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**PRESENTATION OF A MODEL TO PREDICT THE RATE OF OCCUPATIONAL
ACCIDENTS BASED ON BURNOUT INDEXES (CASE STUDY: NOZOHOUR
PAPERMAKING INDUSTRIES FACTORY)**

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ABSTRACT

In this paper, we provide a model to predict the rate of occupational accidents based on burnout indexes. This model enables us to achieve the information needed for enhancing staff's knowledge, attitude and skill in order to improve the performance of duties, reduce burnout, and minimize occupational accidents.

The statistical population is staff of Nozohour Papermaking Industries Factory. This study is an applied research conducted by field method. We collected the data by survey method and analyzed them using descriptive-correlational method. In this research we study the correlation between burnout variables and the rate of accident. We carry out two statistical analyses: descriptive analysis using SPSS, by which we study the data extracted from Maslach burnout questionnaire, and inferential analysis using standard correlation coefficient tests (Pearson).

The value of statistic "r" or the correlation coefficient for burnout variables (emotional exhaustion, personal performance, alienation and involvement) were 0.753, 0.632, 0.738 and 0.699 respectively. In terms of effectiveness and relationship with the rate of accidents, burnout

variables were ranked as follows: 1) emotional exhaustion 2) alienation 3) involvement 4) personal performance.

Accident rate estimation model is: 2.417 (emotional exhaustion) + 1.23 (alienation) = $- 3.833$

Keywords: Accident Rate, Burnout, Emotional Exhaustion, Personal Performance, Alienation, Involvement

INTRODUCTION

Occupational accident is one of the most important concerns in both developed and developing countries. Such accidents may cause bodily damages and even the loss of life. The mortality caused by occupational accidents inflicts irreparable losses on both staff and organizations. To prevent the reoccurrence of occupational accidents, it is necessary to study the causes of such accidents and collect the required information in order to provide an efficient solution. One of the most important causes of occupational accidents is human error (Khodabakhshi, 2009). Occupational accident has been defined as an accident which occurs during and in connection with performance of a duty (Article 60 of Social Security Law). This definition covers the cases where somebody is at work (workplace, affiliated institutes, premises of a company, or outside the premises as ordered by employer), where somebody goes to a clinic or hospital for treatment, where somebody goes to his workplace and back to home, and where somebody attempts to rescue an insured person.

Occupational accidents have been classified in many ways. In 1923, International Conference of Statistics categorized occupational accidents in terms of cause of occurrence. In 1962, occupational accidents were categorized in terms of cause of occurrence and consequences. In 1968, the United Nations grouped them in terms of age, sex, experience, type of job, and the lost working days. Finally, the World Health Center and International Labor Organization categorized occupational accidents in terms of type of accident, materials, work environment, place of injury, nature of injury, and bodily damage caused by accident.

Occupational accident is not a new topic; we are witnessing disastrous work accidents almost every day and in every point of our country (Rendal, R. Ras, 1998). According to the report of Economic and Social Statistics and Computations Office of Social Security Organization, 21,740 occupational accidents were happened in the country in 2009, which shows a reduction compared with 2008. In this report, males constitute the majority of victims, with 76% being married. Carelessness has been recorded as the cause

of 13,217 cases of work accidents. According to this report, falling down, slipping and hitting have constituted the highest percentage of accidents and the age group of 25-29 has suffered work accidents more than other age groups. Carelessness of workers has been reported as the most frequent cause of accidents. Human error and carelessness of workers in enterprises and production units were the cause of 2,919 cases of accident (58%) and topped the list with a significant distance. Nowadays, workers are facing the challenge of continuous increase in occupational duties. They spend more time performing their duties and suffer excessive work pressure (Labor and Social Security Institute, 1993). Occupational burnout has become prevalent among workers. Many scholars have suggested that mental pressure is a prevalent disease of the century and causes occupational burnout in long term. Burnout is one of the main consequences of work tension and leads to physical exhaustion and change of behavior and performance. This indicates the significant role of human error in the occurrence of occupational accidents (Promud Batra, 1996). In this research we want to answer this question: “what relationships are there between burnout and the rate of accidents?” (Hülya Küçükoğlu, 2014). In order to reduce the rate of accidents caused by human errors, it is necessary to study occupational burnout in

order to protect mental health of workers. Although the prevention of unexpected accidents is a very hard job, we can minimize the damages and losses by identifying the influential factors in the occurrence or intensification of accidents, executing scientific safety programs, considering various aspects of projects, and having mentally healthy workforce. In this research we present a model to predict the rate of occupational accidents based on occupational burnout indexes at packaging unit of Nozohour Papermaking Industries Factory.

