Safety Climate Among Contractors' Organizations

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Abstract: Understanding the safety climate of the contractor's organization with regard to safety and risk in the workplace will provide an overview of the current safety culture of that organization. The perceptions and attitudes of the workforce are the important factors in assessing the safety needs in order to facilitate workplace safety improvement. Safety performance may fail if the organization does not take into account these current attitudes and perceptions. The aim of this study is to examine the factors and assessment of safety climate in the contractors' organizations. This study is carried out through questionnaire survey to gauge employee attitudes and perceptions using several attitudes dimensions. The full employee attitude survey questionnaire was divided into two sections which consists of 49 statements. The responses of this study were quite encouraging with 60% participants responded. However, only 38 valid sets of questionnaires were subjected to analysis. The findings indicated that there were many factors and indicators of safety climate that had been found from the literature review. In fact, the numbers of factors required in the safety climate measurements, or which factors were the most effective were always subjected to argument. From the review of safety climate factors, the most frequently measured dimensions were related to management, safety systems and risk, followed by work pressure, competence and rules or procedures. On the assessment of the contractors' safety climate, the total average scores for all dimensions were in levels of satisfaction with a score ranging from 6.48 to 8.04. Also, all the safety climate dimensions showed scores in the satisfactory values with a score above six (6) for the system interfaces of the contractor organizations using the safety climate matrix. Hence, the contractor's organizations surveyed had the positive safety climate toward safety in their workplace.

Keywords: *Safety climate, safety culture, safety climate factors, perception, attitude*

1.0   Introduction

Safety climate and culture are respectively considered subsets of organizational climate and culture (Coyle *et al*, 1995). It is important to clarify the dissimilarity between both of the concept because the aim of the study is to measure safety climate, not safety culture (Cooper, 2000). Culture is the way things are being done, particularly when

things get tough and culture is often invisible to those inside it. The safety culture can be separated into psychological, situational and behavioral aspects (Gadd and Collins, 2002). Measuring safety culture can be done utilizing tools such as the climate surveys, planned observations, target behaviours, positive performance indicators, safety audits and loss statistics (Beus *et al*., 2010).

There are many definitions put forward by the researchers. According to their research findings (Abdullah *et al*, 2009), some of the reachers say that, safety climate is the surface features of the safety culture detected from the workforce's attitudes and perceptions at a given point in time (Flin, *et al*., 2000). For the purpose of this study safety climate is simply as an overall picture of the employees perceptions, attitudes and beliefs regarding the safety and risk in their workplace.

The safety climate measurement factors have been a subject of argument, since Zohar suggested the safety climate model in 1980 (Zohar, 1980, 2010; Coyle *et al*., 1995; Williamson *et al*., 1997). There are several safety climate questionnaires that have been developed to determine the factors that contribute to the safety climate (Luria and Yagil, 2010). They are typically in the form of self-report questionnaires administered as large-scale surveys in different sectors, principally the energy industries, but also in transportation, manufacturing and construction (Flin *et al*., 2000; Wills *et al*, 2006; Mearns *et al*, 2010; Sinclair *et al*, 2010). The most commonly measured dimensions relate to management commitment, communication, priority of safety, safety rules and procedures, supportive environment, involvement, personal priorities and need for safety, personal appreciation of risk and work environment (Flin *et al*., 2000). Previous efforts to associate certain factors to safety climate scales were not entirely successful (Coyle *et al*., 1995). Factors need to be validated to remain reliable when put into practices (Bahari and Clarke, 2013).

Various techniques and practices from other industries have been adapted and adopted into the construction industry in the effort to reduce construction accidents and deaths (Hamid *et al*, 2008a, 2008b). But the success rate remains low due to the robust nature of the construction industry, which demands more specific safety practices. Organizational culture and human factors also play important roles in shaping the safety performance (Ismail *et al*, 2009, 2012). Therefore, the development of safety practices can be benefited from the concept of what safety climate has to offer since it measure the amount of employees' perceptions and attitudes regarding overall safety within their organization (Hamid *et al*, 2010). Presently, people always consider accident statistics and regular workplace audits as the expression for effective safety management (Hamid *et al*, 2004; Huang *et al*, 2006, 2007). But actually safety performances often ignore the peoples" side of safety (Hassan, 2007). Audits can also give an incomplete picture of the level of risk within an organization and what is supposed to be happening (Probst and Estrada, 2010). However, the scientific measurement of occupational safety and health attitudes and expectation at various levels of organizations remain very low. The main

reason that the safety climate need to be assessed can be due to complications in trying to detect and alter the culture of an organization. The culture of an organization is form by the beliefs and values that are shared by a group, which is developed over a period of time. As safety climate represents an employee's attitude to the original safety culture of an organization, hence the outcomes can be use to cultivate the "want-to" safety culture.

This study has been conducted with the aim of determining the factors and assessment of safety climate in the contractors' organizations. To achieve the aim of this study, several objectives have been identified as follows:

1. To identify the safety climate factors and indicators
2. To measure safety attitudes and perceptions among contractors organizations
3. To determine the strength and weakness of system interfaces between contractor organizations.

Firstly, the scope of the literature review on safety climate in the contractors' organizations has taken into consideration the literature surrounding safety climate and safety culture. The effort has also been done on seeking and browsing through the internet to seek extra information by exploring the following key topics, safety climate, safety culture, safety climate factors, perceptions and attitudes.

