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A SYSTEMATIC STUDY OF BEHAVIOURAL SAFETY IN INDIAN CONSTRUCTION INDUSTRY

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ABSTRACT

The construction industry is known as one of the most hazardous activities. Therefore, safety on the site as well as job activities is an important aspect with respect to the overall safety in construction. This study is about a systematic enquiry of behavioural job safety in the construction site. Behavioural safety is a methodology used to improve safety culture through the change of behaviour of working personnel in an organization. The questionnaire was prepared with various factors of behavioural safety and analysing the collected data from the companies by using the statistical package for social and sciences (SPSS). The factors were analysed through collected data, the unsafe acts will be identified and recommending safety measures in terms of safety awareness among the worker. The study reveal that the top management, engineers, site supervisor project manager and contractors must involve the behavioural safety of the workers through safety meetings, monitoring and keeping accident records are the effective terms of minimising accidents.

Keywords*: *safety compliance, safety awareness, safety commitment, SPSS.

I.INTRODUCTION

Construction Industry in India is highly prone to hazards related to site activities and construction projects engage large number of contractual workers. Safety is important aspect in construction industry. Even though proper measures are implemented in many industries, the fatal injury keeps on increasing according to the data from Bureau of Labor Statistics. Most of the construction accidents due to lack of proper training, deficient enforcement of safety, unsafe equipment, unsafe methods or sequencing, unsafe site conditions, not using the safety equipment that was provided, and a poor attitude towards safety. Hence, it is imperative for any development venture to have certain wellbeing rules and methodology to be taken after for site exercises and to make mindfulness among workers, site engineers and supervisors. Recently, as an approach to safety at work, behaviour-based safety programs began to be [adapted in construction industry.

1.1 OBJECTIVE

The objective of the study are as follows,

- Identifying safety-related behaviours that are critical to excellent performance.

- To examine the current culture in the workplace regards to the management of safety and creates a safe working environment for the construction company.
- To suggest remedial measures for removing system barrier to continuous improvement.

1.2 SCOPE

Using simple but effective observation techniques, employees periodically observe each other and then give appropriate one-on-one coaching feedback regarding safety-related behaviours. Observational data is collected and analysed to identify areas needing special attention. It is then discussed in work teams to develop relevant intervention strategies.

II.METHODOLOGY

The literature is reviewed to learn the various thesis that are similar to the chosen and then collection of data from various companies in and around Chennai on unsafe behaviour of safety. Based on the analysed results obtained the necessary changes have to be implemented in the company in order to maximize the outcome of the company. Various companies' feedback is also collected for the study. After the study the obtained results are used to implement changes in the companies by analysing in SPSS. The implementation is done by making the necessary changes in the workers and observing them if there are any improvements. Once the implementation is done the result is viewed by the workers behaviour. The result obtained is positive if their behaviour is improved and the recommendations are given for the study.

III.QUESTIONNAIRE DESIGN

A questionnaire was designed to study more about the safety practices in the construction industry and ways to improve behavioural safety in construction works. The questionnaires are divided into 2 parts; Part 1 which consists of general information and Part 2 preparation of questionnaire in the type of 1-5 Likert scale [9]. The elements highlighted in the questionnaire cover safety commitment, safety compliance, safety communication, safety behaviour, stress recognition, team work, fire safety, worker's health and safety, confined space, person working at height etc., Thus the scales that be used in this study were as below:

1 = strongly agree 2 = agree 3 = neutral 4 = disagree 5 = strongly disagree.

IV.ANALYSIS OF DATA

The data is analyzed statistically by SPSS(Statistical Package for Social Sciences) tool where reliability test and frequency test is performed to check whether the questionnaires are reliable, plot the collected sample frequency and determine the major safety factor [8]. Further mean and standard deviation was performed to rank the variables which is the main objective of this study.

A. Reliability Analysis

Cronbach's alpha is the most common measure of internal consistency ("reliability"). Reliability is the overall consistency of a measure. Ideally, the Cronbach's alpha coefficient of a scale should be above 0.7. Reliability

test was performed to determine whether the questionnaires are reliable or not. If the reliability value is below the limit then the questions are said to be unreliable or invalid for this study.

$$R= k/k\text{-}1\ (1- \sigma_1\ ^2/\sigma y^2)$$

Where k= total number of the items in the list, σ_1 = variance of individual items, σy^2= variance of total test scores. In my study Cronbach's value is greater than 0.9.the result is excellent. The result value of this test is above the limit, then the collected data can be used for other test purpose.The value obtained from this test is **0.946**, which indicates a high level of internal consistency i.e. If Cronbach's alpha value is greater than 0.9, then the questionnaires are said to be more reliable (excellent) as shown in the table.

