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THE EFFECTS OF DEMOGRAPHIC VARIABLES ON NON-VOLUNTARY REPORTING OF AIRCRAFT MAINTENANCE EMPLOYEES

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Abstract:
The main objective of the study is to determine whether there is a difference among averages of dimensions which lead aircraft maintenance personnel in Turkey not to voluntarily report unsafe events or suggestions increasing safety in terms of demographic variables. For this purpose, with data obtained by 483 aircraft maintenance personnel, t-test and ANOVA tests were conducted. Moreover, it is tried to determine whether there is a relationship between dimensions leading not to voluntarily report. In this context, correlation analysis related to dimensions were conducted. Investigating the effect of demographic variables on non-voluntary reporting shows that age, experience, work unit and position have statistically significant effect. Moreover, it was determined that there are meaningful and positive strong relations between dimensions. In another test, it was concluded that demographic variables do not have significant effect on dimensions.

Key words:
Organizational Silence, Voluntary Reporting, Safety Management System, Aircraft Maintenance Employee

INTRODUCTION

According to IATA statistics, in 2019, air transportation recorded in terms of connecting passengers to destinations [1]. Considering that approximately 5 billion passengers are transported all over the world, the importance of airline transportation has increased and the necessity of ensuring safety in a context where activities are carried out on an international platform becomes even more important. With this significance, civil aviation authorities and air transport organizations have focused on aviation safety. In order to manage aviation safety, precautions must be taken before an accident or incident, and in order to take precautions, data is required. The most important source from which the relevant data can be obtained is

the employees who witness the incident or problem that affects the safety before any accident or incident occurs [2].

Jones et al. [3] pointed out the importance of reporting unsafe events that have an important place in the safety management system and create low severity results to prevent future accidents. In other words, personnel should voluntarily report unsafe events or problems to avoid accidents. However, voluntary reporting which is so important to provide safety is not sufficient within the air transport industry. It is taught that personnel keep silent about unsafe events or problems. In other words, personnel avoid voluntary reporting by not sharing information and suggestions which is essential in providing safety [2]. Researches show that the cost of silence is very high [4]. When it comes to aviation organizations, possible silence, in other words, voluntary non-reporting may create a situation that directly affect aviation safety and lead to major disasters [5].

1 LITERATURE REVIEW

1.1 Aviation Safety and Voluntary Reporting Relationship

Research shows that in terms of causing accidents, aircraft maintenance employees rank second after flight crews [6]. Providing safety in aircraft maintenance depends on the technical equipment used and the technical reliability of aircraft maintenance personnel [7]. During aircraft maintenance, aircraft maintenance personnel can make mistakes depending on human factors and these errors cannot be detected until the next flight. This situation may cause bigger problems on the flight [6].

Organizations need information from their employees to continue their operations, make right decisions and solve problems [8]. In this context, aviation organizations must be informed about incidents that threat safety to increase safety and prevent incidents that may rise in the future. The majority of data and information related to safety is obtained from voluntary reports written by aircraft maintenance personnel [9,10].

Because of this importance, ICAO has made it mandatory for each aviation organization to integrate voluntary reporting systems within its organizational structures. Voluntary reporting systems mean voluntarily reporting unsafe events, potential hazards, human errors and violations and suggestions to reduce risks faced by each employee within the organization in order to increase aviation safety [9]. The vast majority of the events subject to these valuable data occur in the eyes of aircraft maintenance personnel [6]. Therefore, it is not possible for managers and employees of the safety management system, who make efforts to manage aviation safety, to collect such data themselves. For this reason, collecting the valuable data mentioned and reporting voluntarily by aviation maintenance personnel is extremely important for increasing safety [9].

As a result, aviation organizations, which manage aviation safety, must know what happens in their organizations. Managing safety requires obtaining qualified data set before accident or incident happens [11]. Therefore, it is extremely important for aircraft maintenance personnel to voluntarily report unsafe events and the safety-enhancing suggestions to prevent future accidents. However, aircraft maintenance personnel are considered to remain silent for unsafe events for various reasons, in other words, they do not voluntarily report the unsafe events [12].

1.2 Silence and Organizational Silence

Employees often have to decide between keeping silent and expressing their feeling, thoughts and concerns in their organizations. However, researches show that employees are

reluctant to voice information that will be valuable for the organization and prefer to keep silence [13].