Specifically, this study only involves contractors' employees having working experience in the construction environment such as project managers, engineers and supervisory staff, safety personal (safety manager and safety officer) and also employees in that firm which are directly involved in the construction project around the district of Johor Bahru. This study was conducted using one of the proposed methods which is the attitude survey through questionnaire form.

2.0   Methodology of Study

The objectives of this study were achieved by using two methods. The first method was the literature review of safety climate in contractors' organization. The review had considered the literature surrounding safety climate and safety culture and all the classification aspect and terms used were derived from the journals, websites, articles as well as research report. Effort was also being done on seeking and browsing through the internet to seek additional information by exploring the key topics. The second method utilized questionnaires survey to asses employees' attitudes and perceptions using several general attitudes dimensions which was adapted from Loughborough University Safety Climate Assessment Toolkit (LSCAT). The concepts related to the employees' perceptions, beliefs and attitudes of people they could have been measured by either a qualitative or quantitative approach. For the purpose of this study, a quantitative method

was considered more appropriate which was an attitude survey by questionnaires form. The phase flow of the study methodology as shown in the Figure 1.
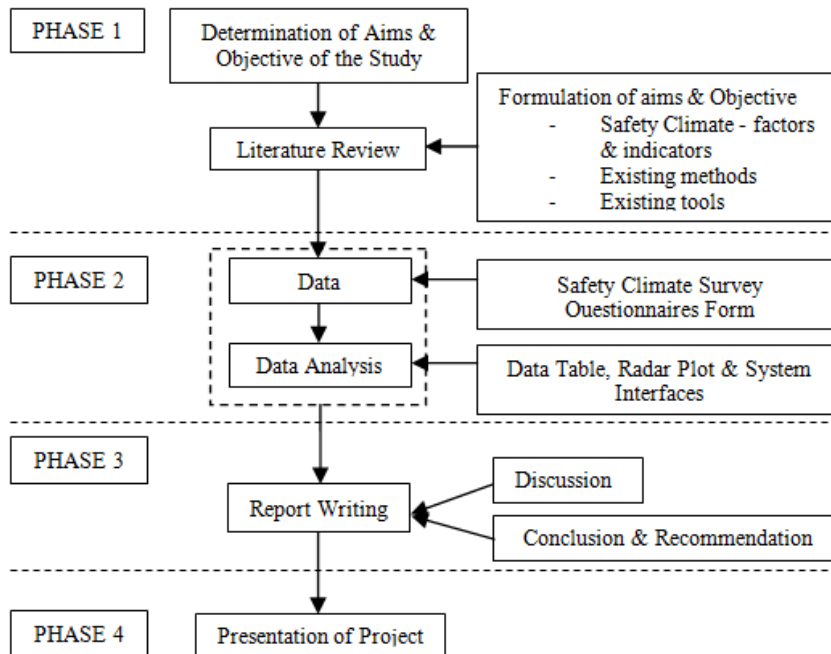

Figure 1: Research Methodology

The full employee attitude survey questionnaire that was modified were divided into two sections consists of 49 statements;
-   Section A - Consisted of six (6) questions for basic personal information.
-   Section B - Consisted of (43) attitudes statement which all require answers on a five point Likert-type scale (ranking from 1 = "strongly disagree" to 5 = "Strongly agree").
-   as well as a final question allowed respondents to give any other comments they might have about health and safety in their workplace.

Section B covered four broad areas as follows:

1.   Organizational context

        i. Management Commitment – 7 questions
        ii. Communication - 5 questions
        iii. Priority of Safety - 4 questions
        iv. Safety Rules and procedures - 3 questions

2.   Social Environment.

      i. Supportive Environment - 6 questions
      ii. Involvement - 3 questions

3.   Individual Appreciation.

      i. Personal Priorities and Need for Safety - 5 questions
      ii. Personal Appreciation of Risk - 4 questions

4.   Work environment.

      i. Physical Work Environment -6 questions

The scores were then summed together to provide values for each dimension as well as the total score. Eighteen (18) of the items were negatively worded and required reverse scoring prior for summation. This analysis generated a score of between 2 and 10 for each safety dimension.

The following steps explained the calculation of the scoring system as suggested by LSCAT:

a)   Each item (questions) was given a value of 5 = 'strongly agree', 4 = 'agree', 3 = 'neither agree nor disagree', 2 = 'disagree', and 1 = 'strongly disagree' response.

b)   The scoring for negative items in the questionnaire was reversed by subtracting the item score from 6 for example, a score of 2 on a negatively worded item was reversed to a score of 4.

c)   Scores should be averaged for each item, across the whole group (or groups).