TABLE 1

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.946	.951	60

B. Frequency Analysis

Frequency Analysis is a part of descriptive statistics, frequency (or absolute frequency) of an eventis the number of times the event occurred in an experiment or study. After data has been entered, it can be analyzed using descriptive statistics. Descriptive statistics are commonly used for summarizing data frequency or measures of central tendency (mean, median and mode). When using frequency analysis, SPSS Statistics can also calculate the mean, median and mode to help users analyze the results and draw conclusions.

Frequency test for designation

TABLE 2

	Frequency	Percent	Valid Percent	Cumulative Percent
Engineer	46	82.1	82.1	82.1
Manager	10	17.9	17.9	100.0
Total	56	100.0	100.0	

Frequency test is performed for designation, since questionnaire survey was conducted in various companies of engineers and managers. This test graphically represents the frequency of respondents collected from engineers and managers. From this result, more number of samples were received from the engineers which has a frequency of **46**and remaining from managers. The figure indicates that out of 56 samples 46 samples were from engineers.

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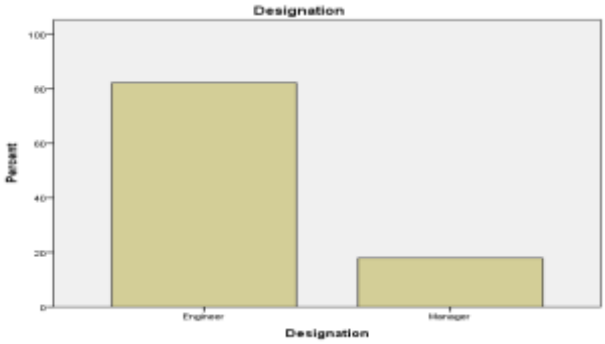

Figure.1

Frequency test for gender

TABLE 3

	Frequency	Percent	Valid Percent	Cumulative percent
Male	49	49	87.5	87.5
Female	7	7	12.5	12.5
Total	56	56	100.0	100.0

Frequency test is performed for gender group, soon after the frequency test carried out for designation group since questionnaire survey was conducted in various companies of different gender groups.This test graphically represents the frequency of respondents collected from different gender group.From the above result we come to the conclusion that more number of samples were collected from male group compared to female group. The figure indicates that out of 56 samples 49 samples were from the male group.

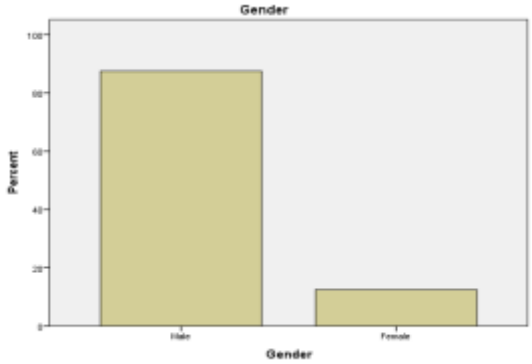

Figure.2

Frequency test for age group

TABLE 4

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 30	54	96.4	96.4	96.4
31- 40	2	3.6	3.6	100.0
total	56	100.0	100.0	

Frequency test is performed for age group, soon after the frequency test carried out for gender group since questionnaire survey was conducted in various companies of different gender groups. This test graphically represents the frequency of respondents collected from different age group.

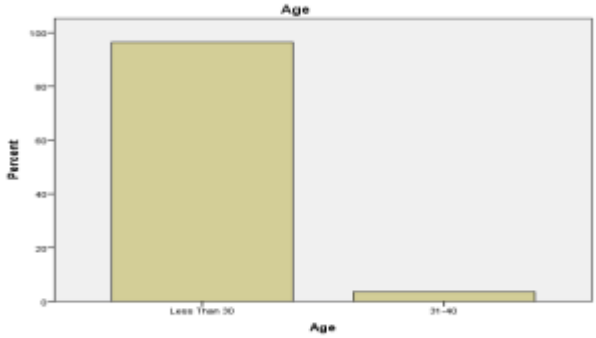

Figure.3

From this result, more number of samples were collected from the age group from **less than 30** which has a frequency of **54**.