2. LITERATURE REVIEW

2.1 Occupational Burnout

Occupational Burnout was innovated by Herbert Freudenberger in 1974 in order to describe the gradual emotional exhaustion and the loss of motivation and commitment among the young staff of a clinic. (Freudenberger, 1974). After that, Henceforth conducted a series of studies on burnout in different fields. Occupational burnout is a mental exhaustion which influences various aspects of health and reduces motivation and vigor (Maslach, Jackson & Leiterl, 1996). This physiological or mental exhaustion stems from excessive and long-term stress (Girdano, 2001). Burnout is a state in which an individual feels a lack of energy and motivation. Generally, a person suffering occupational burnout feels reluctant to perform his occupational duties. This is the

consequence of a continuous pressure which causes an individual to feel exhausted and unmotivated (Farber, 1983). Burnout deteriorates the quality of services provided by employees (Saatchi, 2003). Occupational burnout can be defined as the manifestation of emotional exhaustion after years of work pressure. This manifestation is especially prevalent among the people who have service jobs such as educational and medical services (Sarason, 1984). In the 1970s, Freudengerger used the term "occupational burnout" when he observed the signs of exhaustion in his staff. He defined occupational burnout as the state of physical and mental exhaustion arising from continuous work pressure. Nowadays, different levels of mental pressure are seen in many organizations (Jin-Chuan Lee, Chun-Liang Chen, Shu-Hui Xie, 2013). One of the consequences of such pressures is occupational burnout (Mayo Clinic, 2006). Occupational burnout stems from reduced motivation (Beverly A. Potter, 1998).

Literally, burnout can be defined as deterioration of mental power which is sometimes accompanied with depression. Occupational burnout may stem from dealing with mentally ill persons (Pour Afkari, 2001). It is the syndrome of emotional exhaustion after years of work pressure and commitment to one's job and people (Li Ling, Shen Qin, Shen Li-fang, 2014). In other words, burnout is a physical and mental exhaustion following

a long-time pressure of a hard job (Mayo Clinic, 2006). It is a state in which an individual lacks enough energy and motivation to perform his/her job (Fuladband, 2006). Managers, leaders, those who have a hard or sensitive job, those who perform routine duties, and those who provide a service to the public are more exposed to occupational burnout (Beverly A. Potter, 1998), especially where they feel that their effort is not successful (Sarason, 1984). People in any profession and in any level may be exposed to occupational burnout (Beverly A. Potter, 1998). While it might seem very easy to overcome tensions and pressures, they may be much more complicated than we think (Cristina Vargas, Guillermo A. Canadas, Raimundo Aguayo, Rafael Fernandez Emilia I. de la Fuente, 2014). The reason of this complexity is that personal characteristics and situational factors combine in order to pass a tension period (Sarason, 1984). Psychology has a significant role in fighting against occupational burnout. Elimination of negative attitudes and boosting individuals' self-esteem are among the needs of those suffering burnout (Guler Yavuz, Nuri Dogan, 2014).

2.2 Occupational Accidents

Occupational accident is defined as an accident which occurs during or in connection with the performance of occupational duties. By "during performance

of duties” is meant all times when the insured works at his/her workplace and affiliated institutes, buildings, premises, and when he is on duty outside the premises of a company as ordered by an employer (Qazanchi, 2013). In 1980, the first workplace safety and inspection law was ratified in England, followed by establishment of official inspection offices. In 1987, an accident prevention association was founded in France. In 1889, a few international congresses on work environment protection were held. These congresses led to the development of protection laws, so that the execution of legal obligations and independent role of inspectors were emphasized. To support such measures, some associations were established in Belgium, Sweden, England and some other countries (Eshraqi, 2010). While financial losses arising from unhealthy workplace are not easily perceptible, they are computable in the national gross income. Likewise, this problem has adverse financial impacts on companies and governmental and private institutes (Erabi, 2006). Occupational accidents, in any form and in any level, inflicts economic losses on staff, employer and the society. Such losses may be direct or indirect. Among direct losses we can mention the losses arising from work stoppage, medical costs, and compensations paid for temporary and permanent disability and death