    Score item = $\Sigma\, a_i\, X_i\, /\, \Sigma\, X_i$ (Al-Hammad and Assaf, 1996).
       Where a_i = Constant expressing the weight given to i
            X_i = variables expression the frequency of the response for
             i = 1,2,3,4, and 5

d)   The scores needed to be standardized before plotting and comparing the dimensions. If the actual score was divided by the total possible score and then multiplied by 10, the score could be converted into a 1 to 10 scale . The dimension scores calculated from the questionnaire items were shown in Table 1. The item numbers given referred to those used in the formatted questionnaire. The standardized scores obtained, from the full questionnaire could then be plotted on the graphs such as radar plot..

$$\text{Scores for Each Dimension} \quad = \quad \frac{\Sigma \text{ (Scores items)}}{\text{(Dimension Score)}} \text{ X 10}$$

Table 1: Calculating Dimension Scores

Dimension	Add	Divide by	Multiply by
Management Commitment	Item 1 + (6 - Item 5) +(6 - Item 2) + Item 3 + Item 4 + Item 6 + Item 7	35	10
Communication	Item 8 + Item 12 + (6 - Item 10) + (6 - Item 9) + Item 11	25	10
Priority of Safety	Item 15 + Item 14 + (6 - item 13) + Item 16	20	10
Safety Rules and Procedures	(6 - Item 19) + (6 - Item 18) + (6 - Item 17)	15	10
Supportive Environment	Item 21 + Item 22 + (6 - Item 20) + Item 25 + (6 - Item 23) + Item 24	30	10
Involvement	Item 26 + Item 28 + (6 - Item 27)	15	10
Personal Priorities and Need for Safety	Item 29 + Item 31 + Item 32 + (6 - Item 30) + Item 33	25	10
Personal Appreciation of Risk	(6 - Item 36) + Item 34 + (6 - Item 35) + Item 37	20	10
Work Environment	(6 - Item 41) + Item 43 + (6 - Item39) + (6 - Item 40) + Item 42 + (6 - Item38)	30	10

3.0   Results and Discussion

A total 80 sets of questionnaires were distributed to the targeted respondents around the Johor Bahru district. The responses of this study were quite encouraging with 60% of total rate responses. A total of 10 incomplete questionnaires with a response rate of 12.5 % had to be discarded due to an unacceptable amount of missing entries. As a result, 38 valid questionnaires were completed, which represented a response rate of 47.5 % were

final usable questionnaires subject to analysis. Results presented below were brief findings based on the objectives of the study.

3.1   Section A: Basic personal Information

These surveys have identified several numbers of basic personal information to further clarify the results. Figure 2 and 3 showed the personal information's of the target respondents. The respondents who participated in this study were Project Manager (8%), Engineer (40%), Supervisor (34%), safety personnel which were either safety manager or safety officer (5%), and others which consisted of resident engineers, clerk of works as well as contract managers (13%) that had working experience at site and construction environment. However, 58% of the respondents had health or safety related experience while 42% of the respondent did not have the experience.
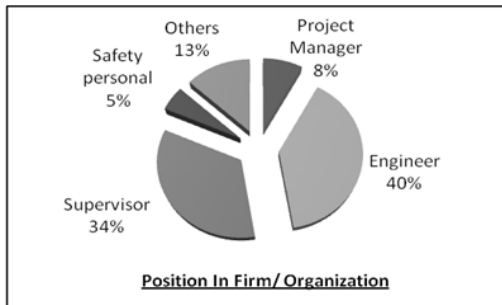

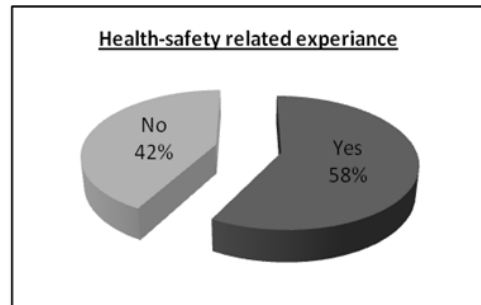Figure 2: Position in firm/ Organization

Figure 3: Health- safety related experience

Figure 4 and 5 indicated that half of the respondents were juniors, working for less than five years old in the company and the majority of them were either diploma or degree holders as shown in Figure 6. Out of these respondents, 50% had working experience below 5 years, while 18.42% of the respondents had experience working from 5 to 10 years. They were the 10.53% of the respondents who had 10 to 15 working experience followed by 21.05% of the respondents who had work experience for more than 15 years. Figure 5 showed that 52.6% of the companies had been established for less than 5 years, followed by 21.1% for 5 to 10 years establishment, while 7.9% of the companies had 10 to15 years of establishment as well as 18.4% of the companies had been established for more than 15 years. Most of the respondents (57%) either possessed a Bachelor Degree, diploma (39%), Certificate (2.6%), no respondents had master and PhD degree.
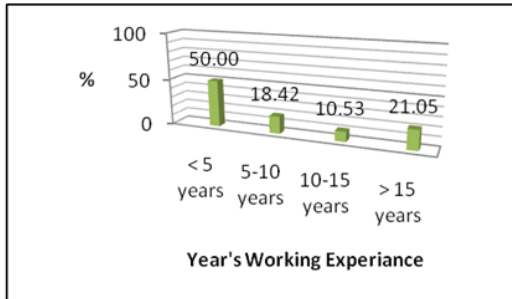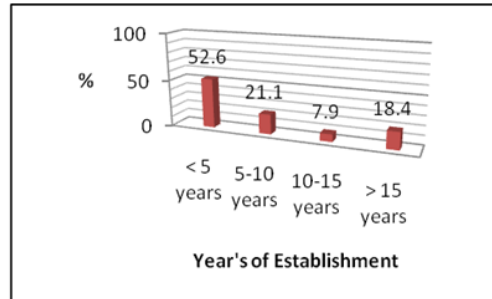
Figure 4: Years of working experiences
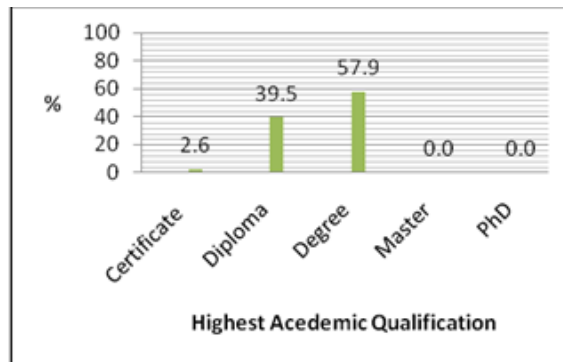

