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THE EFFECT ON THE SAFETY CULTURE OF OCCUPATIONAL ACCIDENTS AND SAFETY BEHAVIOR: THE CASE OF TURKEY

Abstract:

Work accidents are one of the most important problems encountered in working life. The purpose of this study is to measure the impact of safety culture on safety behaviour of employees and occupational accidents In literature, various measurement tools have been used for the evaluation of safety culture. In this study, a questionnaire was created which made use of the measurement scales in these previous studies, whilst also taking into consideration particular Turkish cultural characteristics. The dimensions of safety culture scales are as follows: Managers' commitment, priority of safety, safety training, safety communication, safety awareness and competency, employees' involvement, reporting culture. The sample of the study consisted of total 1371 working manufacturing sector in Turkey. The questionnaire was applied to all the employees during a 1-week period. The mean age of the participants was 30.36±7.69, mean working years 6.31±5.61. The data are analysed using frequency distribution, reliability analysis, correlation, t test and regression analysis.

According to the results obtained with the safety culture dimensions it is a significant relationship between occupational accidents. It has also been found that safety cultures have a positive effect on the safe behavior of employees. According to results, safety culture has an important key role to create a safe and healthy working environment in workplace.

Keywords:

Safety culture, Safety behaviour, Occupational accidents, Turkey

JEL Classification:　I18, D23, J28

1   Introduction

Work accidents attract attention as one of today's global problems. Numerous employees in different parts of the world are losing or injuring their lives due to job accidents. According to the sources of International Labour Organization (ILO), every day, 6,300 people die as a result of occupational accidents or work-related diseases more than 2.3 million deaths per year (http://www.ilo.org/moscow/areas-of-work/occupational-safety-and-health/WCMS_249278/lang--en/index.htm).

Occupational accidents, as well as on a global scale is one of the major problem areas in terms of Turkey. According to data obtained from official sources, between the years of 2007-2016 in Turkey have lost their lives due to workplace accidents 12.610 employees. In 2016 alone, 286,068 work accidents took place and 1405 employees lost their lives. (Republic of Turkey Social Security Institution, 2018). Another remarkable data related to Turkey, by the Turkish Statistical Institute made between 2006 and 2013. "Work Accidents and Work Related Health Problems" is doing research. According to the results of this study in 2013, 2.3% of the total employment is exposed to work accidents within the last 12 months. (http://www.tuik.gov.tr/PreHaberBultenleri.do?id=16118).

When looking at the situation regarding both the world of work accidents in Turkey, it is observed that the major problem in the prevention of occupational accidents. Regulations at the technical and legal level appear to be insufficient at the point of preventing job accidents. Because 90% of the accidents that come to the scene are caused by insecure behavior of the employees. (Tomas, et al, 1999). This situation reveals the concept of security culture.

The concept of safety culture, which started to be used after the nuclear accident that took place in Chernobyl, is one of the important concepts of recent times in the business security literature (Tharaldsen, et al., 2008). After the nuclear accident in 1987, prepared by the OECD Nuclear Agency in a report, it is pointed out to the role of violations of organizational errors and employees in the emergence of disaster (Yule, 2003) The most important point emphasized in this report about possible causes of accidents is that the weakness of the safety culture level is the main factor in the accident (Cox and Flin, 1998).

Both the accident at Chernobyl, as well as other global scale in a major accident, safety culture, especially in cases where a high level of risk has been a key concept describing its role in ensuring the safety of the human factor(Clarke, 1999; Cooper, 2000). However, it does not seem possible to say that there is a consensus on exactly how this concept will be defined.

According to the Advisory Committee on the Safety of Nuclear Installations "The safety culture of an installation is the product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to,

and the style and proficiency of an organization's health and safety management" (Fleming, 2005). According to Turner et al. (1989) safety culture is "the set of beliefs, norms, attitudes, roles and social and technical practices concerned with minimizing the exposure of employees, managers, customers and members of the public to conditions considered dangerous or injurious" (Cox and Flin, 1998). According to the Confederation of British Industry (CBI, 1991), safety culture is, "the ideas and beliefs that all members of the organisation share about risk, accidents and ill health" (Cooper, 2000).

