Journal of Applied Sciences

ISSN 1812-5654

science alert

ANSInet
an open access publisher
http://ansinet.com

Journal of Applied Sciences 10 (5): 425-430, 2010
ISSN 1812-5654

Determinants of Workers Health and Safety in the Malaysian Wooden Furniture Industry

[1]J. Ratnasingam, [2]F. Ioras and [3]M. Bennet
[1]Faculty of Forestry, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia
[2]Buckinghamshire New University, Queen Alexandra Road, High Wycombe,
HP 11 2 JZ Buckinghamshire, England
[3]Safety Engineering Inc., 14A, Tower Block, Bukit Timah Industrial Estate, 52311, Singapore

Abstract: Despite its socioeconomic importance and the labour intensive nature of the sector, the status of the health and safety of the workers in the Malaysian wooden furniture industry has not been studied and reports on the subject is sparse. Therefore, the safety climate, which defines the safety level of the work environment, in the Malaysian wooden furniture industry was studied in thirty wood-furniture manufacturing factories, using a structured questionnaire. The study found that although there were four determinants of the prevailing safety climate in the work environment, it was the management responsibility and safety precautions that had the strongest influence on safety climate. Further, the primary health and safety concerns in the wooden furniture manufacturing industry were the air-borne dust, noise, chemical exposure, materials handling and occupational accidents. In this context, it is essential for the management to show commitment towards health and safety and incorporate safety precautions into the operational system, to ensure a safe working environment in the wooden furniture manufacturing industry.

Key words: Safety climate, safety precautions, safety practices, safe work environment, wooden furniture industry

INTRODUCTION

The wooden furniture manufacturing industry is the fastest growing sub-sector within the Malaysian wood-based industry and its socioeconomic importance, both in terms of workforce employment and foreign exchange earnings, has been growing steadily over the years. In 2008, the sector contributed US$ 2.7 billion in export earnings, while employing almost 68,000 workers (Ratnasingam, 2009). Nevertheless, the health and safety of its large workforce is debatable, as the extensive use of foreign unskilled contract workers in the industry is envisaged to compromise health and safety standards (Ratnasingam and Bennet, 2009). However, studies on workers' health and safety in the Malaysian wooden furniture industry has not been well investigated and hence, reports on the subject are sparse (Ratnasingam and Bennet, 2009). Nevertheless, published statistics on the manufacturing sector suggest that industrial accidents within the broad category of wood products industry is above the national average of the manufacturing sector, implying that studies into this subject is warranted (NIOSH, 2009). Further, the impact of the workers' health and safety issues on the overall industrial productivity is a matter of national and international interests especially when productivity is crucial for industrial competitiveness (Guldenmund, 2000; Geller, 2001; Clarke, 2006a; Pousette *et al*., 2008; Wu *et al*., 2008; Gyekye and Salminen, 2009; Vinodkumar and Bhasi, 2009; Shannon and Norman, 2009).

Studies on industrial accidents have shown that there is a close relationship with the prevailing safety climate at the workplace (Lindell, 1994; Cooper, 2000; Clarke, 2006b; Das *et al*., 2008). The safety climate is defined as the workers' interpretations of features, events and processes in the work environment that are relevant to their safety, which include factors such as, physical attributes (plant design, machinery, personal protective equipment), policies/practices (safety priorities, training, enforcement, housekeeping), safety-related conditions (work stress, social relations with co-workers) and the level of concern and actions by different people in the workplace (management, supervisors, safety specialists, safety committees and the workers in general).