Figure 5: Years of the establishment

Figure 6: highest academic qualifications of the respondent

3.2   *Section B: Attitude Survey of Respondent*

These surveys had identified a number of general attitude dimensions with regard to views on feelings about safety at work, using the questionnaire tool. These measures gave some indication of how people felt overall; to what degree certain views and beliefs were shared among the workforce. Table 2 showed the result of respondent's rating of nine (9) Safety Climate Dimensions and the scores of each item.

From the finding, the overall scores for the management commitment factor was in the satisfactory level which is 7.39. Generally it was measured by respondents' satisfaction with supervision or their perceptions of the manager's or supervisors' attitudes and behaviors with respect to safety. Therefore, respondents were satisfied with the perceptions of management's over commitment to health and safety issues in their workplace that they had been working on. The respondents felt that the managers and supervisors in their workplace performed their job excellently. The overall scores for the communication factor was 7.53 which was at a satisfactory level. The respondents felt

that the environment and efficiency of health and safety communications within their organization in their workplace were satisfactory. The respondents perceived that the interaction between both parties' workers and management were good.

In addition, the respondents felt the relative status of health and safety issues within the organization in their workplace were satisfactory. The respondents perceived that the management in their workplace took seriously the safety issues and considered the employees' safety equivalent to profit and production of the company and also the safety procedures of their organization were meticulously followed. The respondents felt that from time to time they needed to follow the rules to get the job done safely. Sometimes the safety rules and procedures and perceptions of worker relationships remained more unclear and were likely to be influenced by supervisors' behavior and inconsistency of work pressure.

The respondents felt that they had been given such opportunity of good social environment to contribute to the prevention of the risk and health problems in their workplace and perceived that they were responsible to produce solutions for the safety issues rather than relying on the safety specialists. Other than that, the safety specialists should play an advisory or consultancy role in their workplace. The respondents felt that they should be involved with safety issues at work and also involved in informing management of important safety issues. If the workforce felt that they were responsible for their own safety and the others, they were likely to feel a sense of involvement within the company. Thus the active workers' participation was a positive step towards preventing and controlling hazards in their workplace.

The use of personal protective equipment was not treated seriously and considered to be an unnecessary burden especially in the hazardous working conditions. Workers were aware that safety precautions were being ignored, however such faults sometimes have been accepted by employees and many managers because they had become the practices in their workplace. Besides that the respondents felt that they were able to take more risks due to the advances in the personal protective equipment made them feel safer. Some studies had indicated that within the workforce of the same organization, there would be different levels of risk perception. The expression perception of risk along with safety attitudes, assessment of the safety climate appeared to influence employees' judgments of risk.

The perceptions of the respondents about the nature of the physical environment in their workplace were at the satisfactory level. The respondents felt that they should be given a good work environment if they wanted to get the job done safely.

Table 2: Summary of the Result of Safety Climate Dimensions Analysis

Management Commitment		**Rate (%)**					**Score Item**
		SA (5)	**A (4)**	**N (3)**	**D (2)**	**SD (1)**	
1. Management acts decisively when a safety concern is raised	*NR*	4	30	1	-	3	3.84
	PR	10.53	78.95	2.63	-	7.89	
2. Management acts only after accidents have occurred	*NR*	8	7	18	2	3	3.03
	PR	21.05	18.42	47.37	5.26	7.89	
3. Corrective actions are always taken when management is told about unsafe practices	*NR*	5	20	3	8	2	3.47
	PR	13.16	52.63	7.89	21.05	5.26	
4. Workplace management acts quickly to correct safety problems	*NR*	4	28	4	2	-	3.89
	PR	10.53	73.68	10.53	5.26	-	
5. Workplace management turns a blind eye to safety issues	*NR*	1	3	3	22	9	3.92
	PR	2.63	7.89	7.89	57.89	23.68	
6. Workplace managers or supervisors show interest in our safety	*NR*	3	32	3	-	-	4.00
	PR	7.89	84.21	7.89	-	-	
7. Managers and supervisors express concern if safety procedures are not adhered to	*NR*	4	27	1	4	2	3.71
	PR	10.53	71.05	2.63	10.53	5.26	
Communication		**Rate (%)**					**Score Item**
		SA (5)	**A (4)**	**N (3)**	**D (2)**	**SD (1)**	
8. Management operates an open door policy on safety issues	*NR*	3	29	2	4	-	3.82
	PR	7.89	76.32	5.26	10.53	-	
9. Line manager/supervisor does not always inform of current concerns and issues	*NR*	-	4	9	18	7	3.74
	PR	-	10.53	23.68	47.37	18.42	
10. Praise for working safely never given	*NR*	1	11	8	15	3	3.21
	PR	2.63	28.95	21.05	39.47	7.89	
11. Safety information is always brought to the attention by line manager/supervisor	*NR*	1	35	2	-	-	3.97
	PR	2.63	92.11	5.26	-	-	
12. There is good communication about safety issues	*NR*	7	27	4	-	-	3.92
	PR	18.42	71.05	10.53	-	-	
Priority of Safety		**Rate (%)**					**Score Item**
		SA (5)	**A (4)**	**N (3)**	**D (2)**	**SD (1)**	
13. Safety issues are not assigned a high priority	*NR*	-	6	6	14	12	3.84
	PR	-	15.79	15.79	36.84	31.58	
14. Management clearly considers the safety of employees of great importance	*NR*	10	27	1	-	-	4.24
	PR	26.32	71.05	2.63	-	-	
15. Safety rules and procedures are carefully followed	*NR*	4	32	2	-	-	4.03
	PR	10.53	84.21	5.26	-	-	
16. Management considers safety to be equally as important as production	*NR*	5	27	6	-	-	3.97
	PR	13.16	71.05	15.79	-	-	

