from both shipmasters and other maritime professionals—particularly within Türkiye—offers a promising way to address these gaps and enrich the understanding of leadership's role in shaping safety culture in the maritime industry.

2. Methodology

2.1. Purpose, Scope, and Significance of the Study

The main objective of this research is to investigate the relationship between the leadership styles of shipmasters and the safety climate perceptions of oceangoing unlimited officers, such as Chief Officers, Officers, Electrical-Electronic Engineers, Chief Engineers, Second Engineers, and Engineers, within the Turkish context. Additionally, the study seeks to explore the dimensions influencing this relationship and identify other factors affecting safety climate at individual and organizational levels.

This study's qualitative aspect aims to provide a comparative discussion by juxtaposing survey findings gathered from seafarers operating in demanding environments with the perspectives of shipmasters, key actors in the maritime industry. Using a mixed-methods approach, the study seeks to examine which leadership style and its subdimensions exerts a more significant influence on safety climate, thereby offering insights for future research.

Identifying the expected leadership style of shipmasters will contribute not only to improving the working conditions of seafarers but also to enhancing maritime safety, underscoring the significance of this research.

2.2. Research Design, Data Collection Methods, and Analysis

The research design integrated both numerical data interpretation and thematic exploration to capture insights from multiple perspectives, drawing on a combined strategy that bridges quantitative and qualitative paradigms. Thus, a survey was conducted to evaluate the relationships between perceived leadership styles, their sub-dimensions, and safety climate perceptions. Subsequently, in-depth interviews, utilizing semi-structured questions, were conducted with shipmasters, who play a critical role in shaping these perceptions, to gain further insights into these dynamics.

2.2.1. Surveys

Firstly, quantitative methodology was used to analyze the correlation between shipmasters' leadership paradigms and the safety climate as perceived by ship personnel. Within the quantitative research design, actively serving ocean-going qualified maritime officers were sampled. This sample consists of Chief Officers, Watchkeeping Officers, Electro-Technical Officers, Chief Engineers, Second Engineers, and Watchkeeping Engineers. The target population, based on 2023 data obtained from the Turkish Ministry of Transport and Infrastructure, was identified as 11,173 licensed individuals holding the titles of Chief Officers, Watchkeeping Officers, Electro-Technical Officers, Chief Engineers, Second Engineers, and Watchkeeping Engineers in the maritime sector. Thus, the sample size was determined as 381 participants, using a 95% confidence interval to ensure statistical representativeness. A snowball sampling method was employed to reach the target population, and data from 198 respondents who fully completed the questionnaire were included in the final analysis.

The survey consisted of three sections:

1. Demographic characteristics, including age, education level, rank, and years of experience in the maritime sector were collected.

2. Participants' perceptions of the safety climate using the Norwegian Offshore Risk and Safety Climate Inventory (NORSCI), a 32-item scale developed by Tharaldsen et al. [48], were assessed. Before implementation, permission was obtained from the original authors, and ethical approval was gained from the Ege University Social and Human Sciences Scientific Research and Publication Ethics Board (approval no.: 04/12, date: 29/03/2023). The scale was translated into Turkish, and linguistic validity was ensured via the back-translation approach. Pilot interviews were conducted with selected participants from the target population to verify comprehensibility and conceptual equivalence before finalizing the instrument.

3. Participants' perceptions of leadership styles were measured using the Multifactor Leadership Questionnaire, developed by Bass [20]. This scale, consisting of 36 items, is a widely recognized and validated instrument for assessing transformational, transactional, and laissez-faire leadership styles. The Turkish adaptation of the Multifactor Leadership Questionnaire (MLQ) was conducted by Akdoğan [49].

SPSS Statistics 25.0 was utilized for data analysis. Hypotheses are as follows:

H1: The presence of transformational leadership qualities in shipmasters is expected to be positively associated with maritime professionals' perceptions of the onboard safety climate.

- H1a: The presence of charisma and idealized influence (or personal impact) in leadership behavior is expected to be positively associated with seafarers' perceptions of the safety climate.

- **H1b:** The presence of intellectual stimulation as a leadership trait is expected to be positively associated with seafarers' perceptions of the safety climate.

- **H1c:** The presence of individualized consideration in leadership behavior is expected to be positively associated with maritime professionals' perceptions of the safety climate.

H2: The presence of transactional leadership characteristics in shipmasters is expected to be positively associated with maritime professionals' perceptions of the safety climate.

- H2a: The presence of contingent reward as a leadership practice is expected to be positively associated with seafarers' perceptions of the safety climate.

- H2b: The presence of active management by exception is expected to be positively associated with maritime professionals' perceptions of the safety climate.