Corresponding Author: Jegatheswaran Ratnasingam, Faculty of Forestry, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia Tel: +603-89467175 Fax: +603-89432514

Against this background, a study was undertaken to evaluate:

- The determinants of workers' safety climate in the Malaysian wooden furniture industry
- The relationship between safety practices and safety level of the work environment
- The primary health and safety concerns within the wooden furniture manufacturing industry

MATERIALS AND METHODS

The study was conducted in 30 large (employing more than 100 workers, with an annual turnover in excess of US$ 10 million) wooden furniture-manufacturing companies in Malaysia, using a five-part structured questionnaire. The companies were selected according to the following criteria: (1) fifteen companies with accident rates below the industrial average and (2) fifteen companies with accident rates above the industrial average. In this study, accident rate refers to number of accidents at the workplace per million work hours and the accident leads to at least an hour of production loss. All the companies had consented to participate in the study, which was carried out during the period of February to August 2009. The study was conducted in 5 parts.

Part I: This part related to the measurements of safety climate in the factories using a questionnaire, which had 34 variables (Table 1, 2). The variables were selected based on the previous study by Varonen and Mattila (2000) and Zhou *et al.* (2009) as well as after discussions with industrial health and safety experts. The variables were divided into two groups: (1) 20 variables related to safety practices in the factory and the motivational and attitude factors of the management and workers and (2) 14 variables concerning safety precautions in the factory. All the variables were rated based on the Likert's 5 point rating scale where higher rating indicated stronger positive opinion. The questionnaire were distributed to every worker in the thirty factories by the respective factory manager and collected in sealed envelopes one week later. The total number of workers who had participated in the study from all fifty factories was 2893, which provided a response rate of 87%. The structure of the safety climate was determined by means of factor analysis. Factor analysis is a method that enables a large number of variables to be described in a compact manner, using fewer new variables (Brown and Holmes, 1986). Through the use of rotation, it is possible to arrange the factor matrix in such a way that it is easier to interpret. The Kaiser-Meyer-Olkin test was used to estimate whether the data was suitable for analysis, i.e., factor analysis cannot be used if the Kaiser-Meyer-Olkin test index is below 0.5. The maximum likelihood method and varimax rotation were used in the analysis. All factors whose eigen value was greater than 1.0 were accepted, while factors that consisted of three or less variables were rejected, because according to Brown and Holmes (1986), it takes at least three variables to define a factor.

Part II: This part related to the measurement of the safety practices in the factories, in which 14 variables were evaluated based on the Likert's five-point rating scale (Table 3). The senior managers at the respective factories were interviewed to determine the ratings for the

Table 1: Six-factor solution for safety practices of the company and the attitudes and motivation of the company and workers

	Loading of factors					
Variables	1	2	3	4	5	6
The employer considers safety as important	0.57	0.16	0.07	0.09	0.10	0.31
The supervisor encourages safe behavior	0.56	0.10	0.24	0.26	-0.07	0.29
Safety manager encourages safe behavior	0.23	0.15	-0.03	0.95	-0.02	0.08
Fellow workers regards safety as important	0.38	0.45	0.18	0.14	0.07	0.12
Supervisor has sufficient time to try to prevent accidents	0.04	0.16	0.45	0.02	0.17	-0.05
Supervisor intervenes if a worker acts against safety regulations	0.30	0.24	0.51	0.16	0.04	0.21
A busy situation does not prevent the supervisor is safety regulation is not obeyed	0.28	-0.01	0.77	0.07	0.01	-0.22
Safety regulations are clear to all workers	0.13	0.38	0.11	0.04	0.04	-0.18
It is not a burden to obey the safety regulations	0.26	0.60	0.08	0.06	-0.08	0.02
I regard complying with safety regulation as important	0.05	0.55	0.09	0.19	0.13	0.15
The handing of safety issues in the company is flexible	0.35	0.75	0.25	0.06	-0.05	-0.15
It is no use talking about safety issues to the management of the company	0.48	0.02	0.22	0.03	0.38	0.03
It is unlikely that an accident will happen to me	0.19	0.04	0.10	0.07	-0.05	-0.03
Noticing other workers break the safety regulations is annoying	0.01	0.49	0.03	0.07	-0.05	-0.03
Communicating safety issues to the supervisor is easy	0.71	0.05	0.11	0.08	-0.05	-0.03
Accidents do not happen by chance	-0.15	0.05	0.03	0.01	-0.10	-0.35
The accident risks in one's own job cause no anxiety	0.10	0.08	0.19	-0.08	0.65	-0.05
Safety is not the responsibility of only one individual worker	0.50	-0.24	0.19	0.09	0.21	0.18
The safety expertise of supervisors is good	0.64	-0.10	0.09	0.02	0.15	0.10
Safety working habits is worthwhile	0.08	0.61	0.17	0.04	0.07	0.03