On the other hand, a number of studies have been conducted in different sectors related to the effect of the security culture on employee behavior. Given these results obtained from studies of the safety culture of employees it is seen as having a significant impact on safe behavior (Lee, 1998; Fung et al., 2005; Muniz et al., 2007; Yang et al., 2010; Schwarz and Kallus, 2015).

The purpose of this study is to identify employees' safety culture levels and to explain the influence of safety culture on employees' safety behavior. In other words, the study is aimed at analyzing employees' safe behaviour and its effect on workplace accidents.

2. Method

2.1. *Participants and implementation of the survey*

The study sample consisted of 1371 employees from a company in the manufacturing sector in Turkey. The questionnaire was applied to all the employees during a 1-week period. The study sample comprised 93.9% male and 62% married. The mean age of the participants was 30.36±7.69, mean working years 6.31±5.61. 29.1% of the participants stated that they had occupational accidents during the period they worked in the workplace.

2.2. *Safety Culture and Safety Behavior Measures*

When we look at the literature on safety culture, it is seen that different measurement tools are used. These measurement tools differ according to sectors and countries. In this study, a safety culture questionnaire was developed using the scales previously used for safety culture measurement.
The dimensions in the questionnaire and the measurement scales are as follows:
• 	*Managers' commitment:* The 9-item measurement scale was taken from the study by Muniz et al. (2007). This scale, managers' attitudes and behaviors of managers composed of two sub-dimensions.
• 	*Priority of safety:* Taken from the study by Cox and Cheyne (2002), this 4-item scale measures the priority of safety in the organization.

● *Safety training:* The four items of this questionnaire, taken from Neal and Griffin (2002), evaluates employees' perceptions towards the safety training provided by the organization.

● *Safety communication:* The five items of this questionnaire, taken from the study by Neal and Griffin (2002), evaluate employees' perceptions of the communication between management and staff regarding safety.

● *Safety awareness and competency:* This 5-item scale, taken from the study by Lin et al. (2008), evaluates the employees' awareness of safety and their competence to deal with safety problems which may arise.

● *Employees' involvement:* Taken from Muniz et al. (2007), the four items of this questionnaire, reflects the degree of workers' compliance with safety procedures and the extent to which they participate in improving working conditions.

● *Reporting culture:* This dimension focused on the reporting of accidents, near misses and unsafe conditions. This measurement was taken from Havold and Nesset (2009)

In this study, the measurement of safety behavior developed by Neal and Griffin (2000) was used. The questionnaire consisted of six statements such as "I use all the necessary safety equipment to do my job" or "I voluntarily carry out tasks or activities that help to improve workplace safety" to give subjective self-assessments of the employees' safety performance in the workplace, with a 5-point Likert scale (1 = Strongly Disagree - 5= Strongly Agree).

In addition, employees were asked with a single question whether they were previously exposed to work accidents at their workplace. In response to the question "Have you been exposed to a job accident in the workplace where you worked", the participants gave their answers in two alternatives, "yes" and "no".

3. Results

Descriptive statistics, including means, standard deviations and internal consistency reliabilities (coefficient alpha) are shown for all the study scales in Table 1.

Table 1. Descriptive Statistics and Reliability Values

Variables	Mean	C.Alpha
Managers' attitudes	3.43±0.90	0.87
Managers' behaviors	3.68±0.81	0.84
Priority of safety	3.56±.076	0.70
Safety communication	3.67±0.73	0.86
Safety training	3.37±0.88	0.84
Safety awareness	4.16±0.64	0.78

Employees' involvement	3.63±0.75	0.77
Reporting culture	4.58±1.10	0.84
Safety behavior	4.20±0.66	0.87

Table 2 shows the results of a correlation analysis between safety culture variables and safe behavior variables.

Table 2. Correlations between Dimensions of Safety Culture and Safety Behavior

	1	2	3	4	5	6	7	8
Managers' attitudes								
Managers' behaviors	.745**							
Priority of safety	.649**	.684**						
Safety communication	.634**	.675**	.633**					
Safety training	.646**	.728**	.663**	.727**				
Safety awareness	.444**	.433**	.481**	.585**	.434**			
Employees' involvement	.500**	.566**	.514**	.620**	.592**	.488**		
Reporting culture	.348**	.351**	.363**	.385**	.368**	.365**	.355**	
Safety behavior	.356**	.404**	.373**	.433**	.413**	.452**	.484**	.390**

When we look at the results of a correlation analysis between safety culture variables and employees' safety behavior variables (Table 2), it is seen that there is a positive relationship between security culture dimensions and safe behavior. The variable is the most powerful in the relationship of safe behavior variables, the Employees' involvement is variable (r=.484; p<.01).