- H2c: The presence of passive management by exception is expected to be positively associated with seafarers' perceptions of the safety climate.

H3: The presence of laissez-faire leadership style is expected to be positively associated with maritime professionals' perceptions of the safety climate.

2.2.2. Reliability Analyses of the Scales Used

The Cronbach's alpha coefficient is a significant measure for determining internal consistency in Likert-type scales. While a Cronbach's alpha value ranges between 0 and 1, it is generally accepted that reliability increases as the obtained value approaches 1 [50].

Commonly accepted ranges for the Cronbach's alpha value in the literature are as follows:

- An interval of 0.00-0.39 indicates no reliability.
- An interval of 0.40-0.59 indicates very low reliability, suggesting the need for revision.
- An interval of 0.60-0.79 indicates considerable reliability.
- An interval of 0.80-1.00 signifies that the measurement instrument possesses high reliability [51].

The reliability of the MLQ and the NORSCI scales was evaluated using Cronbach's alpha coefficients. The MLQ achieved a high reliability score ($\alpha = 0.870$), while the NORSCI scale indicated moderate reliability ($\alpha = 0.624$)

The Multifactor Leadership Questionnaire (MLQ), utilized in this study to measure leadership styles, is based on theoretical foundations established by Bass [20]. The detailed psychometric properties and development processes of the scale have been primarily shaped by the subsequent works of Avolio and Bass [21]. In these comprehensive evaluations, the internal consistency reliability coefficients (Cronbach's alpha) for the MLQ's sub-dimensions—Transformational Leadership, Transactional Leadership, and Laissez-Faire Leadership—have generally been reported to range between 0.74 and 0.94 [21,25].

To assess maritime professionals' perceptions of the safety climate in this study, the "NORSCI" scale, developed by Tharaldsen et al. [48] was utilized. In the original study, the internal consistency reliability coefficients (Cronbach's alpha) for the dimensions of this 32-item scale were reported to range from 0.672 to 0.857 [48].

2.2.3. Interviews

Following the quantitative phase, the research proceeded with the qualitative component, which involved the execution of comprehensive interviews guided by a semi-structured format. Pilot interviews were conducted to refine the semi-structured interview questions. In the selection process of ship masters, maximum variation sampling was employed, considering factors such as age, rank, type of vessel, and operational region. The target participants were individuals with at least 10 years of maritime experience, including a minimum of five years of service as a shipmaster. Following the pilot interviews, the semi-structured interview questions were finalized, and in-depth interviews were conducted with seven ship masters whose total maritime service ranged between 11 and 23 years, each having a minimum of five years of shipmaster experience. The interviews, which were conducted over six months, had an average duration of 40 minutes.

Data collection continued until thematic saturation was achieved, with recurring themes identified. Qualitative content analysis was conducted using MAXQDA 2022® software. To ensure validity and reliability, techniques such as prolonged engagement, triangulation, and consistency checks were applied (Table 1) [52].

3. Findings and Discussion

The findings and discussion section comprises survey and interview findings, accompanied by an integrated discussion. Each result is interpreted in context, drawing on relevant literature to highlight consistencies and discrepancies, thereby offering a nuanced understanding of the data.

3.1. Survey Findings

To delineate the demographic profiles of the seafarer participants, a frequency distribution analysis was conducted. The resulting demographic data are summarized in Table 2.

Table 1. *Validity and reliability in qualitative research*

Criterion	Research objective	Methods used in qualitative research
Internal validity/credibility	Accurate representation of reality	Prolonged engagement with participants, triangulation through diverse shipmaster profiles, and in-depth data collection to uncover patterns.
External validity/transferability	Application of results to broader contexts	Purposeful sampling for diverse perspectives, along with detailed descriptions including verbatim quotes.
Internal reliability/consistency	Consistency in research execution	Consistent questioning across interviews, audio recording with consent, and systematic coding.
External reliability/confirmability	Objectivity and auditability	Audit trails, shared coding reports, and archived recordings ensured transparency and replicability.
These measures underscore the robustness of the qualitative methodology, reinforcing its alignment with established best practices in research design		

