ATLANTIS PRESS

Advances in Social Science, Education and Humanities Research, volume 292

1st Aceh Global Conference (AGC 2018)

Analysis of Individual Factors on Employees' Perception towards Safety Culture in the Malaysian Manufacturing Industry

[1*]Noor Aina Amirah, [2]Wan Izatul Asma, [3]Shaladdin Muda, [4]Aziz Amin, [5]Nik Fadhilah Nik Him
[1]Faculty of Economics and Management Sciences, Universiti Sultan Zainal Abidin, Terengganu, Malaysia
[2]Institute of Oceanography and Environment, Universiti Malaysia Terengganu, Terengganu, Malaysia
[3]School of Maritime Business and Management, Universiti Malaysia Terengganu, Terengganu, Malaysia
[4]Faculty of Applied Social Sciences, Universiti Sultan Zainal Abidin, Terengganu, Malaysia
[5]Institute for Community Health Development, Universiti Sultan Zainal Abidin, Terengganu, Malaysia
[*]Corresponding author: ainaamirah@unisza.edu.my

***Abstract*—The manufacturing industry has now become one of the most hazardous industries worldwide. Workplace safety remains a field of interest in the manufacturing industry due to the increasing number of accidents in the workplace. Higher number in workplace accidents in this industry has lead to the question of whether the employers commit enough care to the employees' safety and health in striving to optimize productivity. The objective of this paper is to measure whether there is a significant difference between individual factors towards manufacturing employees' view regarding safety culture. The target respondents were employees working in the manufacturing industry in Peninsular Malaysia. The quantitative method was applied in this study. The data collected were analyzed using IBM-SPSS Statistics. This study showed that different individual factors are essential in determining safety culture at the workplace. Everyone should be accountable for the prevention of injury at work or for the care of those affected, directly or indirectly. Occupational safety and health (OSH) requires everyone in the workplace to be involved, including employers, employees, their families and the government, to cooperate as a community with the common interest of better prevention and care.**

Keywords— Safety Culture; Workplace Accidents; Manufacturing Industry; Malaysia; OSH

I. INTRODUCTION

Safety culture is a concept related to organizational environment that influences organizational practices related to risk. These practices are influenced by the employees' attitude and behaviour. The goal of a safety culture at the workplace is to improve occupational safety by reducing the frequency of occupational accidents and preventing high severity events.

To date, workplace safety remains a field of interest in the manufacturing industry due to the increasing number of accidents at the workplace. This increasing number resulted from rapid economic growth via industrialization. The International Labor Organization (ILO), (ILO, 2017) estimates that almost 6,300 people died every day because of occupational accidents or work-related diseases. This number contributed to more than 2.3 million deaths every year. Globally, most countries have been affected by the occurrence of workplace accidents. As an example, in the 2011/12 period, expenses for the workplace-related illnesses was estimated to be £13.8 billion in the UK (HSE,2013), while American businesses incurred annual losses that amounted to USD 170 billion (Leigh, 2011).

Manufacturing is one of the most hazardous industries around the sphere. As reported in the Health and Safety Executive (HSE), (HSE, 2016) there were 70,000 non-fatal workplace injuries reported in the UK in 2014/15. From this total, the four main injuries were from lifting and handling (25%), followed by slips, trips and falls (21%), and being struck by object as well as contact with machinery, both with 12% each (HSE, 2016 & FitforWork, 2016).

According to Amirah et al., (2013), the existence of a safety culture among manufacturing industries in Malaysia is still lacking. Although the manufacturing sector contributes expressively to government income, this sector has the highest number of reported occupational accidents compared to other sectors. This has lead to concerns on whether, in the quest of optimizing productivity, the employers committed enough care to the employees' safety and health? As shown in Table I the manufacturing sector have the highest statistic of investigated occupational accidents up until October 2018 compared to other industries in Malaysia. Based on this table, the occupational accidents were categorized into three categories, i.e. non-permanent disability (NPD), permanent disability (PD), and death (DOSH, 2018).