Table 2 (cont'): Summary of the Result of Safety Climate Dimensions Analysis

Safety Rules and Procedures		Rate (%)					Score Item
		SA (5)	A (4)	N (3)	D (2)	SD (1)	
17. Sometimes it is necessary to depart from safety requirements for production's sake	NR	-	9	11	14	4	3.34
	PR	-	23.68	28.95	36.84	10.53	
18. Some health and safety rules and procedures are not really practical	NR	2	7	6	21	2	3.37
	PR	5.26	18.42	15.79	55.26	5.26	
19. Some safety rules and procedures do not need to be followed to get the job done safely	NR	-	7	4	24	3	3.61
	PR	-	18.42	10.53	63.16	7.89	
Supportive Environment		Rate (%)					Score Item
		SA (5)	A (4)	N (3)	D (2)	SD (1)	
20. Employees are not encouraged to raise safety concerns	NR	-	4	12	14	8	3.68
	PR	-	10.53	31.58	36.84	21.05	
21. Co-workers often give tips to each other on how to work safely	NR	2	27	6	2	1	3.84
	PR	5.26	71.05	15.79	5.26	2.63	
22. Report of unsafe conditions are encouraged	NR	4	28	5	1	-	3.92
	PR	10.53	73.68	13.16	2.63	-	
23. When people ignore safety procedures here, I feel it is none of my business	NR	1	3	2	13	19	4.21
	PR	2.63	7.89	5.26	34.21	50.00	
24. A no-blame approach is used to persuade people acting unsafely that their behavior is inappropriate	NR	-	12	12	9	5	2.82
	PR	-	31.58	31.58	23.68	13.16	
25. I can influence health and safety performance here	NR	4	23	4	7	-	3.63
	PR	10.53	60.53	10.53	18.42	-	
Involvement		Rate (%)					Score Item
		SA (5)	A (4)	N (3)	D (2)	SD (1)	
26. I am involved in informing management of important safety issues	NR	-	32	2	3	1	3.71
	PR	-	84.21	5.26	7.89	2.63	
27. I am never involved in the ongoing review of safety	NR	3	3	11	11	6	3.53
	PR	7.89	7.89	28.95	28.95	15.79	
28. I am involved with safety issues at work	NR	3	29	3	3	-	3.84
	PR	7.89	76.32	7.89	7.89	-	
Personal Priorities and Need for Safety		Rate (%)					Score Item
		SA (5)	A (4)	N (3)	D (2)	SD (1)	
29. Safety is the number one priority in my mind when completing a job	NR	8	28	1	1	-	4.13
	PR	21.05	73.68	2.63	2.63	-	
30. Personally I feel that safety issues are not the most important aspect of my job	NR	-	7	3	16	12	3.87
	PR	-	18.42	7.89	42.11	31.58	
31. I understand the safety rules for my job	NR	4	33	1	-	-	4.08
	PR	10.53	86.84	2.63	-	-	
32. It is important to me that there is a continuing emphasis on safety	NR	5	31	2	-	-	4.08
	PR	13.16	81.58	5.26	-	-	

