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Attributes influencing the acceptance of behavioral safety programs by employees of manufacturing firms in India

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The purpose of this study was to find the attributes which played an influencing role for employees to follow the safety programs voluntarily, as the success of any safety program will depend upon the employees' awareness and willingness to participate in the program. This exploratory research was conducted among employees in India to test the relationship between antecedents and consequences; and safety behavior of the employees. The researchers used statistical inference, more precisely binary logistic regression to test the relationship between the variables. Results indicated that both antecedents and consequences have an influencing role on the safety behavior of the employees. The method of implementation and post implementation monitoring constituted the antecedents. Similarly, knowledge of accidents and involvement in accidents constituted the consequences. As the data for this research through structured questionnaire was collected directly from blue collar workers in various manufacturing industries across India, it provided first-hand information on relationship between antecedents and consequences; and safety behavior of the employees.

Key words: Safety behavior, acceptance, safety management.

INTRODUCTION

In recent times, various governments have imposed laws to ensure safety climate in organizations. Each year, around 11.3 million employees are injured and nearly 11,000 are killed on the job. The estimate for indirect costs due to workplace injuries is approximately USD 1,400 per injury (Williams and Geller, 2000). The concept of occupational safety has gained popularity in the last decade and has been implemented in many organizations to ensure a healthier workforce. A study showed that there exists a relationship between organizational climate and safety climate in an organization. The paper also showed that compliance and participation will be influenced by knowledge and motivation. Motivation acts as a major influencer for participation. Knowledge and motivation will have an influence on safety climate and safety performance. This paper also discuses that safety

climate acts as a predictor of determinants of safety culture (Neal et al., 2000).

A study among construction workers showed that there is no relationship between safety culture and safety behavior or performance. However, they have also added that this might point to the exact factor which involves the safety performance and hence the results might not be appropriate (Glendon and Litherland, 2001). A survey to evaluate the safety program in organizations shows that 30% of the employees had a low safety behavior (Nasab et al., 2009). Another study shows behavioral safety is an important factor influencing the safety climate in an organization (Cooper and Phillips, 2004).

Although, organization invest huge sum of money in formulating safety programs, very few of them really monitor the effectiveness of the program. It is important to note that the effectiveness of the safety program depends on the employee's acceptance and willingness of voluntarily practicing it. With the recent government laws, rules and regulations focusing towards organizational safety, it is important to create and deliver programs that

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adhered voluntarily by the employees. It is also crucial for organization's return on investment and sustainability as it reduces man hour lost and medical expenses. Thus, this research attempts to find the attributes which influences the behavior of employees towards the safety programs.

LITERATURE REVIEW

What is behavioral based safety?

The behavioral based safety programs refer to those which require a change in the behavior of the individual. The behavioral based safety programs may refer to wearing a safety gear or slight modification of operating procedure to one which is more focused towards safety. In recent times, these programs are implemented by organization mainly because of the rules and regulations set forward by various organizations, not all of these programs are followed by the employees. Behavioral based safety programs is an approach to safety that emphasizes on workers behavior towards safety as the major cause of work or occupation related injuries and illnesses. Australian council of trade unions has published a safety kit which states that 80 to 96% of workplace injuries are caused by workers' unsafe behaviors (Australian Council of Trade unions, 2009).

Evolution of the topics and related studies

A study among construction workers have shown five factors to examine safety climate: 'adequacy of procedure', 'work pressure', 'personal protective equipment', 'relationship' and 'safety rules'. The paper also investigated these factors among two groups of employees in two different jobs and found that there was a difference in two of the factors, 'relationship' and 'safety rules'. Hence, we can say that the safety climate varies among different departments in the same organization (Glendon and Litherland, 2001). The overall safety behavior will depend upon the objective of the department. A survey conducted among construction workers show that worker involvement is an important factor for worker acceptance of safety program (Andi, 2006), that is, a worker should actively participate in the safety program being implemented. A study by the Spanish Government showed personal involvement influences individual responsibility, which further influenced safety activities in an organization (Cheyne, 2002).

