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Organizational Safety Climate

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Abstract - *This study aims to determine the extent of safety climate in an electronic manufacturing industry of South India, taking management as well as workers opinion separately. Safety climate was measured through survey using questionnaire. Seven dimension's that define the safety climate were measured, out of which safety knowledge and supervisor's commitment to safety were found to have a low scoring according to management opinion. Safety training and safety priority over production have low scoring percentages according to workers opinion. This indicates the need for sensitizing both Management as well as workers to reorient their priorities about safety. Results of total safety climate in the organization indicate that there is still a long way to go from the management as well as workers' point of view in achieving the desired level of safety climate.*

***Key Words*: Safety Climate, Management Commitment to safety, safety Training, Safety Communication, Supervisor's Commitment to safety, Safeness to work Environment, Safety Priority over Production, Safety knowledge**.

1. INTRODUCTION

Safety Climate is defined as 'the perceptions of employees about safety in their work area' [2]. Dedobbler and Blend (1991) have also defined safety as 'perceptions of people about management actions regarding safety' [3]. Safety Climate measures attitude and perceptions of employees about safety in their work place and helps management to better design and improve the Occupational Health & Safety program.

Safety Climate includes areas such as work practices, work style, operator training, and industrial hygiene, priority of safety over pressure for production [4]. In several studies conducted in the past, many dimensions of safety climate has been defined and they encompass management commitment, safety training, safety communication, safety participation behavior etc.

However, there is no consensus on which dimensions to be included in safety climate study. Zohar (1980) [3] who is considered as the major contributor, in the area of occupational safety research, concluded that '*management commitment'* is the major contributor in occupational safety. Management Commitment includes role of the organizational management in different aspects of safety such as safety policy, safety objectives, safety training, and safety audits. This dimension is the key in studying safety climate in any organization and considered in multiple researches of safety climate [5]. *Safety training* is also one of the major factors that are considered important for improving workplace safety. Safety training imbibes safe behavior of people. This includes the training of workforce regarding the use of safety equipment, emergency procedures, and safety practices. Safety training has been used as a factor to assess safety climate of organizations [6]

Safety and Production are two key aspects that run parallel in industries as in order to achieve production targets workers and production supervisors also ignore safety as they want to meet their production commitments at any cost and for that purpose they usually let go safety procedures. In several studies "*Safety priority over production*" has also been used as a measure of organizational safety climate and measured quantitatively by using questionnaire and some researchers have explored the role of work pressure on safety. *'Safety communication'* plays a key role in the improvement of safety climate in organizations. This aspect includes communication about hazards, risks, policies and objectives etc. Communication about hazards, policies and objectives is initiated by management and delivered to workers; whereas, communication about incidents, near misses are given from workers to management. [7] [8]

Like other dimensions, 'safety communication' has been used to measure safety climate of organizations. *'Safety Knowledge'* involves the level of awareness of workers with their safety environment which includes having knowledge about hazards, risks and use of safety equipment. *'Safeness of work environment*' involves the level of risk and hazards and their impact

on workers and has been used as a key contributor in measuring safety climate. *'Supervisor commitment'* to safety is also one of the prominent facts that influences safety climate, as supervisor is the direct in charge for implementing safety procedures at workplace. Like others, supervisor's commitment has been given a prime importance in several researches. It is evident from the literature that safety performance of any organization is assessed through the measurement of safety behaviors which are estimated quantitatively (using questionnaire). [9] [10]

It is clear from the literature review that the previous research works on safety climate that have been done internationally are mostly done on chemical, construction, and manufacturing industries which are well-established. So, there is need to explore new start-up industries so as to create awareness, build healthy environment and provide them opportunity to make use of human capital efficiently and effectively from the beginning itself.

This highlights the importance and need for this work. Also there is need to assess the impact of adopting Safety Management Certification (OHSAS18001:2007) in terms of improving safety culture, linked with the perception of workers about safety.

From the above literature the authors decided to design this study using the following dimensions as defined by the items listed in the table below:

Table -1: List of Dimensions, Items and its Definition.