Table 2 (cont'): Summary of the Result of Safety Climate Dimensions Analysis

33. A safe place to work has a lot of personal meaning to me	*NR*	4	29	1	1	3	3.79
	PR	10.53	76.32	2.63	2.63	7.89	
Personal Appreciation of Risk		Rate (%)					Score Item
		SA (5)	A (4)	N (3)	D (2)	SD (1)	
34. I am rarely worried about being injured on the job	*NR*	6	25	1	2	4	3.71
	PR	15.79	65.79	2.63	5.26	10.53	
35. In my workplace the chances of being involved in an accident are quite large	*NR*	1	15	9	13	-	2.89
	PR	2.63	39.47	23.68	34.21	-	
36. I am sure it is only a matter of time before I am involved in an accident	*NR*	-	19	7	9	3	2.89
	PR	-	50.00	18.42	23.68	7.89	
37. I am clear about what my responsibilities are for health and safety	*NR*	4	32	1	1	-	4.03
	PR	10.53	84.21	2.63	2.63	-	
Work Environment		Rate (%)					Score Item
		SA (5)	A (4)	N (3)	D (2)	SD (1)	
38. I cannot always get the equipment I need to do the job safely	*NR*	-	12	1	22	3	3.42
	PR	-	31.58	2.63	57.89	7.89	
39. Operational targets often conflict with safety measures	*NR*	1	22	5	10	-	3.63
	PR	2.63	57.89	13.16	26.32	-	
40. Sometimes conditions here hinder my ability to work safely	*NR*	-	20	-	17	1	2.97
	PR	-	52.63	-	44.74	2.63	
41. Sometimes I am not given enough time to get the job done safely	*NR*	1	12	6	19	-	3.13
	PR	2.63	31.58	15.79	50.00	-	
42. There are always enough people available to get the job done safely	*NR*	1	28	8	1	-	3.76
	PR	2.63	73.68	21.05	2.63	-	
43. This is a safer place to work than other companies I have worked for	*NR*	3	20	9	6	-	3.53
	PR	7.89	52.63	23.68	15.79	-	

Notes: Strongly Agree (SA), Agree (A), Neither Agree nor disagree (N), Disagree (D), strongly Disagree (SD), Number of Respondent (NR), Percentage of Respondent (PR)

3.3 Overall Data Profiling

Table 3, table 4, figure 7 and figure 8 showed the plotted scores derived from the safety climate measures to provide a graphical representation of each dimension and an overall picture of the current state of the organization and also comparison between position of workers in an organization. All the safety climate dimension scores gave the values above six (6). All the values had been categories as satisfactory values. The radar plot provided by this graph could be used as a comparison for future safety climate assessments for the same organization for improvement. Gap for improvements were shown on this graph as highest scores on each measure, thus the better the profile, the closer scores were to the outside of the graph.

Example for 'Calculation of Dimension Score for Management Commitment':

$$= \frac{[\text{Item 1} + (6 - \text{Item 5}) + (6 - \text{Item 2}) + \text{Item 3} + \text{Item 4} + \text{Item 6} + \text{Item 7}]}{35} \times 10$$

$$= \frac{[3.84 + (6 - 3.92) + (6 - 3.03) + 3.47 + 3.89 + 4.00 + 3.71]}{35} \times 10$$

$$= 7.39$$

Table 3: Total Average Score for each Dimensions

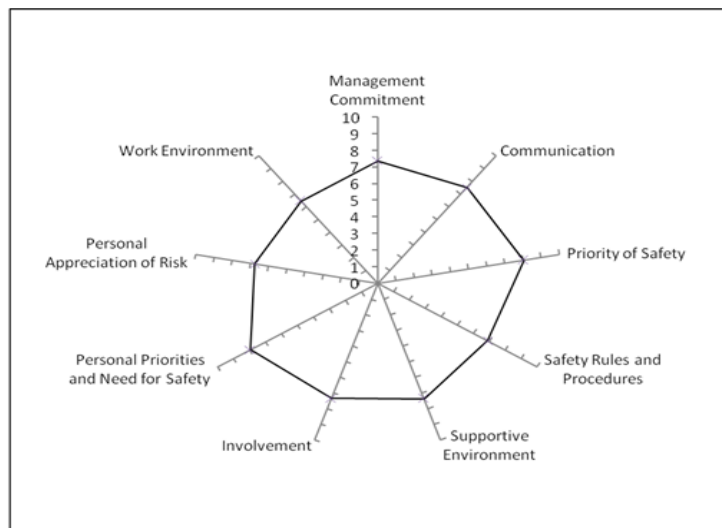| Safety Climate Dimension	Total Average Scores
1. Management Commitment	7.39
2. Communication	7.53
3. Priority of Safety	8.04
4. Safety Rules and Procedures	6.88
5. Supportive Environment	7.37
6. Involvement	7.35
7. Personal Priorities and Need for Safety	7.98
8. Personal Appreciation of Risk	6.76
9. Work Environment	6.48

Figure 7: Result radar plot for total average scores

Table 4: Total average scores between Engineers and Supervisors

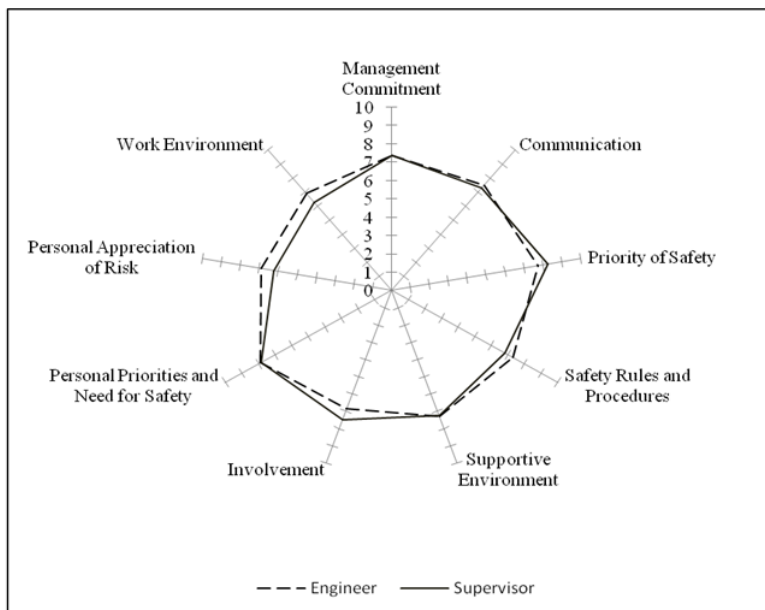| Safety Climate Dimension	Average Score	
	Engineer	**Supervisor**
1. Management Commitment	7.37	7.36
2. Communication	7.49	7.29
3. Priority of Safety	7.73	8.27
4. Safety Rules and Procedures	7.29	6.82
5. Supportive Environment	7.31	7.28
6. Involvement	6.89	7.49
7. Personal Priorities and Need for Safety	7.89	7.85
8. Personal Appreciation of Risk	6.90	6.23
9. Work Environment	6.91	6.28