(Faynioken, 2002). The main objective of investigating an accident is to collect the information needed for providing a solution in order to prevent the reoccurrence of accidents. Despite the scientific advancements in the field of safety and development of systemic safety science which emphasizes the identification and control of risks in order to prevent accidents, it is impossible to zero the rate of accidents neither in the present nor in future. An important safety principle is that the causes of accident is visible a day before accident. Experts are able to see such causes and problems. This knowledge has been developed through study and research on accidents (Delkhosh, 2009).

2.3 Related Works

Iraj Mohammadfam and Rostam Golmohammadi (2008) conducted a research on the relationship between occupational stress, unsafe actions and occupational accidents in auto manufacturing industry. Their results indicated that there is a direct and significant relationship between occupational stress and unsafe actions and between unsafe actions and occupational accidents. Statistical test showed that 1% increase of unsafe actions has more impact on accidents compared with 1% increase in occupational stress (Mohammadfam, 2008). Edmondson (1988), in his thesis under tile of “study on the effect of personal and

occupational variables on occupational burnout among teachers of industrial and educational schools in Connecticut State of the US”, studied a number of factors including age, number of teaching courses per day, size of class, available equipment, basics of teaching, sound balance, salary, teaching history, and educational qualification. The results showed that occupational burnout was the most prevalent factor in the feeling of low personal success. Negative attitude was the second most prevalent factor and emotional exhaustion was the least prevalent factor. Ererairit (1991) made a study under title of “occupational burnout among managers and supervisors”. He studied occupational burnout among 62 supervisors in public health organizations. His results indicated that the main cause of occupational burnout among supervisors was the ambiguity of their role and uncoordinated organizational policies (ERERA 1991). Mallett et al. (1991) conducted a comparative study on the relationship between occupational burnout, anxiety, and social support among clinical nurses, in order to make a comparison between occupational pressure, burnout, anxiety, and social support. The results indicated that there was a direct negative relationship between occupational burnout and anxiety and there was a positive relationship between occupational burnout and social support (Karen Mallett, James H.

Price, Stephen G. Jurs, and Suzanne Slenker, 1991).

Zager & Seidman made a study on occupational burnout and investigated the influence of burnout on the behaviors of teachers. They attempted to find out whether there was a relationship between occupational burnout and teachers’ behavior. The research tools were teacher burnout questionnaire, personal characteristics questionnaire, and personal behavior scale. The results indicated that there was a relationship between occupational burnout and many of mental and physical problems such as headache, depression, and excessive use of alcohol (Seidman, Steven A., Zager, Joanne, 1986).

2.4 Theoretical Model of the Research

The main goal of this research is to provide a model to predict the rate of occupational accidents based on burnout indexes among the staff of packaging unit of Nozohour Papermaking Industries Factory. The hypotheses of this research are as follows:

- There is not a significant relationship between emotional exhaustion and the rate of accident.
- There is not a significant relationship between personal performance and the rate of accident.
- There is not a significant relationship between alienation and the rate of accident.
- There is not a significant relationship between involvement and the rate of accident.

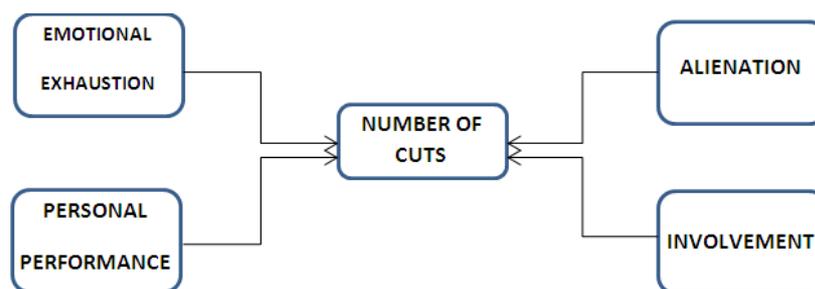


Fig 1: Theoretical model of the research

RESEARCH METHODOLOGY

In this research we used Maslach 8 occupational burnout questionnaire. This questionnaire is a closed questionnaire in which Likert scale has been used. Maslach questionnaire, which is the most popular tool for measuring occupational burnout, consists of 25 questions embracing four dimensions of occupational burnout: personal performance, emotional exhaustion, alienation, and involvement. Nine questions are concerned with emotional exhaustion, five questions deal with alienation, eight questions relate to

the feeling of success (personal performance), and three questions deal with involvement. In this research, descriptive and inferential statistics analyses are as follows:

- Descriptive statistics analysis using SPSS
- Inferential statistics analysis using standard correlation coefficient tests (Pearson)

FINDINGS

Table 1 below shows absolute and relative frequencies of the elements of age, sex, educational qualification, marital status, and occupational records of the respondents.

Table 1: Absolute and relative frequency of demographic information of the respondents

		Absolute Frequency	Percentage Frequency
Sex	Male	178	52%
	Female	164	48%
Age groups	18-25	162	47.4%
	26-30	74	21.6%
	31-36	106	31%
Educational qualification	Middle school	21	6.1%
	High school	54	15.8%
	Associate degree	132	38.6%
	Bachelor's degree	135	39.5%
Marital status	Single	205	59.9%
	Married	137	40.1%
Work records	1-5 years	183	21.1%
	6-10 years	72	19%
	11-15 years	65	53.5%
	16-20 years	22	6.4%

Frequency of occupational accidents

Considering the nature of papermaking process, hand cut is the most frequent accident and the most important challenge in

this industry. Hence, we accurately recorded the frequency of this accident within a period of six months.

Table 2: Central indexes and frequency of cuts

N		Mean	Median	Mode	Std. Deviation	Variance	Minimum	Maximum
342	0	5.96	7.00	0	3.982	15.858	0	13

The mean of cut frequency is 5.96, which equals total cut frequency divided by the number of individuals (342). The highest rate of accident in the period of 6 months was 13. In other words, some workers have suffered hand cut 13 times within the period of 6 months. On the other hand, the lowest rate of accident was 0, i.e. some workers did not experience any cut within the said period. 22.8% of line staff (78 people) experienced no accident within the period of 6 months. 53.5% of staff experienced lower than 7 cuts. This means that 46.5% of total staff suffered more than 7 cuts within the said period, which indicates that the rate of cut among the staff under study is high. The highest accident frequencies were 8, 9 and 10 repetitions among the line staff who had frequency rates of 49, 36 and 41 respectively. This means that 8-10 cut reoccurrences, amounting to 126 cases, were observed and recorded.

Emotional Exhaustion

The central indexes of emotional exhaustion variable ranged from 1 to 5. The value of this variable was 3.22, which indicated that the scores of the factory’s staff was relatively

high. The scores of almost half of the staff were higher than 3.4. Also, data mode was 3.11 which indicated the highest numerical repetitions for the mean of emotional exhaustion variable among the staff. Considering the standard deviation and data variance, it could be said that the data does not have a high dispersion and the results of descriptive data are trustable. It should be noted that in descriptive analysis we also used skewness coefficient, which shows the amount of data asymmetry. Considering skewness coefficient of 9 (- 0.47), it could be said that data aggregation is higher than average and the results of central indexes are confirmed. Also, the results are close to normal distribution (Table 3, line 1).

Personal Performance

The mean of personal performance variable was 2.97, which indicated that the staff’s personal performance is close to average. Considering the median, it could be said that scores of almost half of the staff were higher than 2.87. Also, data mode was 2.7, which indicated the highest numerical repetitions for the mean of personal performance among the

staff. Considering skewness coefficient of 10 (0.037), data aggregation is lower than average, the results are close to normal, and asymmetry is negligible. The comparison of the results obtained in this section and the results of emotional exhaustion reveals that personal performance of the staff generally has lower scores. However, the interpretation of occupational burnout questionnaire indicates that in this variable, unlike other variables, the lower the scores of personal performance, the higher occupational burnout among the staff (Table 3, Line 2).