Dimensions	Definition of Dimension	Items used to Measure the Dimensions
Management Commitment to Safety	The management work together and take responsibilities to make safety and health a priority in the organization.	• Providing Complete Safety Equipment • Regular Audits and inspection • Implementation of safe action plans • Avoid repeating accidents • Use of latest technology for safety
Safety Training	Describes the training material designed to teach and educate in the field of occupational safety and health administration (OSHA)	• Safety expertise of workers reviewed periodically • Providing Safety reinforcement training to all workers • Complete information about hazards and risks
Safety communication	Safety communication is defined as the information sharing system to lead personnel as well as public safety in the workplace. The information may include hazards, risks, policies and objectives.	• Regular updates about new hazards and equipment's • Communicate good safety work practices • Suggestions of workers for betterment of safety
Supervisor's Commitment to Safety	Supervisor's complete dedication and engagement to keep safety and health as the first priority in their respective workplace	• Daily safety inspection • Regular assessing of hazard and risks • Guide workers in safety issues • Listen to safety related problems and solve them

Safety priority over production	Defines as a condition where safety is being treated more important and given preference overproduction .	• Safety ignorance is viewed seriously • Training to Keep safety ahead of all things • Production pressure on workers by management and supervisors causing ignorance of safety measures
Safeness of work environment	Describes policies and procedures to ensure the safety and health of employees within the workplace	• Regular preventive maintenance of machines • Safety checklist and procedure are maintained properly • Control equipment's are present in machines and work environment to avoid hazards.
Safety knowledge	Safety knowledge is defined as the ability and skills acquired for identifying workplace hazards and reducing accidents and exposure to harmful situations.	• Having Complete PPE knowledge • Understanding of safety policy of the company • Knowledge regarding safety targets of company • Complete workplace hazards and risks knowledge.

2. OBJECTIVES OF THE STUDY

This study was carried out with the following objectives:

- To develop a simple instrument to measure the perceived safety climate.
- To assess the perceived level of safety climate in the industry considering both management as well as workers' opinion.
- To find out correlation among different safety dimensions
- To perform regression analysis to predict the relationship between total safety climate score (dependent variable) and its dimensions (independent variables – Management Commitment to safety training; Safety Communication; Safety Knowledge; Supervisors' Commitment to Safety; Safety Priority over production; Safeness of Work Environment)

3. METHODOLOGY OF THE STUDY

In order to achieve above mentioned objectives, a study was carried out at an Electronic Manufacturing Unit in Mysuru. A questionnaire war designed to cover the above dimensions. 35 questions were designed and distributed for a sample size of 100 which included both management group as well as worker's group

Recruitment criteria at this Plant are minimum qualification (Diploma and ITI) but few of these were graduates also, but overall education level of workers is Low because more than 70% workers are Non-graduates. Most of the workers in Plant are in the age of 20-35 years having work experience of average 5-6 years. Keeping in view previous researches mentioned in the literature a questionnaire was developed with a five point Likert scale **(completely agree, moderately agree, neither agree/nor disagree, moderately disagree, complete disagree)** and was used to record the respondents agreement or disagreement with safety climate perceptions about organization. Keeping in view the education level of production line workers, questionnaire was translated into local language (Kannada) so that they can understand and conveniently answer the questions. In current study statistical analyses of reliability, correlation, percentage scores calculation, and regression analysis test have been carried out.

Table 2 shows results of reliability testing of questionnaire which was tested in the study.

Total 125 questionnaires were distributed and 100 responses were received, where effective response rate was about 80%. To maintain confidentiality of the data, there were no questions about personal information like name, designation, signatures etc.

Table 2: Showing results of Reliability Analysis of the Instrument

Dimensions	Total Items	Cronbach's Alpha	Reliability
Management Commitment to Safety	7	0.847	Good
Safety Training	4	0.629	Acceptable
Safety Priority Over Production	4	0.784	Good
Safety Communication	5	0.714	Good
Supervisor's Commitment to safety	4	0.667	Acceptable
Safeness of Work Environment	5	0.686	Good
Safety Knowledge	6	0.600	Acceptable

4. RESULTS

As mentioned previously, response of the workers has been recorded by using five point Likert scales (Completely Agree, Moderately Agree, Neither Agree nor Disagree, Moderately Disagree, Completely Disagree) where score of 1 shows complete agreement and 5 shows complete disagreement

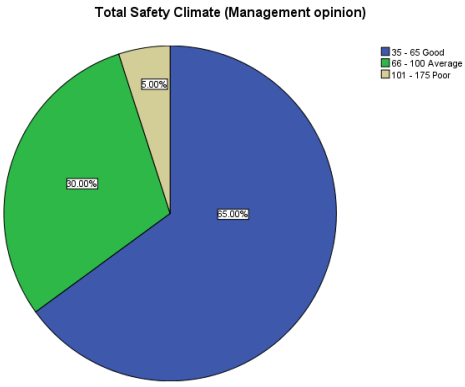

Chart -1: Total Safety Climate (Management Opinion)

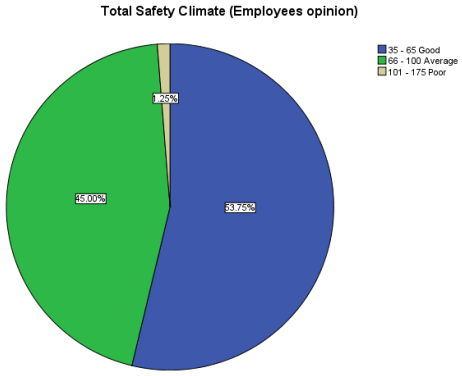

Chart -2: Total Safety Climate (Employees opinion)

Charts showing the" Total Safety Climate" percentage scores within the organization

Table 3 showing Frequency and Percentage scores of Safety Climate and its Dimensions.