According to the Turkish Language Institution, while silence means a period without any sound, being silent means becoming calmer or less noisy [14]. Although the phenomenon of silence starts at the individual level, it is stated that organizational silence occurs with the contagious nature of silence as well as it occurs at the group or organization level [15]. This situation is one of the most important barriers to change and development of the organization [16,17,13,18,19]. In this context, organizational silence can be defined as the consciously concealing information, suggestions, thoughts and anxiety of the employees, which are probably important for organizational problems [2].

Researchers explain silence based on different classifications. In the first of these studies, Pinder and Harlos [17] addressed the silence of the employees and found that the employees exhibited silence based on neglect, indulgence and self-protection of employees. Dyne et al. [16], on the other hand, addressed the silent behaviours of the employees in three dimensions: Acquiescent silence, defensive silence and prosocial silence. Another classification which explains reasons of silence of employees belongs to Brinsfield [5]. Brinsfield has tried to explain the phenomenon in six different classifications: Ineffectual silence, relational silence, defensive silence, diffident silence, disengaged silence, and deviant silence. Alparslan explained organizational silence in four dimensions: Acquiescence of indifference of the top management, silence based on fear, silence based on maintaining relationships, and silence based on prosocial tendency [20].

The importance of breaking silence in organizations led to development of various mechanisms which personnel can voice problems or suggestions related to these problems. The most important mechanism in aviation organisations is voluntary reporting. However, personnel do not voluntarily make reporting which is so important to providing safety and taking required precautions for some reasons and they prefer to stay silence. In this context, in the study, the behaviour of staying silence is defined as not voluntarily reporting.

2 METHOD

2.1 Purpose

The main purpose of the study is to determine whether there is a difference in dimensions' averages which induce aircraft maintenance personnel in Turkey to voluntarily report unsafe events or suggestions in terms of demographic variables. For this purpose, t-test and ANOVA tests were conducted. Another purpose of the study is to determine whether there is a relationship among dimensions inducing aircraft maintenance personnel to voluntarily report. In this context, correlation analysis was conducted. Moreover, in the study, it will be analysed whether voluntary reporting averages differ according to demographic variables.

2.2 Population and Sample

The population of the study includes technician, assistant technician, engineer, manager and maintenance planners working at aircraft maintenance organizations and airlines' aircraft maintenance units. In Turkey, there are about 3800 technicians who have active license from General Directorate of Civil Aviation [21]. The reason for choosing aircraft maintenance personnel as population is the key role played by these personnel in ensuring safety. Accordingly, 483 aircraft maintenance personnel was reached with convenience and snowball sampling and obtained data was analysed.

2.3 Data Collection Tool

The data collection tool used in the study consists of two parts. In the first part, data collection tool consisting of 25 items and 4 dimensions was used to learn the reasons of not reporting voluntarily. 5-point Likert scale was used to obtain the answers of the participants (1-Absolutely Disagree, 2-Disagree, 3-Undecided, 4-Agree, 5- Absolutely Agree). In the second part, demographic data of the participants were collected.

2.4 Validity and Reliability

In the study, Cronbach alpha reliability, which is a frequently used method in the reliability analysis of the scale [22], was applied. As a result of the analysis, the overall Cronbach's alpha value of the scale was determined to be 0.931. The relevant value shows that the scale and the values obtained are highly reliable [23]. Ünder [2] tested the construct validity of the scale with factor analysis and reached the conclusion that the relevant structure was valid. Information on the factor structure of the voluntary reporting scale is shown in Table 1.

Tab. 1 *Information on The Factor Structure of The Non-voluntary Reporting Scale*

Factors	Number Of Items	Factor Loading Value/Range	Item Total Correlations	Alpha Reliability Coefficient
Non-reporting Based On Relational and Prosocial Silence	9	0.634-0.776	0.612-0.757	0.912
Non-reporting Based On Fear and Defensive Silence	4	0.651-0.803	0.589-0.662	0.806
Non-reporting Based On Quiescence and Acquiescence Silence	5	0.573-0.803	0.580-0.672	0.842
Non-reporting Based On Disengaged Silence	7	0.568-0.716	0.468-0.612	0.814
KMO Value	0.922			
Bartlett Sphericity Value	X2=6144.834, p<0.00			

3 FINDINGS

3.1 Demographic Features of Participants

Demographic information of the participants is given in Table 2. According to this information, it is seen that approximately 40% of the participants were over 34 years old. The proportion of those who worked in the relevant profession for more than 5 years was 50%. It is remarkable that 72.3% of the participants received at least a bachelor's degree. On the other hand, it is seen that 174 of the participants were CS (Certification Specifications-Approver) maintenance technicians and 109 of them are non-CS (non-Certification Specifications). When we look at the maintenance units studied, it is seen that 244 of the participants were engaged in line maintenance and 164 in hangar maintenance. It is seen that most of the participants (408) worked directly on the aircraft.

