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A CASE STUDY FOR DEVELOPMENT AND VALIDATION OF A SAFETY CLIMATE SCALE FOR SHIPBUILDING INDUSTRY

ABSTRACT

This research was designed to describe the development of a scale for measuring safety climate considering individual and organizational factors in shipbuilding industry. The population of this study is comprised of the workers employed at eight shipyards located at Tuzla Shipyard Area in İstanbul. These workers are randomly selected from every department and handed out a scale form. Research sample consists of 245 workers in total. The scale developed after a comprehensive scientific literature review about safety climate and conducting a questionnaire. 43-item safety climate questionnaire was developed after a screening process and all the results were analyzed on the SPSS and AMOS statistical programs. The results of research showed that developed safety climate scale is satisfactory with regards to the reliability tests and factor analysis. The analyses demonstrate that this study developed a valid and reliable safety climate scale for shipbuilding industry.

Keywords: Safety Climate, Occupational Safety, Climate Shipbuilding Industry, AMOS Statistics Program

1. INTRODUCTION

The term of safety climate essentially emerged from the research on organizational culture and climate (Glendon and Litherland, 2001) and initially was measured in the work of Zohar, which had 40 items and was developed according to the characteristics of high and low accident-rate companies (Zohar, 1980). According to Zohar (1980), safety climate is one of the different climates that an organization produces, and climate was defined as "a summary of molar perceptions that employees share about their work environments". Several definitions and conceptualizations of the safety climate have been proposed since the first appearance of the term, but it has also not been exclusively and consistently defined. However, based on some common themes among previous safety climate definitions, a general definition can be proposed (Lin, et al, 2008). According to Wiegmann, et al., (2002) safety climate defined as "Safety climate is the temporal state measure of safety culture, subject to commonalities among individual perceptions of the organization. It is therefore situationally based, refers to the perceived state of safety at a particular place at a particular time, is relatively unstable, and

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subject to change depending on the features of the current environment or prevailing conditions".

Safety climate is a multidimensional concept regarding work characteristics and organizational practices (Harvey, et al., 2002). Many studies have revealed that safety climate is the forewarning indicator of safety problems and meaningful predictor of safety performance which is used for measuring safety climate and safety related outcomes of organizations such as occupational accidents and injuries. However, there is no exact consensus on safety climate dimensions in the safety literature (Neal and Griffin, 2004; Clark, 2006; Williamson, et al., 1997). Flin, et al., (2000) reviewed 18 published safety climate survey reports including only the industrial sectors that safety system, management - supervision, risk, competence and work procedure were the most frequent dimensions. Management commitment is also the primary focus as a dimension of much contemporary safety climate research (Lu and Yang, 2011)

An adjacent concept to safety climate is "safety culture". Safety culture is part of the organizational culture tends to focus on the deeper and less accessible core values and assumptions of the organization regarding safety and human resources (Mearns and Flin, 1999). According to the Guldenmund's (2000) review on safety culture and safety climate, safety culture is more associated with attitudes whereas safety climate is more associated with perceptions. Cox and Flin (1998) states that safety climate is often referred to as an empirical measurable component of safety culture applied in survey research with validated questionnaire.

Developing a reliable and valid safety climate scale assumes importance due to its ability to predict safety behavior, safety related outcomes (e.g. frequency or severity of accidents and injuries) and to facilitate collection of accurate data (Vinodkumar and Bhasi, 2009). There have been several methods to assess the safety climate for several industries. One of the most used instruments is applying a questionnaire which has approved validation. For example; Ghahramani and Khalkhali (2015) described and developed a scale for measuring safety climate, for manufacturing companies in Iran, by introducing validity and reliability values of the questionnaire items. Lin et al. (2008) has also obtained safety climate measures in China industry and they found that 21-item questionnaire is valid and reliable for safety awareness, safety competence and safety communication factors in safety climate measures. In maritime industry, Hetherington et al. (2006) introduced safety climate index as fatigue, stress, health, situation awareness, team work, decision making, communication and safety culture. Based on Hetherington et al's study, Niesen, et al. (2013) developed an 11-item safety climate inventory for petro-maritime organization by performing validity analysis. Lu and Yang (2011) introduced safety climate measures on safety policy, safety motivation, emergency preparedness, safety training and safety communication to examine the impact of safety climate on self-reported safety behavior in the passenger ferries.