Table 2. *Demographic profile of survey participants*

Variable	Category	Frequency (f)	Percentage (%)
Gender	Female	12	6.1
	Male	186	93.9
	Total	198	100
Marital status	Married	130	65.7
	Single	68	34.3
	Total	198	100
Educational level	Associate degree (a two-year undergraduate academic degre)	17	8.6
	Bachelor's degree (Master's or doctoral degree)	143	72.2
	Graduate	29	14.6
	Other	9	4.5
	Total	198	100
Rank	Chief officer	97	50.3
	Watchkeeping officer	33	17.1
	Chief engineer	24	12.4
	Second engineer	14	7.3
	Watchkeeping engineer	18	9.3
	Electro-technical officer	7	3.6
	Total	193	100
Ship type (current or last served vessel)	Dry bulk carrier	53	26.8
	Tanker	80	40.4
	Container	30	15.2
	RO-RO/Passenger	14	7.1
	General cargo	6	3.0
	Other	15	7.6
	Total	198	100
Service class	Deck	135	68.2
	Engine	63	31.8
	Total	198	100
Total sea service	0-47 months	74	37.4
	48-95 months	70	35.5
	96 months and above	54	27.3
	Total	198	100
Service duration on current ship	0-3 months	70	35.4
	4-7 months	86	43.4
	7+ months	42	21.2
	Total	198	100
To assess normality, we conducted Kolmogorov-Smirnov test and QQ-plots in SPSS; p-values>0.05 confirmed that the data were normally distributed			

Table 3. *Correlation between leadership styles and safety climate*

Leadership styles and sub-dimensions	Safety climate	Leadership styles and sub-dimensions	Safety climate
Transformational leadership		**Transactional leadership**	
- Pearson r	0.374**	- Pearson r	0.235**
- p-value	0.000	- p-value	0.001
- Sample size (n)	180	- Sample size (n)	180
Charismatic/inspirational leadership		Contingent reward	
- Pearson r	0.375**	- Pearson r	0.288**
- p-value	0.000	- p-value	0.000
- Sample size (n)	180	- Sample size (n)	180
Intellectual stimulation		**Management by exception-passive**	
- Pearson r	0.377**	- Pearson r	0.286**
- p-value	0.000	- p-value	0.000
- Sample size (n)	180	- Sample size (n)	180
Individual consideration		**Management by exception-passive**	
- Pearson r	0.289**	- Pearson r	-0.181*
- p-value	0.000	- p-value	0.015
- Sample size (n)	180	- Sample size (n)	180
		Laissez-faire leadership	
		- Pearson r	-0.196**
		- p-value	0.008
		- Sample size (n)	180
The asterisks indicate the level of statistical significance for the Pearson correlation coefficient: *p<0.05; **p<0.01			

The association between participants' perceptions of safety climate and their experiences of leadership styles and related sub-dimensions was assessed through Pearson correlation analysis. The resulting data are detailed in Table 3.

A moderately positive and statistically significant relationship was identified between the transformational leadership style and the perceived characteristics of the safety climate (r=0.374, significance level below 0.05). Upon applying Pearson's correlation test, among the sub-dimensions, intellectual stimulation exhibited the strongest relationship with the safety climate. Specifically, the analysis revealed a moderate and statistically significant relationship between the intellectual stimulation dimension of leadership and how the safety climate is perceived by maritime professionals.

An examination of both domestic and global scholarly works indicates a substantial body of research addressing transformational leadership across diverse industries. Nevertheless, the literature exhibits a paucity of investigations specifically exploring the nexus between transformational leadership and safety. This observation is in line with the findings of studies conducted in disparate sectors, as evidenced by the works of Mullen and Kelloway [39], Shen et al. [44], and Hoffmeister et al. [42].

Recent empirical safety research and meta-analyses demonstrate that leadership and management practices serve as significant antecedents for followers' safety perceptions, attitudes, and beliefs. This has been confirmed in studies by Hofmann et al. [53], Christian et al. [54], Guldenmund [55], Yule et al. [34], and Zohar and Tenne-Gazit [56].

Furthermore, within the maritime domain, Lu et al. [57] investigated the influence of national cultural norms and leadership paradigms on safety outcomes within dry bulk shipping enterprises. Their findings revealed a positive correlation between transformational leadership and seafarers' safety-related attitudes and conduct. Notably, these outcomes have been corroborated, demonstrating a consistent trend within the same industrial sphere.

Similarly, charismatic/inspirational leadership demonstrated a moderate, positive, and statistically significant relationship with the perception of safety climate (r=0.375, significance level below 0.05). On the other hand, individual consideration showed a weak, positive, and statistically significant relationship with safety climate (r=0.289, at a significance level below 0.05).

The Pearson correlation analysis, which was employed to assess the association between the sub-dimensions

of transformational leadership styles as perceived by participants and their evaluations of safety climate, indicated that the intellectual stimulation sub-dimension exhibited the most robust correlation with safety climate perceptions. Accordingly, there is a moderate, positive and significant relationship between intellectual stimulation and safety climate (r=0.375, at a significance level below 0.05). This result aligns with the findings of Barling et al. [58]. In their study, they emphasized that transformational leaders increase employees' awareness of safety by emphasizing its importance and encouraging intellectual stimulation along with idealized influence to think about safety.