TABLE I: OCCUPATIONAL ACCIDENTS BY SECTOR UNTIL OCTOBER 2018 (INVESTIGATED)

Sector	NPD	PD	Death	Total
Manufacturing	1188	90	25	1303
Mining & Quarrying	18	2	2	22
Construction	61	6	81	148
Agriculture, Forestry, Logging & Fishing	264	7	18	289
Utilities (electricity, gas, water and sanitary services)	47	0	1	48
Transport, Storage & Communication	54	2	9	65
Wholesale & Retail Trade	49	2	1	52
Hotel & Restaurant	59	2	1	62
Financial, Insurance, Real Estate & Business Services	102	5	13	120
Public Services & Statutory Bodies	21	0	3	24
No Information	497	11	19	527
TOTAL	**2360**	**127**	**173**	**2660**

Source: International Policy and Research Development Division, DOSH (2018)

In reality, businesses exist with the aim of making profit, as everything about business relates to economics. Most of the top management decisions on occupational safety and health have been based on dollars and cents. They forget that accidents, injuries, damages and illnesses also have a monetary effect on the production of goods or services provided. The prevention of injury and illness of employees can be formulated in organizations as one of their economic objectives. This is because accidents, injuries and illnesses impose not only a direct cost on the employer, but also an indirect cost, which will affect the total profit of the organizations.

The relation of the total cost of accidents, injuries, damages and illness in the workplace can be depicted as a big iceberg. This concept of an iceberg is often used in many fields. The pioneer researcher in this field, Heinrich (1941), who conducted his research in 1926, viewed that when there is an accident, the cost of workers' injuries will cost the employer four times as much as the compensation and medical payments. Thus, Heinrich used the 4:1 ratio for indirect to direct costs. He further added that the direct cost of injuries and illness can be listed as medical and hospital costs, compensation and liability claims, insurance premiums and cost of lost time. This direct cost, however, will exclude when paid by the employer without reimbursement.

Several researches have been conducted to assess safety culture. Buchan (1999) conducted a research on safety culture by using a qualitative focus group exercise while Grote and Künzler (2000) used audits as its methodology assessment. Cox & Cheyne (2000) used behavioral observations in assessing safety culture in offshore environments. Most of the scholars recommended the use of triangulation methods of assessment in assessing safety culture. However, assessing organizational safety culture through cross-sectional perception surveys is the most common method (Goodheart and Smith, 2014 & Cooper, 2018). Cooper (2008, 2016, & 2018) has conducted much research relating to safety culture using this assessment method.

II. OBJECTIVES AND HYPOTHESES OF THE STUDY

The primary objective of the study was to measure whether there is a significant difference between individual factors in influencing the view of manufacturing employees regarding safety culture. The individual factors measured in the study include gender, age, and work position, number of working years, injury experience and safety raining experience. Therefore, six hypotheses were developed as follows:

H1: There is a significant difference between genders among manufacturing employees in safety culture.

H2: There is a significant difference among manufacturing employees from different age groups in safety culture.

H3: There is a significant difference among manufacturing employees from different work positions in safety culture.

H4: There is a significant difference among manufacturing employees from groups with different years of work experience in safety culture.

H5: There is a significant difference manufacturing employees from groups with different injury experience in safety culture.

H6: There is a significant difference among manufacturing employees from groups with different safety training experience in safety culture.

III. LITERATURE REVIEW

The emergence of the concept of safety culture began in 1986 during the analysis of the Chernobyl disaster in Ukraine. After this disaster, the eyes of many parties were opened to occupational safety and health issues. From this disaster, a more specific term was derived — "safety culture". This term was introduced by the International Atomic Energy Agency (IAEA) in the International Nuclear Safety Advisory Group (INSAG) report in 1999. During this time, the term safety culture was defined as "the assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance" (INSAG, 1999).

According to the Health and Safety Commission (HSC), (HSC, 1993), safety culture can be well-defined as "the creation of individual and group values, attitudes, perceptions, competencies and patterns of behavior that regulate the commitment to, and the style and proficiency of, an organization's health and safety management". In addition, safety culture also can be defined as the attitude, beliefs and perceptions shared by natural groups which define norms and values that lead to how they act and react in relation to risks and risk control system (Hale, 2000).