2. RESEARCH SIGNIFICANCE

This paper mainly contributes to the literature on safety climate and occupational safety perception of workers who actively working at shipbuilding industry. The aim of this study to develop and validate a safety climate scale considering individual and organizational factors for shipyard workers. For this purpose, the 43-item safety climate questionnaire which is developed after a comprehensive scientific literature review was applied to randomly selected 245 workers who work eight shipyards located at Tuzla

Shipyard Area in İstanbul. This paper is designed to consist of four basic chapters. In the introduction part, the safety climate and occupational safety literature that motivate us for this study are given. Secondly; data collection process and statistical method are explained. In the third part, analysis results are introduced. Lastly, discussion and brief conclusion are presented.

3. METHOD

Scale development is a process certain phases follow each other. It is possible to order the scale development process as follows (Clark and Watson, 1995).

- Reviewing the relevant literature
- Interviewing field specialists and instructors
- Forming an article pool
- Consulting to specialists for their opinions on articles
- Calculating content validity rate and determining index
- Revising necessary articles in direction of specialists' opinions
- Pilot scheming
- Validity and reliability practices
- Application on field

As the first step, domestic and foreign sources on the scale desired to be developed were scanned. General information on scale development was obtained. Scale development practices by several specialists were examined. The theoretical background was created necessary for scale development with the practices carried out.

In the second step, experienced engineers working for the study and senior executives were interviewed, and meetings were held with safety practice specialists. Collected information was noted. Recommendations by field specialists were taken into consideration while forming the article pool.

This study uses Lawshe's Technique. Lawshe's Technique requires 5 opinions by specialists in minimum and 40 in maximum, and consists of 6 phases (Lawshe, 1975).

- Generating a field expert group
- Creating candidate scale forms
- Consulting to specialists for opinions
- Obtaining content validity rates of articles
- Obtaining content validity rates of scale
- Preparing the final form based on content validity rate/index scales

We carried out our studies based on this technique and tried reaching specialists. Accordingly, developed articles were presented to 10 specialists for their opinions as academicians from universities and specialists working for the industry. Taking into consideration expert opinions, we determined how many specialists voted for separate possible options for each article. As the next step, we calculated content validity rates by making use of the following formula. Content validity rates (CVR) are found as 1 minus result of the rate of number of specialists stating "Necessary" for any article to overall number of specialists related to that article.

$$CVR=[CV/(N/2)]-1 \quad (1)$$

where N is the total number of the articles.

Veneziano and Hopper (1997) turned minimum CVR (content validity scales) values into a table. The minimum values related to the number of specialists also reveal the statistical significance of an article. Each article was examined and CVR values have been presented in Table

1 and the ones with CVRs under 0.62 was taken out of the scale. And then, Articles 11, 39 and 40 were altered with necessary arrangements made in order to serve the purpose and make the articles more understandable in line with expert opinions. Workers employed at Tuzla Shipyard Area were applied a survey in order to collect necessary useful data. The final survey developed for this purpose consists of 43 questions.

Table 1. Minimum CVR values

Number of Specialist	Minimum Value	Number of Specialist	Minimum Value
5	0.99	13	0.54
6	0.99	14	0.51
7	0.99	15	0.49
8	0.78	16	0.42
9	0.75	17	0.37
10*	0.62*	18	0.33
11	0.59	19	0.31
12	0.56	20	0.29

The survey contains multiple-choice answers to the questions and makes use of a 5-point Likert-type scale (Always, Often, Sometimes, Rarely, Never). The questions used in survey relate to occupational safety and organizational climate. These answers are respectively scored 1, 2, 3, 4 and 5 while calculating the scale point. Survey takers were given necessary information for each survey, and briefed on the importance of answers given to survey and data usability.

4. RESULTS

4.1. Reliability Analysis of the Survey

The most commonly used ones of reliability tests may be listed as Cronbach Alpha, Split, Parallel, and Strict Parallel. A Cronbach Alpha value over 60% is indicator of survey’s success. Some researchers select values over 75% as baseline. Other criteria exceeding 70% show that internal consistency of a survey is ensured and implications could be relied on. As seen in Table 2, percentage values intended and specified in each of 4 tests exceed reliability criteria. Conclusions of the sample are found to be reliable and consistent with high reliability values. It may be said that the survey conducted with persons is successful and consistent in itself and results to be obtained will reflect the truth as each of the reliability criteria exceeds 70% value.