According to Bass [18], transformational leaders who utilize the behavioral component of intellectual stimulation encourage their followers to carefully use their cognitive abilities for problem-solving and reward them accordingly. Thus, they drive their followers toward an entrepreneurial and productive way of thinking.

The Pearson correlation analysis, employed to investigate the association between transactional leadership styles and perceptions of safety climate, demonstrated a statistically significant, albeit weak, positive correlation (r=0.235, significance level below 0.05). Among the sub-dimensions of transactional leadership style, contingent reward exhibited the strongest correlation with the safety climate, showing a weak, positive, and statistically significant relationship (r=0.288, significance level below 0.05).

The analysis further revealed that active management-by-exception exhibited a statistically significant, yet weak, positive correlation with safety climate perception (r=0.286, $p<0.05$). Conversely, passive management-by-exception showed a statistically significant, weak negative correlation with safety climate perception (r=-0.181, $p<0.05$).

Leaders who adopt the contingent reward transactional leadership style clearly communicate their expectations to their followers and reward achievements through incentives and recognition. Although transactional leadership is considered an efficient leadership model for achieving performance goals, managers adhering to this style tend to avoid taking risks and continue with standard managerial processes unless they face extraordinary situations.

The analysis revealed a statistically significant, albeit weak, correlation between the contingent reward leadership style and seafarers' perceptions of safety. However, compared to other dimensions, the observed parameter was at a relatively higher level. This finding suggests that seafarers, operating in a ship environment dominated by standard procedures, value shipmasters' clear articulation of expectations and their recognition, and reward of the fulfillment of those expectations.

Conversely, the laissez-faire leadership style exhibited a weak, negative, and statistically significant relationship with the perception of safety climate (r=-0.196, $p<0.05$). This finding is contrary to our hypothesis (H3), which posited a positive association, thus indicating that Hypothesis 3 is not supported. Laissez-faire leaders are characterized by disengaging, failing to provide guidance or feedback, and neglecting to monitor their followers' performance or focus on the outcomes of their actions [59]. The observed negative correlation strongly suggests that when ship crews operate under such a leadership style, their perceptions of the safety climate are adversely affected. This outcome underscores that the laissez-faire leadership approach is detrimental to the maritime industry's core objectives, which fundamentally prioritize the safety of life and property, alongside environmental sustainability.

3.2. Interview Findings

As part of the qualitative research, which constitutes the second section of the analysis phase of the study, in-depth interviews were conducted with shipmasters holding unlimited ocean-going qualifications. These interviews were recorded with participant consent and transcribed in full for qualitative analysis. The transcribed interview records were uploaded to the MAXQDA 2022® software program, where codes and sub-codes were created. During the coding process, no participant or company information was included, and the seven shipmasters with unlimited ocean-going qualifications who participated in the interviews were named P1, P2, P3, P4, P5, P6, and P7.

To make sense of the data, codes and sub-codes derived from the literature were developed, and their frequency distributions are shown in Table 4.

The analysis of qualitative data was systematically conducted through an in-depth coding process of interview transcripts. First, interviews recorded with participant consent were fully transcribed. Subsequently, researchers carefully read all transcripts multiple times to familiarize themselves with the data.

Following this stage, open coding was performed. Texts were meticulously examined to identify meaningful phrases and concepts, and short, descriptive codes were assigned to these expressions. For instance, statements such as "our captains are constantly holding safety meetings" were tagged with codes like "Continuous Safety Meetings" or "Procedural Communication".

Next, similar and related codes were grouped to form broader sub-themes and main themes. In this process, a deductive approach was incorporated, which drew upon existing conceptual frameworks in the literature, including Zohar [36], Bass & Avolio [26], Reason [60], and Chauvin

Table 4. *Thematic codes and their frequencies*

Code categories	Frequency	Code categories	Frequency
Safety climate dimensions		**Unsafe acts**	
System awareness	19	Routine violations	9
Individual motivation	4	Skill-based errors	2
Safety priority	19	Perceptual errors	3
Safety-related output	12	Decision errors	4
Safety management and scope	18		
HFACS organizational influences		**Leader's power sources**	**0**
Operational process	18	Charismatic power	5
Organizational climate	8	Expertise power	7
Resource management	5	Reward power	2
Unsafe supervision	0		
Failure to resolve known problems	9	**Transformational leadership dimensions**	
Inappropriate operational planning	2	Individualized consideration	11
Inadequate supervision	1	Intellectual stimulation	11
Preconditions for unsafe acts	Inspirational motivation	11	
Personal readiness	3	Idealized influence	5
Crew resource management	3		
Physical and mental limitations	9		
Adverse physiological conditions	1		
Adverse mental conditions	18		
Total 273			

et al. [61]. However, researchers made a conscious effort not to overlook new themes emerging directly from the data, indicating an integration of an inductive approach.