Alienation

The mean of this variable was 3.106, which indicates that the scores of staff are close to average. In other words, the staff has average occupational burnout in terms of this variable. The median and mode of this variable were 3.2 and 1.6 respectively. Considering the

standard deviation and data variance, it could be said that the data has a low dispersion. As with emotional exhaustion variable, skewness coefficient of this variable was below zero (-0.407), which indicates that data aggregation is higher than average and data asymmetry is negligible (Table 3, Line 3).

Involvement

The mean of involvement variable was 3.174 in the numerical range of 1-5, which indicates that scores of the staff are closed to average. In other words, the staff has an average occupational burnout in terms of this variable. The median and data mode were 3.3 and 4 respectively. Considering the standard deviation and data variance, it could be said that the data has a low dispersion. However, skewness coefficient of - 0.417 indicates that data aggregation is higher than average (Table 3, Line 4).

Table 3- Central Indexes and Data Dispersion

	N		Mean	Median	Mode	Std. Deviation	Variance	Skewness	Std. Error of Skewness	Minimum	Maximum
	Valid	Missing									
1	342	0	3.225796	3.44444	3.1111	0.8623575	0.744	-0.470	0.132	1.4444	5.000
2	342	0	2.97076	2.87500	2.750	0.813516	0.662	0.37	0.132	1.375	5.000
3	342	0	3.106	3.200	1.6	0.9071	0.823	-0.407	0.132	1.4	4.8
4	342	0	3.174464	3.333333	4.000	0.9081853	0.825	-0.417	0.132	1.3333	4.6667

Multiple modes exist. The smallest value is shown.

4.1 Inferential Data Analysis

H1: There is a significant relationship between emotional exhaustion and the rate of accident.

Significance level and P-value (.000) confirm the relationship between the variables of

accident rate and emotional exhaustion. Also, r value is 0.753 and is significant at 1% error level, which indicates that there is a significant relationship between variables of accident rate and emotional exhaustion.

Table 4: Pearson correlation coefficient between variables of accident rate and emotional exhaustion

Correlations			
Accident Rate	Emotional Exhaustion		
.753**	1	Pearson Correlation	Emotional Exhaustion
.000		Sig. (2-tailed)	
342	342	N	
1	.753**	Pearson Correlation	Accident Rate
	.000	Sig. (2-tailed)	
342	342	N	

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

H2: There is a significant relationship between personal performance and the rate of accident.

Significance level of correlation between accident rate and personal performance is .000, which indicates that there is a significant relationship between these two

variables at 99% confidence level. Also, “r” value or correlation between accident rate and personal performance is – 0.632, which indicates that there is a significant relationship between variables of accident rate and personal performance.

Table 5: Pearson correlation coefficient between accident rate variables and personal performance

Correlations			
Personal Performance	Accident Rate		
-.632**	1	Pearson Correlation	Accident rate
.000		Sig. (2-tailed)	
342	342	N	
1	-.632**	Pearson Correlation	Accident Rate
	.000	Sig. (2-tailed)	
342	342	N	

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

H3: There is a significant relationship between alienation and the rate of accident.

Significance level of correlation between accident rate and alienation is .000, which indicates that there is a significant

relationship between these two variables at 99% confidence level. Also, “r” value or correlation between accident rate and alienation is 0.738, which indicates that there is a significant relationship between variables of accident rate and alienation.

Table 6: Pearson correlation coefficient between accident rate variables and alienation

Correlations			
Alienation	Accident Rate		
.738**	1	Pearson Correlation	Accident rate
.000		Sig. (2-tailed)	
342	342	N	
1	.738**	Pearson Correlation	Alienation
	.000	Sig. (2-tailed)	
342	342	N	

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

H4: There is a significant relationship between involvement and the rate of accident.

Significance level of correlation between accident rate and alienation is .000, which indicates that, as with other variables,

involvement is significantly associated with accident rate. Also, “r” value or correlation between accident rate and involvement is 0.699, indicating that there is a significant relationship between variables of accident rate and involvement.