Table 2. Reliability test results of questionnaire

	Reliability Results
Cronbach_Alpha	0.921
Split	0.918-0.895
Parelel	0.914
Strict	0.902

4.2. Data Analysis

Frequency distribution tables related to demographic questions are interpreted in the first phase as in Table 3. In the second step, analyses intended to measure validity - reliability of the scale were carried out. The third step contains information on testing group differences in terms of factors for some groups.

Table 3. Demographical characteristics

Related Findings		Frequency	Percentage
Gender	Male	208	84.9
	Female	37	15.1
	Total	245	100.0
Age	19-25	21	8.6
	26-32	75	30.6
	33-39	87	35.5
	40-46	37	15.1
	47-53	25	10.2
	Total	245	100.0
Education Status	Elementary School	15	6.1
	Secondary School	76	31.0
	High School	60	24.5
	College	10	4.1
	University	84	34.3
	Total	245	100.0
Occupation Status	Worker	113	46.1
	Office Personnel	38	15.5
	Educated Office Personnel	26	10.6
	Engineer	68	27.8
	Total	245	100.0
Year in the Sector	0-2	38	15.5
	3-5	77	31.4
	6-10	86	35.1
	11+	44	18.0
	Total	245	100.0
Accident Status	Yes	14	5.7
	No	222	90.6
	Other	19	3.7
	Total	245	100.0

4.3. Factor Analysis Results

The most important phase of factor analysis for the research is to identify, thereby give meaning to obtained factors. While identifying and giving meaning to factors, one should consider observational variables intensely affected by factors and ask what could have an impact on them so intensely. Explanation of the concerning variable after identifying and giving meaning reveals itself as interpretation of a regression equation. Several tests were performed in order to determine the suitability of factory analysis in the first phase of application. Bartlett's Test of Sphericity tests the hypothesis "correlation matrix equals to unit matrix". Denying the hypothesis means the presence of a correlation among variables and applicability of factor analysis on variables comes into question. In this study, as it is seen in Table 4, main mass correlation matrix was found not to be the unit matrix with respect to Bartlett's test and sphericity criteria was met ($p<0.05$). Kaiser-Meyer- Olkin (KMO) value provides information on whether factor analysis is appropriate. Lower KMO values conclude that application of factor analysis will not be appropriate. Regarding KMO criteria; sample size, observed correlation coefficient size and partial correlation coefficients were found to be consistent for factor analysis (see KMO=0.913).

Table 4. KMO and Bartlett test results

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.913 Climate
Bartlett's Test of Sphericity Approx. Chi-Square Df Sig.	4311.464 153 <0.001

In the second phase of analysis, eigenvalues higher than 1 could be counted or decisions could be made by considering factors' percentage of indicating the variance if standardized data matrix is implemented in determining factor numbers. Another option is to make decisions on eigen value-factor graph as in Figure 1, just like in principal component analysis; the graph starts to get monotonous determines the factor number.

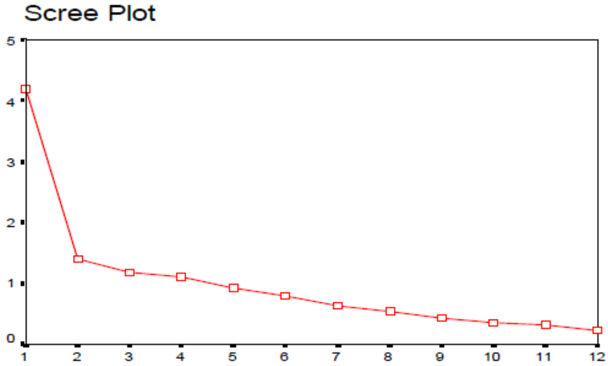

Figure 1. Eigen value-factor graphic

Overall 4 factors were detected with eigen values over 1 out of 43 variables discussed. "Varimax rotation method" was chosen for factor rotation (recommended in the literature after 2013), and explained total variance values are presented in Table 5. Explanatory levels of obtained factors were found to be 65.43%. The first factor ranks first with the highest explanatoriness with 34.91%. The second factor has 11.57% explanatoriness, the third factor 9.774%, and the fourth factor 9.17%. Weighted potency is in question for the first 2 factors.