Tab. 2 *Demographic Characteristics*

Variables	F	%	Variables	f	%
Age			Gender		

25 and younger	85	17.59	Female	19	3.9
26-31	173	35.81	Male	459	95
32-38	103	21.32	No response	5	1.1
39 and older	87	18.01	Total	483	100.0
No response	35	7.27			
Total	483	100.0			
Level of Education			Status of Occupation		
High School	72	14.90	Unemployed	6	1.2
Associate	54	11.18	Employed in Civil Aviation	470	97.4
Bachelor's	295	61.07	No response	7	1.4
Postgraduate	54	11.18	Total	483	100
No response	8	1.67			
Total	483	100.0			
Maintenance position			Maintenance unit		
CS Maintenance Technician	174	36.02	Line Maintenance	244	50.51
Non-CS Maintenance Technician	109	22.56		164	33.95
Assistant Technician	101	20.91	Hangar Maintenance Production/ Maintenance Planning	20	4.14
Other	79	16.35	Other	40	8.28
No response	20	4.16	No response	15	3.12
Total	483	100.0	Total	483	100.0
Professional experience			Experience in the current organization		
3 years or less	142	29.39	3 years or less	215	44.51
4-7 years	135	27.95	4-7 years	137	28.36
8-11 years	60	12.42	8-11 years	53	10.97
12 years or older	108	22.36	12 years or older	20	4.14
No response	35	7.88	No response	50	12.02
Total	483	100.0	Total	433	100.0

3.2 The Relationship Between The Reasons For Non-reporting and Demographic Factors

In this part of the study, it has been examined whether the aviation maintenance employees' means of non-voluntary reporting differ according to demographic variables. For this purpose, firstly, the mean of non-voluntary reporting in terms of gender variable was examined and as a result of the t-test performed in Table 3, it was found that the difference between the mean scores of female and male participants was not statistically significant (*p = .930*).

***Tab. 3** T-test Findings According to Gender*

Group	N	Mean	Ss	Sd	t	p<
Male	459	2.415	0.665	476	-0.087	0.930
Female	19	2.428	0.852			

Then, it was tried to determine whether the mean of non-voluntary reporting differed statistically in terms of age (p = 0.101), education (p = 0.622), title (p = 0.622), work unit (p = 0.221), professional experience (p = 0.354) and experience in the current institution (p = 0.518) variables. After the analysis, it was concluded that the relevant variables did not have a statistically significant effect on the participants' mean voluntary non-reporting.

When the ages of the participants were evaluated by grouping, it was concluded that the means of non-voluntary reporting of participants aged between 26-31 (*2.507 ± .630*) and participants aged 39 and over (*2.293 ± .692*) were statistically significant (*p = .013*).

In the study, it was also examined whether the means of the dimensions that caused the participants not to make voluntary reporting differed statistically according to the demographic variables. In this context, firstly, it was tried to determine whether there was a statistically difference between quiescence and acquiescence silence based on age, experience and unit of work. Table 4 shows the results regarding the relevant variables. According to this, it is seen that the mean of the participants' non-voluntary reporting based on quiescence and acquiescence silence differed statistically in terms of age (*p= .019*), experience (*p= .008*) and unit of work (*p= .030*).

Tab. 4 *T-test Findings of Quiescence and Acquiescence Silence Dimension*

Group	n	Mean	Ss	Sd	F	p<
26-31 Years Old	173	2.733	0.896	258	0.286	0.019
39 Years Old and Above	87	2.448	0.948			
4-7 Years Experience	135	2.751	0.909	241	0.000	0.008
12 Years and Above Experience	108	2.435	0.920			
Line Maintenance	245	2.514	0.903	407	0.357	0.030
Hangar Maintenance	164	2.710	0.880			

Then, it was investigated whether there was a statistically significant difference in the mean of participants' non-voluntary reporting based on disengaged silence in terms of age, experience and title. Table 5 shows the results regarding the relevant variables. Accordingly, it was found that there was a statistically significant difference in the mean of participants' non-voluntary reporting based on disengaged silence in terms of age (*p= .010*), experience (*p= .014*) and title (*p= .008*).