Figure 8: Cooperative radar plots between Engineer and Supervisor

3.4   *System Interfaces*

A safety climate assessment matrix as shown in Table 5 was performed using the results to illustrate strengths and weaknesses in each of the areas and how these were related to the organization, the work groups and the individuals. All the safety climate dimensions scores gave the values above six (6). All the values had been categorized as satisfactory. So those contactors' organizations had the positive attitudes toward safety in their workplace. However, if the data were subjected to analysis by the short-form questionnaires, only 2 critical questions had to be asked for each of the dimension. All the scores gave the values above six (6) which were of satisfactory value except Work Environment (5.76) and Appreciation of Risk (5.79) above six (6) were being considered poor safety climate. Data showed that the weaknesses of the contractors' organizations occurs in the two dimensions which were Work Environment reflected to the area of organization and Appreciation of Risk reflected to the individuals' view of the risk associated with work in their workplace.

Therefore, the contractors' organizations needed to consider the expression perception of risk along with safety attitudes, assessment of the safety climate because that appeared to influence employees' judgments of risk. The improvements in the working environment also could influenced the change in the workers perception of risk. If the risks perception of workers decreased, the probability of having an accident could also decreased.

Table 5: Strength and weakness of system interfaces among contractor organizations

SAFETY CLIMATE MATRIX

Method	SYSTEM INTERFACES		
	Organizations/ Environment	Work group/ Organization System	Individual/ Group/ Organization System
Attitudes Questionnaires	Management Commitment (+)	Supportive Environment (+)	Appreciation of Risk (+)
	Work Environment (+)	Involvement (+)	Personal Priorities (+)

4.0   Conclusions

The conclusions that could be drawn from this study were as follows based on the objectives of the study:

1. This study was conducted to determine the factors and indicators of safety climate within contractors' organizations. There were many factors and indicators of safety climate as suggested from the literature review. However, the number of factors and their effectiveness were still subjected to argument. The disagreements were mostly due to differences in populations, industries or cultures which had affected the judgment of each study. From the review of safety climate factors, the most frequently measured dimensions were related to management, safety systems, risk, followed by work pressure and competence and rules or procedures.

2. The second objective of this study was to assess employees' perceptions, beliefs and attitudes in the contractors' organizations regarding issues on safety and risk in the workplace. From the finding, all of the total average scores for each of the dimensions were at the satisfactory level of with scores ranging from 6.48 to 8.04. It could be concluded that the contractors' organizations had a good safety climate regarding issues of safety and risk in their workplace, perhaps due to the contractors' organizations having good safety management practices. Normally, the expectation from the finding was that should the safety climate within the workforce was better, hence a good safety management practices should be expected from an organization.

3. The third objective was to determine the strength and weakness of system interfaces among contractors' organizations using safety climate matrix. From the finding, all the safety climate dimension scores gave the values above six (6) for the system interfaces of the contractors' organizations. All the values had been categorized as satisfactory. These contractors' organizations had the positive safety climate toward safety in their workplace

References

Abdul-mohsen Al-Hammad and Sadi Assaf (1996). Assessment of Work Performance of Maintenance Contractors in Saudi Arabia. *Journal of Management in Engineering*, 12, 44(1996); doi:10.1061/(ASCE)0742-597X(1996)12:2(44) .

Abdul Rahim Abdul Hamid, Bachan Singh, Wan Zulkifli Wan Yusof and Andrain King Tzee Yang (2004). Integration of Safety, Health, Environment and Quality (SHEQ) Management System in Construction: A Review. *Jurnal Kejuruteraan Awam (now MJCE),* 16(1): 24-37.

Abdul Rahim Abdul Hamid, Muhd Zaimi Abd Majid, Bachan Singh. (2008a) *An Overview of Construction Accident in Malaysia* (book chapter: Issues in Construction Industry). ISBN 978-983-52-0568-2. Pp: 110.

Abdul Rahim Abdul Hamid, Muhd Zaimi Abd Majid and Bachan Singh. (2008b) Causes of Accident at Construction Sites, *Malaysian Journal of Civil Engineering (MJCE)*, Vol 20, No 2, pp 242-259.

Abdul Rahim Abdul Hamid, Khairulzan Yahya and Lim Wei Han. (2010) Management Competencies for Preventing and Reducing Stress at Construction Site. *Built Environment Journal (UiTM),* Vol. 7, No. 2, 32-37, 2010, ISSN 1675-5022.