Dimensions	Scores	Frequency (Management opinion)	Frequency (workers opinion)	Percentage % (Management opinion)	Percentage % (workers opinion)
Management Commitment to Safety	7-9 Good 10-27 Average 28- 35 Poor	13 6 1	40 30 10	65 30 05	50 37 12.5
Safety Training	4-6 Good 7-14 Average 15- 20 Poor	9 9 2	24 40 16	45 45 10	30 50 20
Safety Priority Over Production	4-6 Good 7-14 Average 15- 20 Poor	12 6 2	34 31 15	60 30 10	42.5 38.8 18.8
Safety Communication	5-7 Good 8-15 Average 16- 25 Poor	8 10 2	35 40 5	40 50 10	43.8 50 6.2
Supervisor's	4-6 Good 7-14	5	53	25	66.2

Commitment to safety	Average 15- 20 Poor	12 3	23 4	60 15	28.8 5
Safeness of Work Environment	5-7 Good 8-15 Average 16- 25 Poor	8 10 2	24 44 12	40 50 10	30 55 15
Safety knowledge	6-9 Good 10-17 Average 18- 30 Poor	8 8 4	40 33 7	40 40 20	50 41.2 8.8
Total safety Climate	33-65 Good 66-100 Average 101-175Poor	13 6 1	43 36 1	65 30 5	53.8 45 1.20

Table 3 shows percentage scores of responses against all seven dimensions of safety climate included in this research. The scoring is done for all the 35 questions having Likert scale, where 35 is considered as lowest score and 175 is considered as highest score. These scores obtained from respondents are divided into 3 categories. 'Good' safety climate having scores between (35-65) 'Moderate' safety climate having scores between (66-100) and 'Poor' safety climate having score between (101-175). Similarly percentage scoring is done for each dimensions of safety climate considering management and workers opinion as shown in the table above. The percentage results of total safety climate in the organization indicate that (65%) is at higher level, (30%) is at moderate level and (5%) at lower level as per management opinion. workers opinion scores to the total safety climate in the organization states that (53.75%) is at higher level, (45%) is at moderate level and (1.25%) at lower level as shown in the chart (1) and chart (2).Out of all seven dimension's safety knowledge and supervisor's Commitment to safety have low scoring percentages according to management opinion and safety training and safety priority over production have low scoring percentages according to workers opinion

Table 4 showing correlations among seven dimensions of safety climate

Variable	1	2	3	4	5	6	7
Management Commitment to Safety	1	0.984**	0.788**	0.997**	0.904**	0.900**	0.667**
Safety Training	0.984**	1	0.870**	0.979**	0.934**	0.958**	0.845**
Safety Priority over Production	0.788**	0.870**	1	0.794**	0.879**	0.972**	0.943**
Safety Communication	0.997**	0.979**	0.794**	1	0.922**	0.909**	0.802**
Supervisor's Commitment	0.904**	0.934**	0.879**	0.922**	1	0.950**	0.955**
Safeness of Work Environment	0.900**	0.958**	0.972**	0.909**	0.950**	1	0.945**
Safety Knowledge	0.667**	0.845**	0.943**	0.802**	0.955**	0.945**	1

Table 4 shows results of Pearson's correlation among variables and shows that all the variables have positive correlations with each other with in the significance level of 0.01. These positive correlations among these seven dimensions are interrelated to each other and are measuring safety in similar way. Highest positive correlation exists between "Management Commitment to Safety" and "Safety Communication" ($r = 0.997$, $p = 0.000 < 0.01$) which indicates that strong commitment to safety by management has increased the Safety Communication in the organization. Second strong positive correlation exists between "Safety Training and "Management Commitment to safety" ($r = 0.984$, $p = 0.000 < 0.01$) which indicates that "Management Commitment to Safety" has positive influence on "Safety Training" in the organization. Weak positive correlation exists between "Safety knowledge and "Management commitment to safety" ($r = 0.667$, $p = 0.000 < 0.01$) which indicates that "Management commitment to safety has least positive impact on

workers "Safety knowledge" as compared to other dimensions.