Table 5. Total variance values

Factors	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1 Factor	4.189	34.911	34.911	4.189	34.911	34.911
2 Factor	1.389	11.576	46.487	1.389	11.576	46.487
3 Factor	1.173	9.774	56.261	1.173	9.774	56.261
4 Factor	1.100	9.170	65.431	1.100	9.170	65.431

The graph starts to get monotonous and tendency changes can be seen as the 4th factor. That is, a monotonous construct is present after the 4th factor and 4th factor is the spot this tendency changes. 4 factors obtained through overall 43 articles are grouped and named as follows with respect to conceptual meaning. The questions corresponding to obtained factors were analysed for reliability intended to the Reliability of Question Set. Cronbach's Alpha values were examined, and the results have been given in Table 6. Scale is considered reliable in the event that Cronbach's Alpha is 0.70 and over, and it is considered over 0.60 when question set is minimum. As seen in the table, each of the sub-domains (factor) exceeds the values in question and refers to the reliability of the scale.

Table 6. Cronbach Alpha values

Scale Sub Dimensions	Factor Number	Cronbach Alpha
Satisfaction regarding occupational works safety applications	Factor 1	0.901
Perception regarding attitude of management for occupational work safety	Factor 2	0.899
Knowledge/Capability	Factor 3	0.920
Fatalism	Factor 4	0.904

Table 7 presents the factor structure related to the studied scale. Factor weights vary between values 0.55–0.84. As it is seen the first factor is the most important one, and explains 34.911% of overall variance. The variables in this factor with factor loads over 0.55 relate to workers' sense of satisfaction concerning occupational health and safety practices and rules. This factor includes 17 variables. Two variables with the highest weight on this factor are the ones "our shipyard possesses instructions for occupational safety" and "our safety is frequently checked for occupational safety". For that reason, this factor may be named satisfaction for occupational safety.

The second factor explains 11.576 of total variance. This factor includes 17 factors in total. The three variables with the highest weight on this factor are the ones "those are quickly laid out who do not work appropriately to occupational safety", "Shipyard management constantly monitors whether its workers conform to occupational safety procedures" and "Shipyard management regularly inspects occupational safety". Consequently, this factor may be named satisfaction regarding to safety applications in work environment.

The variable with the highest factor value of those above mentioned is the one "those are quickly laid out who do not work appropriately to occupational safety". The reasons for that is high rate of workers' feeling a sense of fear towards losing their jobs. It should be the subject of another study that workers feel obligated as a requirement for continuance of their jobs instead of contributing to safety climate consciously.

The variable with the highest factor of information/competence variables is the one "I take initiative on subjects related to occupational safety". Drawing on this variable, one can understand that workers feel they possess sufficient information and equipment on occupational safety. Nevertheless, another study could discuss whether workers taking initiative possess sufficient information or not.