Frequency test for nature of job

TABLE 5

	Frequency	Percent	Valid Percent	Cumulative Percent
Desk/ office job	8	14.3	14.3	14.3
Site/ field work	20	35.7	35.7	50.0
Both desk job/ site job/field work	28	50.0	50.0	100.0
Total	56	100.0	100.0	

Frequency test is performed for nature of group, soon after the frequency test carried out for age group since questionnaire survey was conducted in various companies. This test graphically represents the frequency of respondents collected from different nature of job group. From this result, more number of samples were collected from both office, site and field work group which has a frequency of **28**. The figure indicates that out of 56 samples 28 samples were from both office, site/field work and 20 from field work and 8 from office job.

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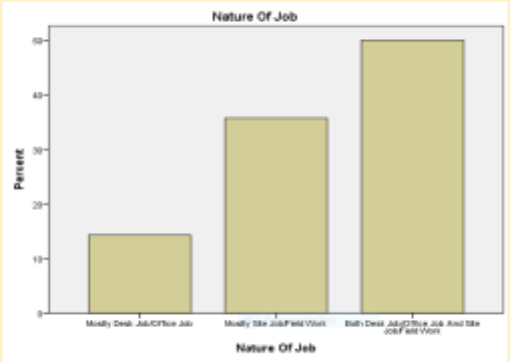

Figure.4

Frequency test for experience

TABLE 6

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 5 years	34	60.7	60.7	60.7
6-10 years	18	32.1	32.1	92.9
More than 20 years	4	7.1	7.1	100.0
total	56	100.0	100.0	

Frequency test is performed for experience, since questionnaire survey was conducted where respondents experience range were different. This test graphically represents the frequency of respondents collected from different experience group. From this result, more number of samples were collected from the respondents whose experience ranges from **0-5** which has a frequency of **34**. The figure indicates that out of 56 samples 60.7% samples were from the group respondents ranges from 0-5 and 32.1% from the range of 6-10 years and 7.1 % from more than 20 years.

Figure.5

C. Mean and standard deviation

Safety commitment

TABLE 7

	N	Mean	Std. Deviation	Variance
Q1	56	3.95	.749	.561
Q2	56	4.70	.537	.288
Q3	56	3.96	.852	.726
Q4	56	4.16	.757	.574
Q5	56	4.07	.684	.468
Q6	56	4.36	.645	.416
Q7	56	4.16	.757	.574

From this result shows Q2 has the highest value of mean when compared to other factors. Therefore, personal protective equipment should be properly maintained and provided to workers during construction is more important.

Safety compliance

TABLE 8

	N	Mean	Std. Deviation	Variance
Q8	55	4.09	.752	.566
Q9	56	4.16	.757	.574
Q10	56	3.96	1.026	1.053
Q11	56	3.95	1.034	1.070
Q12	56	3.75	1.031	1.064
Q13	56	3.98	.798	.636
Q14	56	3.55	.761	.579
Q15	56	4.11	.623	.388

From this result shows Q9 has the highest value of mean when compared to other factors. So this factors contribute more priority than other factor. Therefore, accident report should be properly maintained during construction is more important.

Safety awareness/communication

TABLE 9

	N	Mean	Std. Deviation	Variance
Q16	56	4.21	.680	.462
Q17	56	4.45	.737	.543
Q18	56	4.12	.689	.475
Q19	56	4.23	.809	.654
Q20	56	4.12	.833	.693
Q21	56	4.39	.623	.388
Q22	56	4.27	.674	.454
Q23	56	4.23	.603	.363
Q24	56	4.11	.652	.425
Q25	56	4.29	.624	.390

From this result shows Q17 has the highest value of mean when compared to other factors. So this factors contribute more priority than other factor. Therefore, communication is more important within the management.

Workers health and safety

TABLE 10

	N	Mean	Std. Deviation	Variance
Q26	56	4.55	.630	.397
Q27	56	4.09	.815	.665
Q28	56	4.21	.563	.317
Q29	56	4.34	.581	.337
Q30	56	4.25	.580	.336
Q31	56	4.55	.630	.397
Q32	56	4.00	.688	.473
Q33	53	4.26	.684	.467
Q34	55	3.73	.952	.906
Q35	56	4.39	.652	.425

From this result shows Q26 and Q31 has the highest value of mean when compared to other factors. So this factors contribute more priority than other factor. Therefore, safety measures and safety incentive program is more important during construction.