Table 7: Pearson correlation coefficient between accident rate variables and involvement

Correlations			
Involvement	Accident Rate		
.699**	1	Pearson Correlation	Accident rate
.000		Sig. (2-tailed)	
342	342	N	
1	.699**	Pearson Correlation	Involvement
	.000	Sig. (2-tailed)	
342	342	N	

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

Presentation of the model to estimate the rate of accident based on predictive variables

Considering that predictive variables were limited, we used Enter regression test to provide a model for estimating the rate of accidents. Given the use of Enter regression method, we included all predictive variables

in the model. In this model, according to correlation coefficient (r), the relationship between predictive variables and accident rate was 0.757. Considering multiple determination coefficient 11, the predictive variables included in model 1 can explain almost 57.4% of the changes in accident rate (R2=0.874).

Table 8: Coefficients of each variable in measurement model

Coefficients					
Sig.	t	Standardized Coefficients	Unstandardized Coefficients		Model
		Beta	Std. Error	B	
.029	-2.186		1.753	-3.833	(Constant) 1
.441	-.772	-.081	.463	-.357	Involvement
.030	2.181	.280	.564	1.230	Alienation
.447	-.762	-.047	.0305	-.232	Personal performance
.000	4.287	.523	.564	2.417	Emotional exhaustion

a. Dependent Variable: rate variable

The significance level indicates that only predictive variables of alienation and emotional exhaustion can predict the rate of accident at 95% level. Also, regression test (t) is significant at the level of less than 0.05 for these two variables. Regression standard

coefficients indicate that the variable of emotional exhaustion (with Beta=.523) has a bigger share in prediction of cut rate among the staff.

$$\text{Accident Rate (Y)} = -3.833 + 1.23 (\text{alienation}) + 2.417 (\text{emotional exhaustion})$$

CONCLUSION

In this research we studied the correlation between burnout indexes and the rate of accident. We investigated research hypotheses using descriptive analysis (mean, median, mode, skewness coefficient, standard deviation and variance) and inferential statistics (Pearson correlation coefficient and multivariable regression by Enter method). The results are as follows:

- The first hypothesis: there is a significant relationship between emotional exhaustion and the rate of accident. The results of descriptive analysis indicated that the relationship between these two variables is linear. Data dispersion showed a high linear relationship between the two variables. Significance level or P-value (.000) confirmed the relationship between accident rate and emotional exhaustion. Also, “r” value is 0.753, indicating that the relationship is significant at 1% error level.
- The second hypothesis: there is a significant relationship between personal performance and the rate of accident. The results of descriptive analysis indicated that the relationship between these two variables is almost linear, but reverse unlike emotional exhaustion. Significance level of correlation between accident rate and personal performance is (.000), which indicates that the relationship between these two variables is significant at 99% confidence level. Also,

“r” value or correlation between accident rate and personal performance is -0.632, which indicates that there is a significant relationship between accident rate and personal performance.

The third hypothesis: there is a significant relationship between alienation and the rate of accident. As with other hypotheses, the results of descriptive analysis indicated that the relationship between these two variables is direct. In inferential analysis, significance level of correlation between accident rate and alienation is (.000), which indicates that the relationship between these two variables is significant at 99% confidence level. Also, “r” value or correlation between accident rate and alienation is 0.738.

The fourth hypothesis: there is a significant relationship between involvement and the rate of accident. The results of descriptive analysis indicated that the relationship between these two variables is direct. Significance level of correlation between accident rate and personal performance is (.000), which confirms the significant relationship between these two variables. The value of “r” or correlation between accident rate and involvement is 0.699, which indicates that there is a significant relationship between accident rate and involvement.

Presentation of a model to estimate the rate of accident based on predictive variables: The

significance level indicates that only predictive variables of alienation and emotional exhaustion can predict the rate of accident at 95% confidence level. Also, regression test (t) is significant at the level of less than 0.05 for these two variables. Regression standard coefficients indicate that the variable of emotional exhaustion (with Beta=.523) has a bigger share in prediction of cut rate among the staff.

- Classification and prioritization of burnout components: the value of statistic “r” or correlation coefficient for the variables of “emotional exhaustion”, “personal performance”, “alienation” and “involvement” are 0.753, 0.632, 0.738 and 0.699 respectively.
- Correlation coefficient of variable of emotional exhaustion = 0.753
- Correlation coefficient of variable of personal performance = 0.632
- Correlation coefficient of variable of alienation = 0.738
- Correlation coefficient of variable of involvement = 0.699

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