Finally, the established sub-themes and main themes were reviewed, refined, and organized to best address the study's research questions. This iterative coding process allowed for a deep exploration of underlying patterns and relationships within the data, ensuring that our findings are strongly supported by the data and offer rich, context-specific insights. The entire coding process was systematically managed using MAXQDA 2022® software.

This table presents the code frequencies analyzed through MAXQDA 2022®, a software utilized for qualitative content analysis. Codes and subcodes were developed based on the literature, and frequencies reflect the occurrences of themes derived from interviews conducted with shipmasters.

In the third section of the questionnaire administered to voluntary participants, the MLQ, developed by Bass [20], was used to assess participants' perceptions of the leadership style they experienced. This scale is frequently employed in national and international literature, with its validity and reliability proven in revealing how different leadership styles are perceived by followers.

Both the survey administered to seafarers and the semi-structured interviews conducted with shipmasters highlighted a predominant emphasis on transformational leadership characteristics. For this reason, the fundamental dynamics of our research focus on the transformational leadership style and its sub-dimensions in relation to the dimensions of the safety climate. Semi-structured questions were directed to participants, and some of their responses are presented below: (The statements for each code were not provided in detail, to avoid excessive length, and only the core dynamics related to transformational leadership and safety climate have been included here).

As part of the qualitative research, interviews were conducted with shipmasters to uncover their leadership styles. The following questions were asked:

- "What is your communication style when managing your team?"
- "Can you describe your working approach?"
- "Do you find it appropriate to involve your team in decision-making processes?"
- "How do you prefer to motivate your crew?"
- "How would your crew describe you as a leader?"

The responses were coded, and the results indicated that shipmasters exhibited characteristics of transformational leadership**.** The answers provided by participants were categorized into codes and sub-codes, both guided by the literature and through open coding conducted by the researchers. The resulting code-sub-code frequency values and participant feedback are presented in Figure 1.

To explore participants' perspectives on safety, the following questions were posed:

• "What does a successful ship operation mean to you?"

• "Does the International Maritime Organization's core philosophy of Safe, Secure, and Efficient Shipping on Clean Oceans manifest in Turkish-flagged or Türkiye-affiliated ships?"

• "Is safety a prioritized element in ship operations for Turkish-flagged or Türkiye-affiliated vessels? (If so, why? What is the source of your thoughts?)"

• "Do Turkish seafarers exhibit an awareness of safety in this regard?"

• "What does safety culture mean to you?"

• "What measures do you take to enhance the safety of the ship you are working on?"

• "As a captain, what types of incidents, including near-miss events, pose threats to safety on your ship?"

These questions along with variations were directed to participants. The collected responses were evaluated based on the safety-related sub-dimensions [48]:

• Safety priority,

• System awareness,

• Safety-related outputs,

• Safety management and scope.

The code-subcode frequency values and participant feedback derived from this evaluation are illustrated in Figure 2.

Among the safety climate dimensions, "safety priority" was identified as one of the codes with the highest frequency. The results align with the study conducted by Sønderstrup-Andersen et al. [41], which significantly associates the "safety priority" dimension with transformational leadership. In this context, participants provided feedback emphasizing adherence to safety procedures, the prioritization of life and property safety, and environmental sustainability in the face of violations.

The dimension of "safety management and scope", which reflects the importance management attributes to safety, the role of safety officers, and employee participation and contributions to safety matters, was also among the codes with the highest frequency. This highlights the importance placed on safety topics by sector managers while revealing the influence of upper management in forming a safety culture. Indeed, policies implemented by upper management contribute to the development of a safety culture, which manifests concretely as the safety climate observed on ships.

The content analysis further identified additional codes closely related to the safety climate, including "work