Table 7. Factor structure

Factor 1: Variables for Satisfaction regarding occupational works safety applications	Factor Loads
Personnel employed by yard is subject to occupational health and safety training	0.760
The yard I’m working now has much safer conditions than my previous workplace	0.767
Our yard has occupational safety instructions	0.845
Our yard is often controlled for its occupational safety	0.821
Our yard has a time schedule related to commission plan	0.789
Time schedule related to commission plan can be easily applied	0.743
The equipments related to occupational safety is provided regularly within the yard	0.693
There is emergency planning in the yard	0.699
All employees in the yard are trained for first aid during emergency cases	0.753
The employees in the yard are aware of their assigned positions	0.551
The rules and regulations related to occupational safety are definite and clear	0.693
Our yard has forms available which employees can report the relevant dangerous situations related to occupational safety	0.699
Employees within the yard are in cooperation with each other for sharing information related to occupational safety	0.730
Employees within the yard can recognize the difference of behaviours if complies with occupational safety procedures or not	0.620
Employees within the yard feel responsibility to obey occupational safety rules	0.632
Workload prevents me to perform the work safely	0.621
Factor 2: Variables for Perception regarding attitude of management for occupational work safety	Factor Loads
Employees within the yard do not hesitate to contact top management in order to inform non - observants to occupational safety rules	0.662
Employees within the yard can express their distress easily	0.699
Employees within the yard have common team spirit	0.801
Employees who are suitable for occupational safety are rewarded in our yard	0.706
Employees who works in accordance with occupational safety are awarded in the yard	0.842
Procedures related to my duties enable to perform my work in a professional way	0.562
Yard management holds its own employees responsible for occupational safety	0.699
Yard management makes effort in order to be kept informed regarding problematic situations related to occupational safety	0.801
Yard management keeps all kind of occupational safety equipment in stock	0.762
Yard management searches the reasons of accidents objectively	0.651
Yard management continuously issues the instructions related to occupational safety	0.602
Yard management continuously observes our working environment in order to control compliance with occupational safety procedures in the workplace environment	0.705
Yard management often provides its employees with occupational safety guide	0.772
Yard management always tracks if its employees comply with occupational safety procedures or not	0.841
Yard management regularly carries out inspection regarding occupational safety	0.832
Employees contribute to the decisions taken with their ideas in order to improve occupational safety quality	0.623
Employees can contribute during forming occupational safety procedures with their ideas	0.764
Factor 3: Knowledge/Capability Variables	Factor Loads
I take initiative in case needed related to occupational safety	0.883
I believe the necessity that rules related to occupational safety within the yard shall be defined in advance	0.759
Recording accidents provides safe working environment	0.661
Yard management is willing to keep records of any accident	0.593
Yard management tries to receive feedback in every respect regarding occupational safety	0.691
I am open to any project that will improve occupational safety quality in my working environment	0.560
I am interested in occupational safety	0.778
All employees are familiar with reporting procedure for injury cases	0.721
I take initiative in case needed related to occupational safety	0.802
I believe the necessity that rules related to occupational safety within the yard shall be defined in advance	0.796
Recording accidents provides safe working environment	0.658
Factor 4: Fatalism	Factor Loads
Accidents can be prevented by good luck	0.724
If any accident is meant to happen, such accident cannot be prevented	0.695

4.4. Test of Normality for Factors

Confirmatory factor analysis and structural equation modeling are sensitive analyses on providing normal distribution. For that reason, 4 factors were tested for normality shown in Table 8.

Table 8. Tests of normality of factors

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Satisfaction	2.345	230	0.123	3.960	230	0.100
Perception	3.071	230	0.097	5.960	230	0.210
Knowledge/Capability	4.663	230	0.139	4.778	230	0.286
Fatalism	6.771	230	0.099	4.220	230	0.125

Indicating normal distribution with both test results for all factors, H_0 hypothesis was considered $p>0.05$. In this condition, it is possible to apply confirmatory factor analysis and structural equation modeling practice.

4.5. Confirmatory Factor Analysis and Structural Equation Modelling Practice

Confirmatory factor analysis is a strong statistical method used to analyze a hypothetical framework and frequently resorted to in adapting a scale developed in a certain culture to another. For that reason, confirmatory factor analysis method was applied in construct validity practice of the scale. Goodness of fit indices belonging to the model show sufficiency in order to consider confirmatory factor analysis results valid. Even though it was stated that chi-square, CFI and RMSEA should be found coherent for sufficiency of the model (Hair, et al., 2006) all the indices was checked in adaptation practice. Table 9 introduces the goodness of fit index values for confirmatory factor analysis. It is indicated for goodness of fit indices that GFI, NFI, RFI, CFI and IFI indices at values over 0.90 show sufficient level of fit; values getting closer to 0 show bad fit, and getting closer to 1 show perfect fit; SRMR and RMSEA under 0.05 is a good fit value, and falling under 0.08 shows an acceptable goodness of fit; the rate of chi-square value to degree of freedom under 5 shows good fit (Schumacker and Lomax, 2004).