A stepwise regression analysis was conducted to assess the effect of safety culture variables on employee safety behavior. These analyzes were made by adding stepwise to all other independent variables (safety culture variables), as safe behavior dependent variables. The results from this analysis are shown in table 3.

Table 3. Regression Analysis Results

Stage	Independent Variables	B	Beta	t	p	F	R^2
1	Employees' involvement	.430	.484	20.337	.000	413.601	.235
2	Employees' involvement	.308	.347	13.280	.000	284.317	.297
	Safety awareness	.296	.285	10.905	.000		
3	Employees' involvement	.267	.300	11.495	.000	220.175	.327

	Safety awareness	.244	.235	8.940	.000		
	Reporting culture	.120	.198	8.058	.000		
	Employees' involvement	.229	.257	8.954	.000		
4	Safety awareness	.226	.218	8.184	.000	169.604	.333
	Reporting culture	.112	.185	7.479	.000		
	Managers' behaviors	.073	.098	3.512	.000		

Dependent Variables: Safety Behavior

According to Table 3, it is found that the security behavior variable significantly explains the behaviors of employees 'involvement, safety awareness, and reporting culture and managers'.

The total contribution to explaining variance of these variables is approximately 33%. In the model obtained in the fourth stage, when the Beta values were examined, the safety behavior was explained by employees' involvement (β = .257, p <.05), safety awareness (β = .218, p <.05) p <.05), and managers' behaviors (β = .098, p <.05) were found to have relative avoidance.

In addition, the relationship between exposure to occupational accidents and safety culture variables in the study was examined by t test. The results of this are shown in table 4.

Table 4. Relations between Work Accident and Safety Culture Variables

Safety Culture Variables	Work Accident (Exposed/Not Exposed)							
	Yes			No				
	N	M	SD	N	M	SD	t	P
Managers' attitudes	399	3.61	.82	972	3.71	.80	-2.237	**.025**
Managers' behaviors	399	3.26	.92	972	3.50	.89	-4.359	**.000**
Priority of safety	399	3.48	.80	972	3.60	.75	-2.670	**.008**
Safety communication	399	3.57	.71	972	3.71	.74	-3.053	**.002**
Safety training	399	3.23	.88	972	3.43	.87	-3.882	**.000**
Safety awareness	399	4.07	.63	972	4.19	.64	-3.323	**.001**
Employees' involvement	399	3.55	.72	972	3.66	.76	-2.550	**.011**
Reporting culture	396	4.59	1.03	960	4.58	1.12	.238	.812

According to Table 4, it is notable that employees who are not exposed to work accidents have a higher average of safe culture dimensions (excluding reporting culture) than workers who have experienced job accidents (p <.05).

4. Conclusion

Safety culture is an important element in establishing a healthy and safe working environment. According to the results obtained from this research, there is a positive relationship between the safety culture and the safe behaviors of employees. The results from this research indicate that employees' involvement, safety awareness, reporting culture, managers' behaviors is highly associated with safety behavior. It is seen that the variable that affects the most safety behavior among these variables is the employee employees' involvement.

There was also a significant relationship between exposure to work accidents and safety culture dimensions. The average safety culture of those who have been involved in work accidents is lower than those who are not exposed to work accidents. But no significant relationship was found between the reporting culture and exposure to work accidents.

Safety culture is an important factor in creating a healthy and safe working environment, as evidenced by the results obtained from this work and from other work done in this area. Security cultures have a significant role to play in providing and improving their businesses. To create a positive or positive safety culture, it is possible to list the roles of the parties in the following way (Fung et al., 2005; Muniz et al., 2007).:

- Leadership and commitment from the top that is genuine and visible.

- Changing a safety culture is a long-term strategy that requires sustained effort and interest.