Table 2: One-factor solution for company safety precautions

Variables	Loadings
Information on safety issues	0.83
Preventive safety measures	0.78
Supervision of safety	0.77
Safety analysis	0.71
Safety in purchases	0.70
Encouraging safe work methods	0.69
Reactions to safety initiatives	0.66
Safety inspections	0.65
Safety in work planning	0.62
Housekeeping	0.61
Accident investigation	0.60
Safety training	0.55
Participation in design process	0.51
Degree of initiative on safety	0.38

Table 3: Variables used in company safety practices

Factors	Variable involved	Average score for factor
Management role	Management involvement	4.23
	Provision of safety rules to employees	
	Erection of signs on safety regulations	
	Safety information and regulations	
	Keeping up-to-date with safety matters	
	Participation of safety authorities in risk assessment	
	Safety assessment within factory	
Anticipation of hazards	Job hazard analysis	3.03
	Investigation of near accidents	
	Housekeeping	
	Internal safety inspection	
Safety training	Safety program	3.13
	Safety training for management, safety manager, line supervisor, workers	
	System for familiarizing new employees to safety rules	

variables. These variables were then grouped into groups, namely: (1) the safety activities of factory management, (2) anticipation of hazards and (3) safety training. The means of factors were calculated as the means of all those variables that were included in each factor.

Part III: This part focused on the measurement of the safety level in the factories, which was carried out based on correlation between the drivers of safety climate and the safety level of the work environment. The safety level of the work environment was evaluated on the degree of compliance of each of the factories to the 45 safety checkpoints, as reported by Ratnasingam and Bennet (2009).

Part IV: This part focused on establishing the relationship between the drivers of safety climate and the accident rate in the factories surveyed. The work accidents that had occurred during the period 2007-2008 were analyzed based on the insurance claims made. This information was regarded as accurate as physicians' statements supported the claims and the compensation paid by the insurance companies depended on these reports (NIOSH, 2009).

Part V: In this part of this study, a total of 20 workers chosen randomly from each factory, were asked to list down their primary health and safety concerns related to their workplace.

RESULTS

Part I: Safety climate and safety precautions: When the correlation matrix that represent the variables concerning daily safety practices of the company and attitudes and motivational factors of the organization and workers received a Kaiser-Meyer-Olkin test index of 0.86, the results was deemed to be suitable for analysis. The analysis produced six factors. The analysis accounted for 40% of the total variance, a result that was statistically acceptable. The first factor represented the organization's attitude towards safety (variables 1, 2, 12, 15, 18 and 19), the second the workers' own attitudes toward safety (variables 4, 8, 9, 10, 11, 14 and 20) and the third was the daily supervision of safety in the workplace (variables 5, 6 and 7). All three factors were internally consistent. Variable 8 was included in factor 2 even though its loading was under 0.4 because it was consistent with the interpretation of this factor. Because the fourth and fifth and sixth factors consisted of two or less variables, they were rejected.

When the correlation matrix that represented the variables concerning safety precautions of the company received a Kaiser-Meyer-Olkin test index value of 0.94, the results were found to be suitable for analysis. The analysis produced one factor. The solution accounted for 48% of the total variance, which was acceptable. The factor was internally very consistent. Only variable 14 in Table 2 received a loading that was under 0.40. On the basis of these analysis, the determinants of safety climate in the wooden furniture manufacturing industry could be defined as:

- Company responsibility
- Workers' safety attitudes
- Safety supervision
- Company safety precautions

The Cronbach-α was 0.83 for factor 1, 0.68 for factor 2, 0.61 for factor 3 and 0.93 for factor 4. Based on the satisfactory reliability level of 0.80, the reliability of factors 2 and 3 were considered too low.