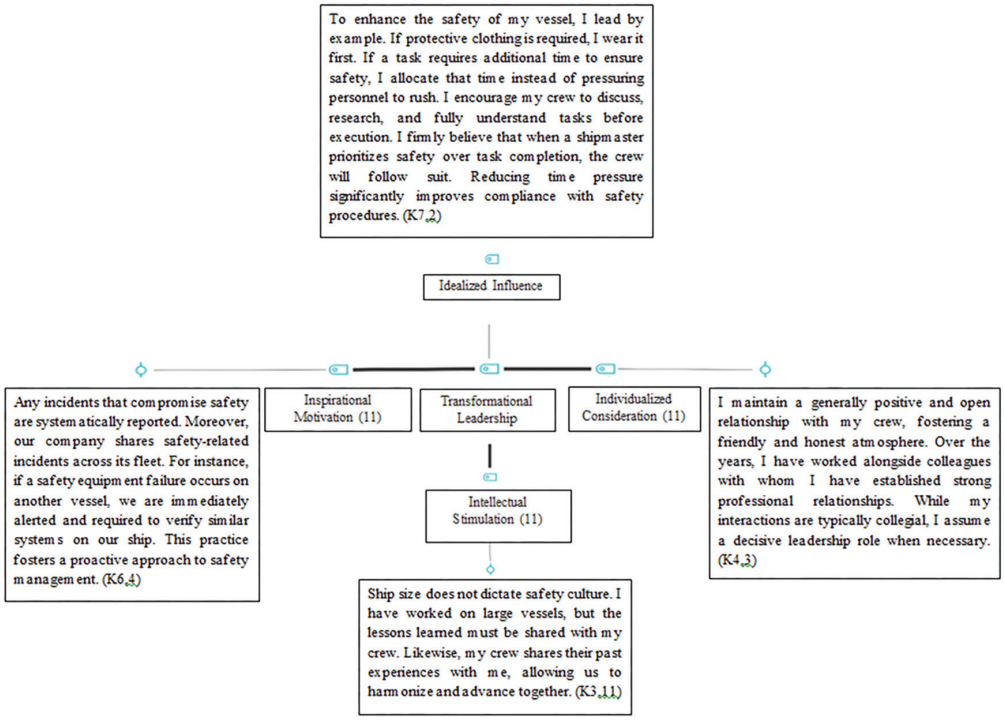


Figure 1. *Transformational leadership code-subcode model and participant feedback*

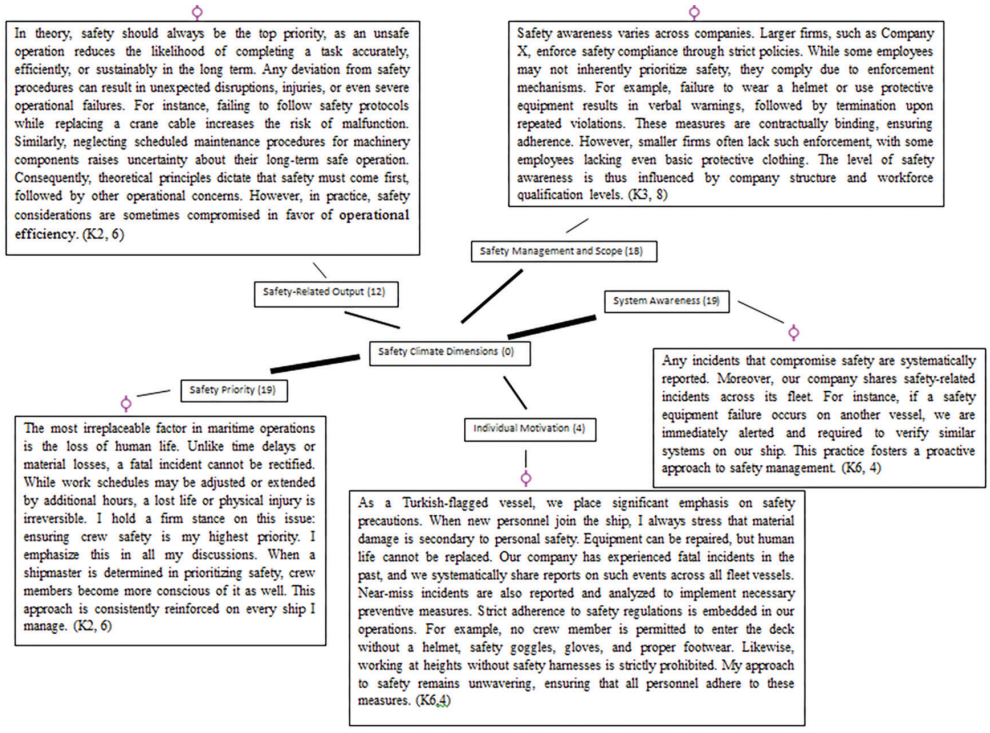


Figure 2. *Safety climate dimensions code-subcode model and participant feedback*

Table 5. *Codes identified by researchers regarding safety climate*

Code categories	Frequency
Structure of the work environment	14
Open communication	12
Routines	10
Teamwork	9
Hierarchy	5
Total	50

environment structure," "hierarchy," "teamwork," "open communication" and "habits". The codes discovered by the researchers are illustrated in Table 5.

The establishment of safety attitudes and behaviors among individuals, and their adoption as a cultural norm, is influenced by multiple factors. Particularly emphasized by shipmasters, the significance of "habits" lies in individuals' ability to create a difference in safety through self-regulation. Despite the existence of standardized procedures, the human factor remains the primary cause of maritime accidents [4-7]. While shipping companies play a crucial role in instilling safety awareness among seafarers, individual self-regulation and personal efforts are equally vital to support this process.