Cooper (2000) further defined safety culture as a part of the organizational culture which affects the attitudes and beliefs of members in the organization in terms of health and safety performance. In addition, Pidgeon and O'Leary (2000) concluded that safety culture is a set of assumptions and their related practices that permit beliefs about danger and safety to be constructed. They further added that, in exploring safety culture, people need to go beyond individual attitudes towards safety. We need to explore the level of mutual recognition and the organizational structures and resources that support the organizational understanding towards risk and danger. This also supported by Bhattacharya (2015), who said that safety culture represents all aspects of an organization's values and actions related to safety.

Amirah (2014) developed a safety culture model for the manufacturing industry in Malaysia. From this model, it was found that in developing safety culture in the manufacturing industry, it was influenced by behavioral aspects and mediated by the situational aspect. These behavioral aspects comprise of management commitment, employees' involvement, training and education as well as motivation, while the situational aspect refers to safety compliance, and adherence to the Occupational Safety and Health Act (OSHA) and standard operating procedures.

IV. RESEARCH METHOD

A questionnaire was designed to conduct the survey. The data collection was conducted face-to-face and through direct mail to randomly selected manufacturing companies in Peninsular Malaysia. Six questions were designed to accumulate general information about the demographic or individual factors chosen for this study. The six individual factors being studied are gender, age, and work position, number of years of working with the current employer, injury experience and safety training experience.

The scope of the population used in this study includes the manufacturing organizations in Peninsular Malaysia that employ 100 employees and above. All these manufacturing organizations must be registered with the Federation of Malaysian Manufacturers (FMM). From the list from FMM, the total number of organizations that satisfied the scope of this study and was considered in this research amounted to 1080. The sampling techniques used in this study were cluster sampling and simple random sampling. The cluster sampling technique was carried out by dividing the organizations into four zones i.e. Eastern Zone, Southern Zone, Klang Valley Zone and Northern Zone. This cluster sampling technique was used because it could increase the probability of the organizations being chosen as a sample in the smaller population according to states or zones. This will avoid over-representation by certain states or zones that have a large number of organizations. The simple random sampling was used to choose the organizations from the list of companies provided by the FMM.

From the total of population of 1080, a sample size of 285 is deemed adequate to represent a population in this study (Krejcie and Morgan, 1970). However, the researcher used an additional 20 percent of the sample size to get a better response rate from the respondents. Therefore, the new total for a sample size was 342.

The two main criteria used in the determination of respondents are employees who are directly involved with production and those who are middle and lower-level employees. These two main criteria are important since the respondents will encompass employees with different sets of skills and qualifications. Based on these two criteria, the respondents were selected among production operators, technicians, supervisors, executives or equivalent from the production, maintenance and quality departments. These different categories were chosen since the employees in these departments are directly involved in the production line and exposed to higher risk compared to other departments such as administration and finance.

The Statistical Package for Social Science (SPSS) was used in preparing data analysis to measure the significant difference in demographic profile. The first hypothesis as tested using the t-test and other hypotheses were tested using ANOVA. These types of analyses were used to meet the objective and hypotheses of this study.

V. RESULTS AND DISCUSSION

From the total 342 respondents, only 282 respondents completed the questionnaire, which approximates to an 82.4 percent response rate. According to Ary et al. (1985), the total amount of acceptable responses in data collection is estimated to be not less than 75 percent of the total respondents. Therefore, the percentage of respondents' responses in this study is acceptable for further analysis. After screening the data, the analysis revealed that 11 questionnaires had to be rejected since the respondents did not fully answer all questions. Hence, only 271 respondents or 79.24 percent of the total target respondents were selected and used in this study for data analysis.