Tab. 5 *T-Test Findings of Disengaged Silence Dimension*

Group	n	Mean	Ss	Sd	F	p<
26-31 Years Old	173	2.256	0.684	258	1.196	.010
39 Years Old and Above	87	1.978	0.606			
4-7 Years Experience	135	2.210	0.693	241	1.556	.014
12 Years and Above Experience	108	2.003	0.591			
Assistant Technician	101	2.287	0.649	273	.361	.008
CS Technician	174	2.076	0.622			

Finally, it was examined whether there was a statistically significant difference between the participants' experience and non-voluntary reporting means based on fear and defensive silence. Table 6 shows the results. Accordingly, it was found that there was a statistically significant difference in the mean of participants', who had 3 years or less experience and 12years and more experience, non-voluntary reporting based on fear and defensive silence (*p=.021*). It was concluded that the experience, title and unit of the aircraft maintenance employees did not have a statistically significant effect on the mean of non-voluntary reporting based on fear and defensive silence.

Tab. 6 *T-Test Findings of Fear and Defensive Silence Dimension*

Group	n	Mean	Ss	Sd	F	p<

3 Years and Less Experience	215	2.466	0.848	233	3.005	0.021
12 Years and Above Experience	20	2.937	1.028			

It was determined that the mean of the participants' non-voluntary reporting based on relational and prosocial tendency did not differ statistically according to demographic variables.

3.3 Relationship between Dimensions Leading to Non-Reporting

Correlation analysis is carried out to determine whether there is a linear relationship between any two variables [24]. For this purpose, correlation analysis was used to determine whether there was any relationship between the four factors that caused aircraft maintenance personnel not to make voluntary reporting.

According to the results of correlation analysis in Table 7, there was a positive relationship among dimensions leading to non-voluntary reporting. Accordingly, there was a statistically significant and positive strong relationship between disengaged and relational and prosocial dimensions ($r= 0.619;\ p<0.01$). The second high value ($r = 0.580;\ p <0.01$) obtained as a result of the correlation analysis indicates that there was a statistically significant and positive strong relationship between quiescence and acquiescence and relational and prosocial dimensions. According to the results of the analysis, there was a statistically significant and positive strong relationships between non-reporting based on relational and prosocial dimensions and non-reporting based on fear and defensive dimensions ($r = 0.567;\ p <0.01$); non-reporting based on disengaged and non-reporting based on quiescence and acquiescence dimensions ($r = 0.518;\ p <0.01$).

Tab. 7 *Correlation Analysis Findings*

n=483	Fear and Defensive	Relational and Prosocial	Quiescence and Acquiescence
Relational and Prosocial	0.567**	-	-
Quiescence and Acquiescence	0.473**	0.580**	-
Disengaged	0.353**	0.619**	0.518**

**. Correlation is significant at the 0.01 (2-way) level.

4 CONCLUSIONS

In the aviation organizations, it is extremely important for the organizational decisions that the employees express their feelings, thoughts and concerns about each issue that concerns the aviation safety. Researches show that if employees do not voluntarily report, organizations pay a heavy cost. For this reason, it is very important for the managers of organizations, who want to manage safety, to identify obstacles to voluntary reporting. In addition, the effect of demographic variables on the mean of non-voluntary reporting of aircraft maintenance personnel was examined.

When the effect of demographic variables on each non-voluntary reporting dimension is examined; age, experience and unit of work have effect on quiescence and acquiescence silence; age, experience and position have effect on disengaged silence; and experience has effect on fear and defensive silence. On the other hand, it was concluded that any demographic variable did not have a statistically effect on the relational and prosocial dimension.

When an assessment was made in terms of the relationship between each dimension, there were positive relations between the dimensions. Accordingly, it was concluded that there were statistically significant and positive strong relationships between disengaged and relational and prosocial silence; relational and prosocial and fear and defensive silence. These positive strong relationships allow us to interpret each dimension triggering each other causing aircraft maintenance technicians not to make voluntary reporting.

The final analysis performed in the research is the analysis of the effect of demographic variables on general voluntary reporting. In this context, it is beneficial to state that demographic variables are determined to have no effect on the responses of the participants in some studies [25]. Parallel to this finding, it was concluded that the variables of gender, age, education, title, unit of work, professional experience and experience in the current institution have no effect on the overall volunteer reporting averages of aircraft maintenance technicians. When the age variable was grouped and evaluated, it was found that the average of non-voluntary reporting of participants aged 26-31 and 39 and over varied statistically and that technicians between the ages of 26-31 were more silent.

As a result, considering the importance of voluntary reporting in terms of aviation safety, it is seen that it is extremely valuable to know the factors that cause not reporting. In this sense, the effect of demographic variables on voluntary reporting should be carefully examined and employee behaviours should be understood and interpreted in the context of relevant variables.

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