Andrew R. Wills, Barry Watson and Herbert C. Biggs (2006). Comparing safety climate factors as predictors of work-related driving behavior. *Journal of Safety Research*, 37 (2006) 375–383.

Che Hassan, C.R., Basha, O.J. and Wan Hanafi, W.H. (2007) Perception of building construction workers towards safety, health and environment. *Journal of Engineering Science and Technology*, Vol. 2, No. 3 (2007) 271 – 279.

Cooper, M. D. (2000) Towards a model of safety culture. *Safety Science*, 36, 111-136.

Cox, S.J. and Cheyne, A.J.T. (2000). *Assessing safety culture in offshore environments. Safety Science.* vol.34, no. 1-3, p111-129.

Faridah Ismail, Ahmad Ezanee Hashim, Razidah Ismail and Muhd. Zaimi Abdul Majid (2009). The Operationalisation of Safety Culture for the Malaysian Construction Organisations. *International Journal of Business and Management*, Vol 4 No. 9 (Sept 2009) Pp. 226 – 237.

Faridah Ismail, Norizan Ahmad, Nurul Afida Isnaini Janipha and Razidah Ismail (2012). Assessing the Behavioural Factors' of Safety Culture for the Malaysian Construction Companies. *Procedia - Social and Behavioral Sciences,* 36 (2012) 573 – 582.

Flin, R., Mearns, K., O'Connor, P., and Bryden, R., (2000). Measuring safety climate: Identifying the common features*. Safety Science*, 34, 177-192.

Fiona Davies, Rachel Spencer and Karen Dooley., (2001) Summary guide to safety climate tools, Offshore Technology Report 1999/063, HSE books, ISBN 0 7176 1958 3

Gadd, S. and Collins, A.M. (2002) Safety Culture: a review of the literature Health & Safety Laboratory HSL/2002/25.

Gil Luria and Dana Yagil (2010). Safety perception referents of permanent and temporary employees: Safety climate boundaries in the industrial workplace. *Accident Analysis and Prevention*, 42 (2010) 1423–1430.

Guldenmund, F., (2000). The nature of safety culture: a review of theory and research. *Safety Science*, 34 (1-3), 215-257.

Griffin, M. A., and Neal, A. (2000) Perceptions of safety at work: A framework for linking safety climate to safety performance, knowledge, and motivation. *Journal of Occupational Health Psychology*, 5,347-358.

Health & Safety Executive (HSE). (2005) A review of safety culture and safety climate literature for the development of the safety culture inspection toolkit, Research report 367, HSE Books, ISBN 0 7176 6144 X

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

Jeremy M. Beus, Mindy E. Bergman and Stephanie C. Payne (2010). The influence of organizational tenure on safety climate strength: A first look. *Accident Analysis and Prevention* 42 (2010) 1431–1437.

Kathryn Mearns, Lorraine Hope, Michael T. Ford and Lois E. Tetrick (2010). Investment in workforce health: Exploring the implications for workforce safety climate and commitment. *Accident Analysis and Prevention* 42 (2010) 1445–1454.

Nor Azimah Chew Abdullah, Jeffery T. Spickett, Krassi B. Rumchev, and Satvinder S. Dhaliwal (2009). Validity and Reliability of The Safety Climate Measurement in Malaysia. *International Review of Business Research Papers,* Vol. 5 No. 3 April 2009 Pp. 111-141.

Oi-ling Siu. (2004). Safety climate and safety performance among construction workers in Hong Kong: The role of psychological strains as mediators. *Accident Analysis & Prevention*, Volume 36, Issue 3, May 2004, Pages 359-366.

Robert R. Sinclair, James E. Martin, Lindsay E. Sears (2010). Labor unions and safety climate: Perceived union safety values and retail employee safety outcomes. *Accident Analysis and Prevention* 42 (2010) 1477–1487.

Siti Fatimah Bahari and Sharon Clarke (2013). Cross-validation of an employee safety climate model in Malaysia. *Journal of Safety Research*, 45 (2013) 1– 6.

Tahira M. Probst and Armando X. Estrada (2010). Accident under-reporting among employees: Testing the moderating influence of psychological safety climate and supervisor enforcement of safety practices. *Accident Analysis and Prevention*, 42 (2010) 1438–1444.

Williamson, A., Feyer, A., Cairns, D. and Biancotti, D., (1997). The development of a measure of safety climate: the role of safety perceptions and attitudes. *Safety Science*, 25, 15-27.

Yueng-Hsiang Huanga, Michael Hob, Gordon S. Smith and Peter Y. Chen (2006). Safety climate and self-reported injury: Assessing the mediating role of employee safety control. *Accident Analysis and Prevention* 38 (2006) 425–433.

Yueng-Hsiang Huang, Jiu-Chiuan Chen, Sarah DeArmond, Konstantin Cigularov and Peter Y. Chen (2007). Roles of safety climate and shift work on perceived injury risk: A multi-level analysis. *Accident Analysis and Prevention* 39 (2007) 1088–1096.

Zohar, D. (1980). Safety climate in industrial organizations: Theoretical and applied implications. *Journal of Applied Psychology*, 65, 96-102.

Zohar, D. (2010). Thirty years of safety climate research: Reflections and future directions. *Accident Analysis and Prevention* 42 (2010) 1517–1522.