To test hypothesis 1, the t-test was used. As shown in Table II, the results indicate that p=0.719. Therefore, the alternate hypothesis in this study was rejected and the null hypothesis was accepted since p>0.05. This test shows that there is no significant difference between males and females in terms of their view regarding safety culture. ANOVA was then used to test hypotheses 2 to 6. As shown in Table III, the results indicate that p = 0.056. Therefore, the second hypothesis in this study was rejected since p>0.05. It can be concluded that there is no significant difference in the employees' view on safety culture among those from different age groups.

TABLE II: T-TEST ON GENDER

		Levene's Test for Equality of Variances		***t-test for Equality of Means***				
		F	***Sig.***	***t***	***df***	***Sig.(2-tailed)***	***Mean Difference***	***Std. Error Difference***
Safety Culture	Equal variances assumed	.977	.324	.360	269	.719	.03092	.08584
	Equal variances not assumed			.356	216.073	.722	.03092	.08676

TABLE III: ANOVA TEST ON AGE

	Sum of Squares	***df***	***Mean Square***	***F***	***Sig.***
Between Groups	4.348	4	1.087	2.339	.056
Within Groups	123.634	266	.465		
Total	127.983	270			

Table IV shows the results for hypothesis 3 which indicate that p=0.037. Therefore, hypothesis 3 could not be rejected since p<0.05. It can be concluded that there is a significant difference in employees' view on safety culture when compared based on different work positions. Table V shows the results of hypothesis 4, which indicate that p=0.017. Therefore, this hypothesis also could not be rejected since p<0.05. It can be concluded that there is a significant difference in the view on safety culture among groups of manufacturing employees with varying years of work experience.

TABLE IV: ANOVA TEST FOR WORK POSITION

	Sum of Squares	***df***	***Mean Square***	***F***	***Sig.***
Between Groups	3.112	2	1.556	3.339	.037
Within Groups	124.871	268	.466		
Total	127.983	270			

TABLE V: ANOVA TEST FOR YEARS OF WORKING EXPERIENCE

	Sum of Squares	***df***	***Mean Square***	***F***	***Sig.***
Between Groups	6.488	5	1.298	2.830	.017
Within Groups	121.495	265	.458		
Total	127.983	270			

As shown in Table VI, the results for hypothesis 5 indicate that p=0.005. Therefore, this study failed to reject this hypothesis since p<0.05. It can be concluded that there is a significant difference in view regarding safety culture among

manufacturing employees with varying injury experience. The results for the last hypothesis is shown in Table VII which indicate that p=0.000. Therefore, this study failed to reject this hypothesis since p<0.05. It can be concluded that there is a significant difference in the view regarding safety culture among manufacturing employees with varying safety training experience.

TABLE VI: ANOVA TEST FOR INJURY EXPERIENCE

	Sum of Squares	***df***	***Mean Square***	***F***	***Sig.***
Between Groups	5.960	3	1.987	4.347	.005
Within Groups	122.023	267	.457		
Total	127.983	270			

TABLE VII: ANOVA TEST FOR SAFETY TRAINING EXPERIENCE

	Sum of Squares	***df***	***Mean Square***	***F***	***Sig.***
Between Groups	10.353	3	3.451	7.833	.000
Within Groups	117.630	267	.441		
Total	127.983	270			

Hypothesis 1 proposed that there would be a significant difference in the view regarding safety culture among male and female manufacturing employees. However, this hypothesis was not supported by the results of the t-test analysis, which revealed that there is no significant difference in their view of safety culture based on gender (p=0.719). Although there is no significant difference, the male manufacturing employees have slightly more concern regarding safety culture compared to the female manufacturing employees.

Hypothesis 2 proposed that there would be a significant difference in the view regarding safety culture among manufacturing employees with different age groups. This hypothesis was also not supported by the results of the ANOVA analysis, which revealed that there is no significant difference in employees' view regarding safety culture among those from different age groups. This shows that all manufacturing employees regardless of their age group are concerned about having a positive safety culture in their workplace. This might be due to their experience concerning the accident cases in the workplace that comes from different age groups of employees.