The results suggest that although the determinants of safety climate in the wooden furniture involve four factors, the company responsibility and company safety precautions were found to be the predominant determinants of safety climate. This finding was parallel to the report by Varonen and Mattila (2000), who reported

that company responsibility and company safety precautions determined the prevailing safety climate in the Finnish woodworking industry. Further, the results from this study emphasized the fact that the workers' safety attitudes and safety supervision have little effect on the safety climate in the Malaysian wooden furniture industry. Inevitably, the high accident rate in the wood products industry could be attributed to the poor attitude of the foreign contract-workers towards safety issues, as well as the lack of built-in safety precautions in the factories. Therefore, the safety climate within the wood products industry should be implemented through systematic management and operational approach (Ratnasingam and Bennet, 2009).

Part II: Safety practices: In evaluating the safety practices in the factories involved in the study, it was found that the safety activities of the management received the highest score while anticipation of hazards and safety training received lower scores (Table 3).

The safety climate factor 4, company safety precautions had a statistically correlation with the factor of anticipation of hazards ($r = 0.792$ at $p<0.05$), which described the company safety practices. However, safety climate factor 1, 2 and 3 showed no correlation with the company safety practices. In this context, an effective company safety precaution is able to pre-empt any possible safety hazard that may arise in the working environment, while the management's and safety training appear to have minimum effect on the safety practices. This finding suggest that although the company management may demonstrate a high degree of concern for safety in the working environment, no amount of training and management intervention can replace the effectiveness of the company safety precaution scheme built into the operational system on the factory shop-floor to ensure a safe work environment (Lindell, 1994).

Part III: Safety level: The safety climate factor 1, company responsibility and factor 4, company safety precautions had a statistically significant correlation with the safety level of the work environment ($r = 0.882$ and 0.820 at $p<0.05$, respectively), while other factors did not show any such relationship. In this context, the prevailing safety level in the Malaysian wooden furniture industry is affected primarily by company responsibility and company safety precautions, which in turn ensures a safe working environment (Ratnasingam and Bennet, 2009).

Part IV: Occupational accidents: The safety factor 1, company responsibility and factor 4, company safety precautions, had a statistically significant correlation with the accident rate reported by the factories ($r = 0.776$ and 0.884 at $p<0.05$, respectively). However, factor 2 and 3 showed no such relationships. The incidence of occupational accidents in the Malaysian wooden furniture industry is also closely linked to company responsibility and company safety precautions, clearly suggesting that a safe operational system must be in place to ensure safety in the work environment (Lindell, 1994; Ratnasingam and Bennet, 2009).

Part V: Health and safety issues: The primary health and safety concerns of the workers in the wooden furniture manufacturing industry can be divided into 5 categories, namely: (1) air-borne dust, (2) noise, (3) chemical exposure, (4) manual handling and (5) occupational accidents. Although other factors, such as poor lighting, poor hygiene and fire hazards were highlighted, these factors were considered insignificant due to their low ratings of importance. The results show that the workers in the Malaysian wooden furniture industry are more concerned about their immediate work environment, as it has a strong bearing on their productive capacity. This is to be expected since as contract workers, their wages are dependent on the number of hours worked (Ratnasingam and Bennet, 2009). Further, the reluctance of workers to use the safety gadgets provided as it is deemed to be uncomfortable and interferes with their productive capacity, suggest that unless the use of safety gadgets by workers are made mandatory, it may be more economical to reduce the safety hazards at the place of origin through technological and operational means.