Emphasis on the "structure of the working environment" highlights the unique characteristics of the maritime sector. In a similar vein, the emphasis placed on hierarchical structures is widely recognized as essential for minimizing operational risks and maintaining procedural integrity. Crew members continuously interpret their surroundings—both in terms of physical layout and operational routines—forming individual judgments based on these observations. These mental processes are expected to align with formal safety protocols, serving as internalized references for safe conduct. Moreover, perceptions of the work environment, shaped through day-to-day interactions among colleagues, contribute to the formation of more refined and stable judgments. As such, individuals' interpretations of their working context are inextricably linked to their broader perceptions of the organization's safety climate.

The concept of "hierarchy," frequently emphasized by shipmasters, has been a structure established for decades to ensure the smooth operation of shipboard activities. This formal structure is essential for the effective implementation of safety procedures, as well as for maintaining communication and coordination. The effective existence of a hierarchical structure minimizes potential risks and ensures the safe execution of ship operations.

Besides, shipmasters frequently highlight the significance of fostering "open communication." Such communication plays a vital role not only in boosting crew members' motivation and commitment to the vessel, but also in promoting a shared understanding of job responsibilities and safety protocols. The shipmasters interviewed expressed strong awareness of this need, with many noting a noticeable improvement in safety consciousness over recent years—an encouraging sign

for future practices within the maritime industry. Indeed, the growing body of academic research in the maritime sector indicates that the emphasis and awareness given to safety among all stakeholders, including policymakers, will continue to increase under the guidance of scientific findings.

The issue of "routines" particularly emphasized by the ship master highlights the importance of individuals making a difference in safety through self-regulation. Although maritime operations are governed by established procedural guidelines, human factors continue to be the principal contributors to accidents [4-7]. While shipping companies are responsible for cultivating safety awareness among their crews, the active engagement of individuals through self-regulation and personal commitment is also vital.

4. Conclusion & Future Research Directions

This research offers empirical support for the association between shipmasters' leadership paradigms and the perceived safety climate among maritime professionals. The quantitative analyses show that transformational leadership displays the most substantial positive correlation with safety climate perceptions (r=0.374, at a significance level of 0.05), whereas transactional leadership shows a less pronounced, yet statistically significant, positive correlation (r=0.235, at a significance level of 0.05). Conversely, laissez-faire leadership exhibits a negative correlation with safety climate perception (r=-0.196, a significance level below 0.05).

Recent empirical safety research and meta-analyses demonstrate that leadership and management practices emerge as significant antecedents for followers' safety perceptions, attitudes, and beliefs [34,53-56]. Furthermore, in the maritime industry, a study by Lu et al. [57] investigating the impact of national culture and leadership style on safety performance in dry cargo shipping companies found that transformational leadership had a positive effect on seafarers' safety attitudes and safety behavior. Indeed, the consistency of the results has been confirmed in the same sector.

The qualitative findings reinforce these results, indicating that shipmasters predominantly adopt transformational leadership practices, emphasizing safety awareness, safety management, and structured safety procedures. Shipmasters who exhibit intellectual stimulation, motivational leadership, and individualized consideration are more effective in fostering a strong safety climate among seafarers.

A detailed examination of the subdimensions of transformational leadership and safety climate perception reveals that the strongest correlation is found with intellectual stimulation, followed by charismatic/inspirational motivation and individualized consideration. The moderate, positive, and significant relationship between intellectual stimulation and safety climate suggests that shipmasters who encourage critical thinking, inquiry, and open dialogue create an environment where seafarers better understand safety protocols and develop a stronger commitment to compliance. These findings are supported by qualitative analyses where shipmasters identified as transformational leaders most frequently emphasized intellectual stimulation. Consequently, seafarers working with shipmasters who stimulate intellectual engagement and problem-solving tend to exhibit a more positive perception of safety and adherence to safety regulations.

Additionally, the study highlights that safety awareness is shaped by organizational structure. Large maritime companies use strict safety policies and contractual obligations ensuring higher compliance. However, smaller ones demonstrate greater variability, with some lacking even fundamental safety measures. These findings suggest that structural and cultural factors significantly influence safety perceptions and adherence levels.

Both qualitative and quantitative findings highlight the importance of leadership training programs that emphasize intellectual stimulation, safety-oriented leadership, and proactive risk management. Such programs could enhance safety awareness, improve compliance, and foster a more robust safety culture across different maritime organizations.