Hypothesis 3 proposed that there would be a significant difference in the view regarding safety culture among manufacturing employees with different work positions. This study involved three levels of work positions – production operators or technicians, supervisors, and executives or engineers. These three different levels are the employees that are directly involved in production with different exposure to hazards, as they conduct different tasks and have various workloads. From the ANOVA analysis, the results show that there is a significant difference in the view regarding safety culture among manufacturing employees with different work positions. Employees who were highly exposed to hazards in their workplace are more concerned about safety culture compared to those employees who have a low risk of having an accident. Therefore, different work positions have a significant difference among manufacturing employees in respect of their concern for safety culture.

Hypothesis 4 proposed that there would be a significant difference in the view regarding safety culture among manufacturing employees with different years of work in the current workplace. This hypothesis could not be rejected due to the results of the ANOVA analysis, which show that there is a significant difference in employees' view regarding safety culture when based on groups with varying years of work experience. This is because, after a few years of work, these employees might have experienced a near miss incident or suffered injury, either minor or major. They might also have witnessed accidents occurring to their colleagues. Therefore, employees with different years of working experience will have different views concerning safety culture since their concerns are based on their past experience.

Hypothesis 5 proposed that there would be a significant difference in the view regarding safety culture among manufacturing employees who had experienced varying degrees of injuries. This hypothesis could not be rejected due to the ANOVA analysis, which showed that there is a significant difference in the view regarding safety culture among employees with different injury experience. Logically, employees who had suffered from workplace accidents will be more careful in fulfilling their duties, as they are more likely to be affected in terms of traumatic experience and temporary disability. People learn from past experiences, leading them to slowly change their attitude and become more aware of safety.

Hypothesis 6 proposed that there would be a significant difference in the view regarding safety culture among manufacturing employees with different rates of safety training experience. This hypothesis also could not be rejected since the results of the ANOVA analysis show that there is a significant difference among manufacturing employees concern regarding safety culture based on their varying safety training experience. Periodic safety training is important for the employees, as a

reminder that danger exists anytime and anywhere, and that no one is fully protected from accidents. Employees may not always recognize the importance of safety training or may even think that it is unnecessary, but good safety training provided by employers will be useful to them. They will gain better understanding in safety at the workplace and learn what can result from not following safety rules and procedures. Furthermore, sufficient training and education can also provide new knowledge and skills to employees. With effective safety training and education, employees are able to give immediate feedback to their supervisors and employers when they see anyone performing their job incorrectly or in manner that could bring about danger or hazards.

VI. CONCLUSION

From the findings, although the respondents responded to the issue of safety culture in different ways, individual factors are important in determining safety culture. Responses varied due to factors such as work position, years of working experience, injury experience and safety training experience. However, the results show that regardless of gender and age group, employees view safety at the workplace as important. This is because, as humans, directly or indirectly, all of us are responsible for the prevention of injury at work and for the care of those affected. OSH requires everyone in the workplace to be involved, including employers, employees, their families and the government, to cooperate as a community with the common interest of better prevention and care.

VII. ACKNOWLEDGEMENTS

I would like to thank the Ministry of Higher Education, Malaysia for funding this research through a scholarship from MyBrain15 (MyPhd) and Research Management, Innovation and Commercialization Centre (RMIC) of Universiti Sultan Zainal Abidin for funding this publication.

REFERENCES

Amirah,N.A., (2014). Relationship between Behavioral Aspects, Safety Compliance and Its Effect on Safety Culture in the Manufacturing Industry in Peninsular Malaysia. Universiti Malaysia Terengganu, Terengganu.

Amirah, N.A., W.I. Asma, M.S. Muda and W.A.A.W.M. Amin. (2013). Safety Culture in Combating Occupational Safety and Health Problems in the Malaysian Manufacturing Sectors. *Asian Social Science*, 9(3): 182.

Ary,P., Jacob,L., Razavieh. (1985). Introduction to Research in Education 3rd Edition, New York: Holt, Rinehart & Winston.

Buchan, R., (1999). Safety Can't Wait: A Global Campaign for Transformational Change. SPE/IADC 52797. In: Proceedings of the 1999 SPE/IADC Drilling Conference, Amsterdam, March 9 – 11.