Table 9. Model fit for confirmatory factor analysis

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	0.871	0.831	0.959	0.945	0.958
Saturated model	1.000		1.000		1.000
Independence model	<0.001	<0.001	<0.001	<0.001	<0.001
RMSEA					
Model	RMSEA	LO 90	HI 90	PCLOSE	
Default model	0.071	0.014	0.111	0.205	
Independence model	0.303	0.277	0.329	<0.001	
HOELTER					
Model	HOELTER 0.05	HOELTER 0.01			
Default model	79	90			
Independence model	13	15			

Examining Table 9, one can see that very good fit values are found in fit indices based on independent model. CMIN/DF (1.405)<2, CFI (.958)>.95 shows perfect fit, i.e., exceeding 0.95 level. In addition, "RMSEA" for square root of approximation errors was found under 0.08, which was (0.071). TLI (Tucker & Lewis Index), is normalized fit index. It is the form of model with degree of freedom added a NFI does not get close to 1 in such cases that number of samples for NFI is low, and this negativity is thereby eliminated. Our study is close to perfect fit with TLI .945. HOELTER index requires at least 79 answers; our model is over this figure with 230 feedbacks. Hoelter .05 and Hoelter .01 index values reveals how many number of samples in minimum is for reliability range. Here, this model was tested with samples more than necessary with minimum 79 samples between 0.05 freedom ranges. Standardized RMR shows good fit as it is very close to 0.05 with .0538. Theoretical model's very little difference between its covariance matrix and sample's covariance matrix shows that theoretical model is consistent with sample data. Therefore, factors are confirmed for reliability with confirmatory factor analysis, and the test has yielded the expected results. A structural equation modeling was established following confirmatory factor analysis and safety climate was considered latent factor, examining its impact on considered subdomains and presented in Table 10.

Table 10. Structural equation model

	Estimate	S.E.	C.R.	p
Safety climate <--- F1	0.910	0.159	5.727	<0.001
Safety climate <--- F2	0.845	0.136	6.195	<0.001
Safety climate <--- F3	0.814	0.137	5.940	<0.001
Safety climate <--- F4	-0.667	0.149	4.490	<0.001

Safety climate gets lower as F4 gets higher, but safety climate gets higher as other factors get higher. The greatest positive contribution comes from factor 1 and factor 2. Safety climate in a certain business establishment is positively affected by activities such as providing workers in that business establishment with qualified occupational safety training and practicable occupational safety instruction, distributing task planning and time schedule, reporting and workload at optimum levels. Satisfaction is associated with how workers perceive their jobs. Several authors emphasize that satisfaction is the most significant factor that affects workers' behaviors in a business establishment. Satisfaction is comprised by determinants such as physical working environment, time pressure, workload, stress, distribution of tasks and division of labor (Grote and Künzler, 2000). The most critical variable affecting the safety climate in a business establishment is the workers of that business establishment. Workers' feeling safe in working environment and subsequently getting personal satisfaction positively affects other workers as well, reinforcing the safety climate. The management's feeling sensitivity on operation of current occupational safety in a certain business establishment positively affects workers at that business establishment believing in the existing safety climate in that business establishment evenly. Attempts to form a strong management on subjects of occupational safety and health plays a vital role in forming a positive safety climate. If the management in a certain business establishment has strong communications with workers, then workers add greater value to safety climate.

Workers aware of a management having parallel thoughts with themselves are expected to increase their efficiency in forming safety climate. In another word, if majority of workers in a certain business establishment acts in accordance with occupational safety, they set a good example for other workers, and assume the leading role on this subject, helping other workers increase their awareness of safety climate, too. Therefore, positive reception of workers increases safety climate. As is seen in factor 3, the 3rd factor that positively affects safety climate of a business establishment is the variable for workers with high knowledge and competence on occupational safety. Workers' self-confidence and responsibility go up inside business establishment, and thereby make positive contributions to formation of safety climate as their level of knowledge increases.

Knowledge and competence on occupational safety and behavior effect lay the foundation for the structure of safety climate. A systematic training process has enhanced workers' occupational safety competence.

Nevertheless, knowledge and training alone are not sufficient to form safety climate. Research shows that safety knowledge and competence are important factors for satisfaction of predicting the suitability to safety climate (Hofmann et al, 1995). This factor contains knowledge and competence aimed at rules and practices, also generates a behavior effect aimed at safety climate within routines, work processes, rules and system integrity.

The 4th factor which is fatalism negatively affects the safety climate of a certain business establishment. Fatalism is briefly defined as one's belief in fate. This belief asserts that all events are previously determined and there is nothing we can do to prevent these events from occurring. This condition is a social risk affecting safety climate (Rundmo and Hale, 2003). Workers with fatalistic approach ignore requirements and obligations of safety climate, and show a careless attitude. Workers with fatalistic characteristics hamper the formation of safety they are not aware of or they neglect.