Stress recognition

TABLE 11

	N	Mean	Std. Deviation	Variance
Q36	54	4.00	1.064	1.132
Q37	56	4.16	.654	.428
Q38	56	3.18	1.177	1.386
Q39	56	4.00	.953	.909
Q40	56	2.59	1.092	1.192
Q41	56	3.80	1.034	1.070
Q42	56	3.71	.731	.535
Q43	56	4.05	.749	.561
Q44	56	3.98	.751	.563

From this result shows Q37 has the highest value of mean when compared to other factors. So this factors contribute more priority than other factor.

Site condition.

TABLE 12

	N	Mean	Std. Deviation	Variance
Q45	56	4.30	.630	.397
Q46	56	4.30	.685	.470
Q47	55	4.20	.650	.422
Q48	56	4.23	.660	.436
Q49	56	4.07	.759	.577
Q50	56	4.20	.672	.452

From this result shows Q45 and Q46 has the highest value of mean when compared to other factors. So this factors contribute more priority than other factor. Therefore, hazardous materials should be properly maintained and stored in every site condition.

Teamwork

TABLE 13

	N	Mean	Std. Deviation	Variance
Q51	56	4.05	.773	.597
Q52	56	4.11	.652	.425
Q53	56	4.20	.724	.524
Q54	56	3.73	.674	.454
Q55	56	4.14	.586	.343

Q56	56	4.11	.679	.461
Q57	56	4.05	.616	.379
Q58	56	4.04	.713	.508
Q59	56	3.98	1.000	1.000
Q60	56	4.34	.668	.446

From this result shows Q55 has the highest value of mean when compared to other factors. So this factors contribute more priority than other factor. Therefore, teamwork is important to improve safety in construction and also safety program should conduct regularly.

V. CONCLUSION

After the completion of the reliability and frequency test, results show that the questionnaire formed was reliable. TheCronbach's alpha value obtained from reliability test is **0.946**, which indicates a high level of internal consistency i.e. then the questionnaires are said to be more reliable (excellent) and frequency of the sample collected was framed graphically from frequency analysis. Mean and standard deviation were determined by descriptive analysis.The study disclosed that the top management, engineers and contractors must involve the behavioural safety of the workers through safety meetings, monitoring, keeping accident records and provide PPE during construction are the effective terms of minimising accidents.

REFERENCE

[1]. A.Pieter, Cornelissen, J. Joris, Van Hoof, D.TMenno De Jong, *Determinants of safety outcomes and performance: A systematic literature review of research in four high-risk industries*, Journal of safety research, 62,2017, 127- 141.

[2]. S. PriscilNidhu, B. Abinaya,*Evaluating safety management practices in construction industry by using SPSS software*, SSRG international journal of civil engineering,2017, 24-28.

[3]. Brain H.W. Guo, A. vicente, Gonzalez, *Predicting safety behaviour in the construction industry: development and test of an integrative model*, journal of safety science, *84*, 2016, Page 1-11.

[4]. Heng Li, Miaojia Lu, Shu-Chien Hsu, Matthew Gray, Ting Huang *Proactive behaviour-based safety management for construction safety Improvement*, 2015, 107-117.

[5]. ZhipengZhou, Yang Miang Goh, Qiming Li, *Overview and analysis of safety management studies in the construction industry*, 2015, 337-350.

[6]. Markkumattila, maritahyttinen, eevarantanen, *Effective supervisory behaviour and safety at the building site*, international journal of industrial ergonomics *13*, 2014,85-93.

[7]. Dawei Chen, Hanzhi Tian, *Behaviour based safety for accident prevention and positive study china construction project*, Procedia Engineering *43*, 2012, 528 – 534.

[8]. Zhenzhong Hu, Jianping Zhang, *BIM and 4D based integrated solution of analysis and management for conflict and structural safety problem during construction*, automation in construction *20*, 2010, 167-180.

[9]. C.R. Chehassan, O.J. Basha, W.H. Wan hanafi, *Perception of building construction workers towards safety, health and environment*, Journal of Engineering Science and Technology, *2(3)*, 2007, 271 – 279.