- Policy statement of high expectations and conveying a sense of optimism about what is possible are required.

- The sense of "ownership" of safety and health must permeate all levels of the workforce. This requires employee involvement, suitable training and communication.

- Consistency of behavior against agreed standards should be achieved by audition and good safety behavior should be a condition of employment and considered in performance appraisals.

- All accidents and near misses have to be thoroughly investigated.

- Management must receive adequate up-to-date information so as to be able assess the performance and review the safety and health system.

- Realistic and achievable targets have to be set and the corresponding performance has to be measured.

References

CLARKE, S. (1999). Perceptions of Organizational Safety: Implications for the Development of Safety Culture, *Journal of Organizational Behavior*, 20(2), 185–198.

COOPER, D. M. (2000). Towards A Model of Safety Culture, *Safety Science,* 36, 111–136.

COX, S. and FLİN, R. (1998). Safety Culture: Philosopher's Stone or Man of Straw?", *Work and Stress*, 12(3), 189–201.

COX, S.J. and CHEYNE, A.J.T. (2000). Assessing safety culture in offshore environments. Safety Science, 34, 111-129.

FLEMİNG, M. (2005). Patient Safety Culture Measurement and Improvement: A "How To" Guide. *Healthcare Quarterly,* 8, 14-19.

FUNG, I.W.H.; TAM, C.M.; TUNG, C.F.K and MAN, A.S.K. (2005). Safety Cultural Divergences Among Management, Supervisory And Worker Groups in Hong Kong Construction İndustry*, International Journal of Project Management,* 23, 504–512.

HAVOLD, J.I., and. NESSET, E (2009), "From safety culture to safety orientation: Validation and simplification of a safety orientation scale using a sample of seafarers working for Norwegian ship owners", *Safety Science,* 47, 305–326.

http://www.ilo.org/moscow/areas-of-work/occupational-safety-and-health/WCMS_249278/lang--en/index.htm

LEE, T. (1998). Assessment of Safety Culture at A Nuclear Reprocessing Plant, *Work and Stress,* 12, 217–237.

LİN, Sİ-HAO; TANG, W.J.; MİAO, J.Y.; WANG, Z.M. and WANG, P.X. (2008). Safety Climate Measurement at Workplace in China: A Validity and Reliability Assessment. *Safety Science,* 46, 1037–1046.

MUNİZ, B.F.; PEON, J.M.M. and ORDAS, C.J.V. (2007). Safety Culture: Analysis of The Causal Relationships Between İts Key Dimensions, *Journal of Safety Research,* 38, 627–641.

NEAL, A. and GRİFFİN M.A. (2002), "Safety Climate and Safety Behaviour", *Australian Journal of Management,* 27, 67–78.

Republic of Turkey Social Security Institution (RTSCI) (2018). http://www.sgk.gov.tr/wps/portal/sgk/tr/kurumsal/istatistik/sgk_istatistik_yilliklari.

THARALDSEN, J.E.; OLSEN, E. and RUNDMO, T. (2008). A Longitudinal Study of Safety Climate on The Norwegian Continental Shelf, *Safety Science,* 46, 427–439.

TOMAS, J.M.; MELİA, J.L. and OLİVER, A. (1999). A Cross-Validation of A Structural Equation Model of Accidents: Organizational And Psychological Variables As Predictors of Work Safety, Work & Stress, 13(1), 49-58.

Turkish Statistical Institute (TSI), 2018), http://www.tuik.gov.tr/PreHaberBultenleri.do?id=16118.

YANG, C.C; WANG, Y.S; CHANG, S.T.; GUO, S.E. and HUANG, M.F. (2010). A Study on the Leadership Behavior, Safety Culture, and Safety Performance of the Healthcare Industry, World Academy of Science, Engineering and Technology L: *Educational and Psychological Sciences,* 2(2), 87-94.

YULE, S. (2003). "Senior Management influence on Safety Performance in the UK and US Energy Sectors", Doctoral thesis, University of Aberdeen, Scotland.

SCHWARZ, M. and KALLUS, K.W (2015). Safety Culture and Safety-Relevant Behavior in Air Traffic Management, *Aviation Psychology and Applied Human Factors*, 5, 3-17