A Multiple Regression Analysis was performed to find the relationship between the total safety Climate Score which is considered as dependent variable and the dimensions of the safety climate which are considered as independent variables. Table 5 shows the multiple linear regression model summary and overall fit statistics. We find that the adjusted R (square) of the model is 0.579 that means that the linear regression explains 57.9% of variance in the data. The Durbin-Watson d = 1.849 which is between the two critical values of 1.5 < d < 2.5 and therefore we can assume that there is no first order linear auto-correlation in our multiple regression data.

Table 5:Showing Multiple Regression model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.780[a]	.609	.579	.35030	1.849

a. Predictors: (Constant), Safety knowledge, Safety Priority over production, Supervisor's commitment to safety, Management Commitment to safety, Safeness of work environment, Safety Training, Safety Communication

b. Dependent Variable: Total Safety Climate

The linear regression's F-test has the null hypothesis that there is no linear relationship between the dependent and independent variables (in other words R square = 0). Table 6 ANNOVA, shows that the model can predict Y using X. The significance is 0.000 (which is < 0.05) indicates that we can reject the null hypothesis that "the model has no predictive value". Thus we can assume that there is a linear relationship between the variables in our model

Table 6: Showing the AVOVA for 0.05 Significance

Model	Sum of Squares	df	Mean Square	F	Sig
Regression	17.551	7	2.507	20.432	0.000[a]
Residual	11.289	92	.123		
Total	28.840	99			

a. Predictors: (Constant), Safety knowledge, Safety Priority over production, Supervisor's commitment to safety, Management Commitment to safety, Safeness of work environment, Safety Training, Safety Communication

b. Dependent Variable: Total Safety Climate

Table 7: showing the multiple linear regression estimates including the intercepts and significance levels

Model	Unstandardized coefficients		Standardized Coefficients	t	sig	Co-linearity Statistics	
	B	Std error	Beta			Tolerance	VIF
(Constant)	-.871	.234		-3.723	0.00		
Management Commitment to safety	.313	.053	.397	5.923	0.00	.948	1.055
Safety Training	.253	.054	.329	4.675	0.00	.858	1.165
Safety Priority over production	.208	.050	.285	4.154	0.00	.901	1.110
Safety Communication	.096	.063	.108	1.507	.135	.822	1.217
Supervisor Comitment	.072	.062	.083	1.151	.253	.813	1.230
Safeness of work environment	.115	.056	.140	2.067	.042	.928	1.078
Safety knowledge	.332	.052	.416	6.332	.000	.987	1.014

Table 7 shows two non-significant coefficients, 'safety Communication' and 'supervisors Commitment' Coefficients have significance value greater than 0.05 thus they are considered as non-significant in the model. The beta expresses the relative importance of each independent variables in standardized terms firstly we find that (Management Commitment to Safety, Safety Training, Safety Priority over Production, Safeness of Work Environment, Safety Knowledge) are significant predictors, secondly we find that "Safety Knowledge" has highest impact (beta = 0.416) followed by "Management Commitment to Safety" impacts the total safety climate of the organization (beta = 0.397). The table also checks for multi co-linearity in our multiple regression model. Tolerance should be > 0.1 (or VIF < 10) for which they are

5. CONCLUSION

As mentioned earlier that 'perception of workers about safety at their workplace' was measured by using a five point Likert scale (strongly agree to strongly disagree). It has been noted that the mean score of safety climate is 2.36 out of 5, respectively. These statistics are an indication of workers positive perception about safety practices at their workplace. In this research, safety climate has been measured by capturing workers perceptual response over seven factors, where it has been found that all the factors are positively correlated with each other. These correlations also indicate that good safety climate improves overall safety performance and different factors of safety climate measurement are linked with each other. The percentage scoring calculated for the safety climate and its dimensions shows that 65% and 53.75% of organization is having strong and effective safety climate as per management and workers opinion respectively. Therefore from the statistical results it could be accepted that organization is having an overall average safety climate. It may further be said that although overall safety climate is average, the two dimensions "Safety Knowledge and Supervisor's Commitment to safety" as per Management opinion and the dimensions "Safety Training and Safety Priority over production" as per Workers opinion should be considered critically for further improving the safety climate of the organization. For maintaining a good Safety Climate management must have to place "Safety" as the top priority in any kind of circumstance. Moreover all the five dimensions do not differ from each other as their significance level is < 0.05. This further indicates the predictive validity of the model which explains 57.9% of variability of data in the model. The results obtained from regression analysis show that the model is predictive, has no tendency of error terms and follows a linear relationship between the variables of the model.

It can be concluded that workers in this organization have a positive perception about safety at their work. The instrument developed for this research, validates the above statement as safety climate score was found to be positive in the organization. Furthermore, safety climate has a direct relationship with safety performance. There are factors such 'safety-training', 'safety knowledge', 'supervisor's commitment' and 'safety priority over production' that need further improvement in this organization

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