DISCUSSION

The results of this study, which corresponds to the findings of Varonen and Mattila (2000), Smith *et al.* (2006), Hahn and Murphy (2008) and Baek *et al.* (2008), emphasizes that workers safety is highly influenced by the prevailing safety climate factors in the factories. Nevertheless, it must be emphasized that health and safety rules and regulations alone are not the answer to accident prevention. Safety researchers have identified and advocated several approaches in addition to enforcement to help understand this complex problem. Going beyond external regulatory systems, past research to improve occupational safety emphasized the so-called accident prone individual and the ergonomic design of equipment (Sheehy and Chapman, 1987). Subsequent research, however, demonstrated that simply trying to eliminate or control unsafe employees does not solve the root cause of the problem. Geller (1996, 2001) has conclusively shown that the most productive path to reducing accidents is through a greater use of techniques from industrial psychology and organizational science.

The analysis presented in this study enables the identification of primary risk factors for the wooden furniture industry. Risks associated with the immediate work environment (such as air-borne dusts from machining operations, noise emission, chemicals exposure and manual handling of materials as well as the related occupational accidents) are highest concerns of workers (Gazo *et al*., 2002). Further, the best safety climate within the wooden furniture sector requires a management team that provides its full support for what can be called a culture of safety. Specifically, the senior management of the organization need to do more than just pay lip service to safety, as they need to cultivate an organizational culture that truly believes in and values safety. Leadership for safety must also be shown throughout the managerial ranks in the organization, especially by the plant manager and supervisors (Stewart, 2001). The human resource practices that ensure a workforce that can meet goals for safety, productivity and quality is valuable for increasing safety performance (Geller, 2001). In this context, as shown in this study, the safety precautions taken as part of the standard operating procedures on the factory shop-floor has the strongest influence on creating the highest safety climate, as previously reported by Michael and Leschinsky (2003). Although, training and workers attitude toward safety plays a role in the prevailing safety climate (Veigle and Horst, 1982), their influence is somewhat limited by the quality of the workforce in the Malaysian wooden furniture industry, which is predominated by contract foreign-workers. According to Personick and Biddle (1989), the nature of the workforce is crucial in determining the motivation towards safety and training and as shown in this study, appears to limit the influences of training and supervision on the prevailing safety climate in the industry.

Industrial implications: Health and safety regulation alone will not ensure the highest safety climate within the wooden furniture industry. It's the management's commitment and built-in safety precautions that would ensure a safe work environment, which in turn would ensure a productive workforce. Managers of wooden furniture mills would be wise to remember that a successful safety program not only requires their own buy-in, but also requires bottom-up involvement from the workforce. An effective system of manufacturing practices with built-in safety precautions, as advocated by the ISO 18000 scheme will encourage the safety-related involvement of all employees, is even more valuable when dealing with contract foreign-workers, as in the case of the Malaysian wooden furniture industry, to drive for improved safety performances in the wooden furniture industry.

CONCLUSION

Even though the working environment in the wooden furniture industry is deemed unsafe, in reality the prevailing safety level is dependent on the management commitment and safety precautions taken. Improving safety performance should be a primary concern for managers at all levels, as it has far reaching economic and social bearings in the competitive wooden furniture manufacturing industry.

REFERENCES

Baek, J.B., S. Bae, B.H. Ham and K.P. Singh, 2008. Safety climate practice in Korean manufacturing industry. J. Hazard Mater., 159: 49-52.

Brown, R.L. and H. Holmes, 1986. The use of factor-analytic procedure for assessing the validity of an employee safety climate model. Accident Anal. Prev., 18: 455-470.

Clarke, S., 2006a. The relationship between safety climate and safety: A meta-analytic review. J. Occup. Health Psychol., 11: 315-327.

Clarke, S., 2006b. Contrasting perceptual, attitudinal and dispositional approaches to accident involvement in the workplace. Safety Sci., 44: 537-550.

Cooper, M.D., 2000. Towards a model of safety culture. Safety Sci., 36: 111-136.