Bhattacharya,Y. (2015). Measuring Safety Culture on Ships Using Safety Climate: A Study among Indian Officers, *International Journal of e-Navigation and Maritime Economy* 3 (2015) 161 – 180.

Cooper, M.D. (2000). Towards a Model of Safety Culture. *Safety Science*, 36, pp. 111- 136.

Cooper, M.D. (2008). Risk-weighted Safety Culture Profiling. SPE 111823. In: The 9th International Conference on Health, Safety, Security & Environment in Oil & Gas Exploration and Production. 15-17 April 2008, Nice, France.

Cooper, M.D. (2016). Navigating the Safety Culture Construct: A Review of the Evidence. Franklin, IN: BSMS. Retrieved September 15, 2017 from http//behavioural-safety.com/articles/safety_culture_review.pdf

Cooper, M.D. (2018). The Safety Culture Construct: Theory and Practice. In: Gilbert (Ed.). Safety Cultures, Safety Models: Taking Stock and Moving Forward. Springer Briefs in Safety Management.

Cox, S.J., Cheyne, A.J.T. (2000). Assessing Safety Culture in Offshore Environments. Saf. Sci. 34 (1), 111-129.

FitforWork. (2016). Tackling the Issues of Sickness Absence in Manufacturing. Retrieved October 25, 2016 from https://fitforwork.org/blog/tackling-the-issue-of-sickness-absence-in-manufacturing/?cv=1

DOSH. (2018). Occupational Accidents Statistics by Sector until October 2018. Retrieved November 28, 2018 from http://www.dosh.gov.my/index.php/en/occupational-accident-statistics/by-sector.

Goodheart, B.J. and Smith, M.O. (2014). Measureable Outcomes of Safety Culture in Aviation – Meta-Analytic Review. Int. J. Aviation, Aeronautics, Aerospace 1 (4).

Grote, G. and Künzler, C. (2000). Diagnosis of Safety Culture in Safety Management Audits. Saf. Sci. 34 (1), 131-150.

HSE. (2016). Health and Safety in Manufacturing in Great Britain, 2014/15. Retrieved October 19, 2017 from www.hse.gov.uk/statistics/industry/manufacturing/manufacturing.pdf?pdf=manufacturing

HSE. (2013). Annual Statistics Report for Great Britain 2012/13. Retrieved October 18, http://www.hse.gov.uk/statistics/overall/hssh1314.pdf.

Hale, AR. (2000). Culture's confusions. *Safety Science*. Vol.34, No1-3, 1-14.

Health and Safety Commission (HSC). (1993). ACSNI Study Group on Human Factors. 3rd Report: *Organising for Safety*. (London: HMSO).

Heinrich,H.W. (1941). Industrial Accident Prevention: A Scientific Approach. New York: McGraw-Hill.

ILO. (2017). Safety and Health at Work. Retrieved June15, 2017, from http://www.ilo.org/global/topics/safety-and-health-at-work/lang--en/index.htm.

International Nuclear Safety Advisory Group (INSAG). (1999). Basic Safety Principles for Nuclear Plants. Safety Series No.75-INSAG-3Rev.1 INSAG 12. Retrieved 15 October ,2016, http://www-pub.iaea.org/MTCD/publications/PDF/P082_scr.pdf

International Policy and Research Development Division, DOSH (2018). Occupational Accidents Statistics by Sector until October 2018. Retrieved November 28, 2018 from http://www.dosh.gov.my/index.php/en/occupational-accident-statistics/by-sector.

Krejcie, R.V. & Morgan, D.W. (1970). Determining Sample Size for Research Activities, Educational and Psychological Measurement, Vol. 30, pp. 607-610.

Leigh, P.J. (2011). Economic Burden of Occupational Injury and Illness in the United States. The Milbank Quarterly, Vol. 89, No. 4, 2011, 728-772.
Pidgeon, N. & O'Leary, M. (2000). Man-made Disasters: Why Technology and Organizations (sometimes) Fail. *Safety Science*, Vol.34 (1), 15-30.