Based on the empirical findings of this study, it is crucial to enhance the leadership approaches of shipmasters to foster positive attitudes towards the safety climate, which encompasses daily perceptions related to organizational policies, managerial processes, work practices, and the working environment. In this regard, it is recommended that maritime education institutions develop their curricula for students aspiring to be future shipmasters. This includes imparting current approaches and practices in leadership, communication, and management skills, as well as raising awareness by sharing findings from academic studies.

During the qualitative research process, feedback from some interviews with shipmasters indicated a tendency for safety rules to be relaxed, particularly in small-scale shipping companies. Indeed, the efforts of shipping companies to establish a robust safety culture will play an effective role in creating a positive safety climate perception on board vessels. Therefore, it is recommended that measures be taken, especially in small-scale shipping companies, to address safety issues in a more professional manner. Additionally, it is advised that, due to the inherent nature of the sector, policymakers develop more detailed and systematic auditing processes for the enforcement of existing strict safety rules and procedures.

Beyond its contribution to the literature, this study is believed to support policymakers, ship management executives,

seafarers, and educators in maritime training institutions to enhance their commitment to safety. However, it would also be highly valuable for other researchers to investigate how safety awareness can be further increased under varying managerial conditions. Furthermore, it is suggested that future research aiming for comprehensiveness in safety-related studies include in-depth interviews with Designated Persons Ashore (DPAs), senior officials responsible for safety within shipping companies, in addition to shipmasters.

The sample size for our survey, which constitutes the first part of our research design, was determined to be 381 individuals based on information obtained from officials at the Turkish Ministry of Transport and Infrastructure. However, the overall population of 11,173 individuals includes seafarers who hold valid licenses but are not actively working in the sector, forms the study's universe. This implies that the actual accessible sample size was less than 381. To reach the determined sample size, contact was made with numerous shipping companies, requesting their assistance in distributing questionnaires to the target audience. Additionally, support was sought from maritime educational institutions and individuals connected to the industry. Despite these efforts, the response rate for the questionnaires remained limited to 261 individuals. Data from 261 respondents were examined, and only the 198 individuals who answered all questions were included in the analyses.

The target population frequently changes employers due to their work procedures being tied to voyages and contracts, resulting in low organizational loyalty. Furthermore, adverse conditions caused by the pandemic during the thesis work and periods of leave or long-haul voyages, which made questionnaire distribution impossible were additional limitations contributing to the response count being restricted to 198 individuals.

In the second part of the research design, in-depth interviews were conducted using semi-structured questions. Initially, face-to-face interviews with shipmasters were planned to thoroughly explore their perspectives and experiences in uncovering the relationship between leadership style and safety climate. However, due to the adverse effects of the pandemic and the earthquake disaster during the research process, interviews with seven shipmasters holding unlimited ocean-going qualifications were conducted online rather than in person. Additionally, some shipmasters, who the researcher requested to interview, faced situations where interviews had to be postponed or could not be conducted at all due to being on a voyage, poor internet connectivity, or high workload. Despite these challenges, the quality of the interviews was not negatively affected, as online sessions maintained clear visuals and flawless audio recordings.

Despite all these limitations, this research offers significant theoretical contributions to understanding the complex relationship between leadership styles and safety climate perception in the maritime industry. Specifically, it addresses a gap in the existing literature by revealing that the laissez-faire leadership style, contrary to expectations, has a negative impact on safety climate. This finding provides a new perspective on the applicability of classical leadership theories within the maritime context and emphasizes that future theoretical models should give more consideration to the potentially detrimental effects of laissez-faire leadership.

Furthermore, our study's mixed-methods approach has allowed us to support quantitative correlations between leadership and safety climate with in-depth qualitative data, enabling us to understand not only the existence of relationships but also how and why these relationships emerge. This methodological integration offers a more comprehensive perspective compared to previous studies that were limited to merely correlational relationships. Particularly, the strong impact of intellectual stimulation on safety climate indicates that this sub-dimension of transformational leadership should play a more central role in maritime safety theories.

Ethics

Ethics Committee Approval: Ethical approval was gained from the Ege University Social and Human Sciences Scientific Research and Publication Ethics Board (approval no.: 04/12, date: 29/03/2023).

Footnotes

Authorship Contributions

Concept design: E. Kılıçlı, and N. A. Ayyıldız Ünnü, Data Collection or Processing: E. Kılıçlı, Analysis or Interpretation: E. Kılıçlı, N. A. Ayyıldız Ünnü, and B. Kuleyin, Literature Review: E. Kılıçlı, N. A. Ayyıldız Ünnü, and B. Kuleyin, Writing, Reviewing and Editing: E. Kılıçlı, N. A. Ayyıldız Ünnü, and B. Kuleyin.

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