Das, A., M. Pagell, M. Behm and A. Veltri, 2008. Towards a theory of the linkages between safety and quality. J. Operat. Manage., 26: 521-535.

Gazo, R., J.D. McGlothlin, Y. Yih and J. Wiedenbeck, 2002. Ergonomics and safety in secondary wood processing. Proceedings of the 30th Annual Hardwood Symposium, (HS'02), NHLA, Memphis, TN., pp: 114-120.

Geller, S., 1996. The Psychology of Safety. How to Improve Behaviors and Attitudes on the Job? Chilton Book Co., Chicago, USA., pp: 390.

Geller, S., 2001. Working Safe: How to Help People Actively Care for Health and Safety? 2nd Edn., CRC Press, New York, ISBN-10: 1566705649, pp: 328.

Guldenmund, F.W., 2000. The nature of safety culture: A review of theory and research. Safety Sci., 34: 215-257.

Gyekye, S.A. and S. Salminen, 2009. Educational status and organizational safety climate: Does education attainment influence workers perceptions of workplace safety? Safety Sci., 47: 20-28.

Hahn, S.E. and L.R. Murphy, 2008. A short scale for measuring safety climate. Safety Sci., 46: 1047-1066.

Lindell, M.K., 1994. Motivational and organizational factors affecting the implementation of worker safety training. Occup. Med., 9: 211-240.

Michael, J.H. and R.M. Leschinsky, 2003. Human resources management and training needs of Pennsylvania lumber producers. Forest Prod. J., 53: 28-32.

NIOSH., 2009. Report on workers safety in the manufacturing sector. National Institute of Occupational Safety and Health (NIOSH), Bangi, Malaysia.

Personick, M.E. and E.A. Biddle, 1989. Job hazards underscored in woodworking study. Monthly Labor Rev., 112: 18-23.

Pousette, A., S. Larsson and M. Torner, 2008. Safety climate cross-validation, strength and prediction of safety behavior. Safety Sci., 46: 398-404.

Ratnasingam, J. and M.C. Bennet, 2009. Health and safety issues of the Malaysian furniture sector. IFRG Report No. 17, Singapore.

Ratnasingam, J., 2009. Status of the Malaysian wooden furniture industry. Special Report No. 4, IFRG, Kuala Lumpur, Malaysia.

Shannon, H.S. and G.R. Norman, 2009. Deriving the factor structure of safety climate scales. Safety Sci., 47: 327-329.

Sheehy, N. and A. Chapman, 1987. Industrial Accidents. In: International Review of Industrial and Organizational Psychology, Cooper, C.L. and I.T. Robinson (Eds.). Wiley Interscience, Chichester, UK., ISBN-13: 978-0471936343, pp: 201-227.

Smith, G.S., Y.H. Huang, M. Ho and P.Y. Chen, 2006. The relationship between safety climate and injury rates across industries: The need to adjust for injury hazards. Accidently Anal. Prev., 38: 556-562.

Stewart, J., 2001. The turnaround in safety at the Kenora pulp and paper mill. J. Am. Soc. Safety Eng., 46: 34-45.

Varonen, U. and M. Mattila, 2000. The safety climate and its relationship to safety practices, safety of the work environment and occupational accidents in eight wood-processing companies. Accidently Anal. Prev., 32: 761-769.

Veigle, J. and B. Horst, 1982. Millwork industry shows slow growth in productivity. Monthly Labor Rev., 105: 21-26.

Vinodkumar, M.N. and M. Bhasi, 2009. Safety climate factors and its relationship with accidents and personal attributes in the chemical industry. Safety Sci., 47: 659-667.

Wu, T.C., C.H. Chen and C.C. Li, 2008. A correlation among safety leadership, safety climate and safety performance. J. Loss Prevent. Proc., 21: 307-318.

Zhou, Q., D. Fang and X. Wang, 2009. A method to identify strategies for the improvement of human safety behavior by considering safety climate and personal experience. Safety Sci., 46: 1406-1419.