To determine the ranges while evaluating the questionnaire, range value is found for the interval, and group interval is calculated by dividing range by fixed number of groups (Bertram, 2009). There are 43 questions present in the worked scale, and the minimum point is 43. In this way, the highest point to be obtained from the scale will be 215 (43x5); 215–43=172 is the range of scale. This study is based upon 20 in line with studies used in similar scales in the literature. Accordingly, applied scale was determined 172/20=8.6. This value is multiplied by 100 and used as percent value, and rounded to whole number, thereby giving 0.80 value.

Accordingly, point range is 0.80. Point range formed to evaluate the scale used in prepared study was determined as follows:

- I totally agree 1.00–1.80
- I agree 1.81–2.60
- I partially agree 2.61–3.40
- I rarely agree 3.41–4.20
- I disagree 4.21–5.00

This point range is general evaluation tool that does not change by any survey, but has the property to change in case the number of question changes. Evaluation may be drawn not only from this point but also from general point score of the scale. That is, 2 ways are recommended for researchers. The first one is interpretation of analysis following likert range values, and the other one is evaluation through the result of a binary discrimination from general point average of the scale.

Mean of general answer score is found 2.18, drawing upon Table 11. That means; respondents have answered in "i agree" range. Average point value of respondents is found 93.75. This point could be used for binary discrimination as well, that is, a classification could be preferred as those with higher perception of occupational safety and those with lower perception of occupation safety by assigning respondents under 2 groups outside 5-point likert survey.

Table 11. Descriptive statistics

		Statistic
Score	Mean± Std. Deviation Median (Minimum-Maximum)	93.7565±22.42195 91.5000 (52.00-159.00)
Mean	Mean± Std. Deviation Median (Minimum-Maximum)	2.1804±0.52144 2.1279 (1.21-3.70)

As can be seen, average point has high discrimination potency in test result variable table, Table 12, with 94.3% for both groups. In this way, respondents over 0.94 could be described as those with high perception while those at or under 0.94 as those with lower perception. From this point of view, 41.8% of the participants in the study were found to be high in perception of occupational safety, and 58.2% of which low in perception of occupational safety.

Table 12. Test result variable(s): score

Area	Std. Error	Asymptotic Sig.	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
0.943	0.031	<0.001	0.913	0.984

Drawing upon the conducted study, we observed that groups with similar levels of education responded similarly to the survey. To exemplify, elementary school or comprehensive high school graduates give lower points to the questions in survey whereas university graduates tend to give higher points to survey. From a different point of view, number of field workers taking the survey is about two times the number of engineers. Analyses show that workers employed at engineering staff at shipyard reports more positively on safety climate than field workers. Thus, that field workers gave lower points to survey led to low perception in the result of survey. Apart from the above-mentioned examples, we observe that 46.9% of workers taking the survey have a work experience in the industry between 0 to 5-year ranges if we take years of employment of workers as baseline. More experienced workers are more aware of duty functions and they usually come across with less occupational risks due to increasing occupational experience compared to those with less experience (Basha and Maiti, 2012). Those in the first years of their working lives tend to give low points to survey as they are in their first years of working lives and therefore don't possess sufficient perception of occupational safety. On the contrary, workers taking the survey and with working experience over 11 years tend to give high points to survey. Nevertheless, considering working conditions and types of death in previous years at shipyards, one can comment that 44.8% score for perception of occupational safety we obtained shows that occupational safety climate has been improving at Tuzla Shipyards Area, given in Table 13.

Table 13. Occupational safety perception

	Frequency	Percentage
Low	127	55.2
High	103	44.8
Total	230	100.0

5. DISCUSSION AND CONCLUSION

In this study, the impacts of the safety climate on safety behaviors of employees were examined in terms of satisfaction, perception, knowledge/capability and fatalism. In accordance with this purpose, a valid and reliable 43-item safety climate questionnaire was developed after a screening process for shipbuilding industry in Tuzla area of İstanbul. According to the results obtained from the study; job satisfaction, perception and attitude of the administration and safety knowledge and competence of the employees have a positive significant effect on safety climate and awareness has been identified. Similarly; high awareness of employees on safety concept, participation in improvement of working conditions and safety management system and cooperation with administration on safety issues enable that employee gives more attention to occupational safety procedures.

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