Behavior modification

A study discovered behavior based safety programs were best methods to avoid occupational accidents (Geller,

2001). Behavioral safety programs put too much stress on the employees, and hence, the stress prevents the employee from participating in the safety program (Frederick, 2001). The paper also stated that though many organizations have implemented safety programs, they do not monitor the efficiency and the effectiveness of the programs (Geller, 2001). The UK's Health and Safety Executive stated that behavior based safety programs 'require front line staff to carry out behavioral safety observations on their colleagues'. The safety kit also explained some flaws in using observational techniques to ensure efficiency.

Behavior modification has acted as a temporary or a permanent solution. The permanent or temporary solution depends on whether it is focused on the behavior or the effects of the behavior. The effect of the behavior is only noted if the adverse effects of the behavior are known. Hence, to improve the behavior modification to a permanent solution, a method of feedback should be used to negotiate and make the correct modification. The feedback should be withdrawn gradually as an abrupt end to the feedback may lead to the assumption that the behavior is accepted before the behavior is actually accepted. The paper also highlighted the behavioral observation for feedback should not be done in regular intervals as this may not provide the exact status in the organization (Saari, 2002).

Workplace accidents

The behavior modification has been proven as a method for reducing accidents, as the unsafe activities or acts are changed to safer acts. A method of describing accidents is to look at the unsafe conditions and unsafe acts which were behind it. The behavior modification focuses on improving these unsafe acts. An unsafe act is one which involves a person in a hazardous area and exposes him in the hazard. Therefore, it is possible to link each accident to one or more unsafe acts. Hence, by modifying these unsafe acts it is possible to reduce accidents. The feedback is also used in this case to bring forward a positive experience which will encourage people to perform things well. Another point to be noted is that, an accident generally may have more than one unsafe act behind it and it is necessary to change all the acts to achieve positive results (Saari, 2002).

It is essential to set targets by examining the accidents and identifying the contributing factors. Accident is a sample of possible occurrences. It is important to identify key elements which have link to production goals, which needs to be corrected. Choosing a suitable target behavior is essential for the success of the program.

Hence, positive feedback is needed for the success of the behavior modification, as it has a great potential for accident prevention. The success also depends upon how enthusiastic people are on getting involved in the safety programs (Saari, 2002).

Safety management

A study about organization climate showed that positively rated climate was closely associated with fewer accidents. Cooperation climate which refers to communication between members in the organizations has a lower accidents rate (Stetzer et al., 1997). A study of the safety climate in universities and colleges had the following findings, that is, when compared to the colleges or universities which had a safety manager, the safety behavior was better in the place with a safety manager. Similarly the presence of a safety committee also had an influence on the safety behavior of the employee. This could be also because the schools or colleges which employ a safety manager have a higher budget when compared to those places without the safety manager or safety committee.

This may be because of the fact that the safety manager may regularly monitor the effectiveness of the safety programs. Safety manager and safety committee also influenced the safety structure in the organization (Wu et al., 2007). All of the aforementioned concepts can be summarized by using the ABC model of behavior that is the behavior modification is based on the antecedents or behaviors.

ABC model of behavior

The ABC stands for antecedents, behavior and consequences. Antecedents refer to an event which acts as a trigger which is used to start a particular behavior. Behavior refers to the event or behavior which needs to be modified in order for the safety behavior to be implemented. The consequence refers to the result which may be attained from use of the behavior. The paper also states that consequence also drives behavior (Fleming and Lardner, 2002). It is important to determine the inappropriate behavior and also to modify the improper behavior in the first instance (Denti, 2004), so that we can change the behavior based on the consequence of the improper behavior.

An article about the practical application of the ABC model showed that consequence is nearly 80% more influencing when compared to attitude which only influences by 20% (Biteler, 2008). From the ABC model, we can also conclude that behavior modification is generally based on intervention, which is to observe behavior before and after an intervention. This is essential to making sure that the behavior modification, that is, the intervention, is an efficient one. Though it is not possible to find particular results, it is possible to move on in the right direction (Gellar, 2005).

Types of intervention

There are three kinds of intervention approach to improve

behavioral safety, that is, instructional intervention, supportive intervention and motivational intervention. Instructional intervention uses an activator or antecedent event to change the old behaviors to much efficient ones. Its aim is to get the participants involved and instruct them in transition from unknowingly at risk to knowingly safe stage.

This type of intervention is mainly based on activators such as education sessions, training sessions etc. Since the instruction comes before the behavior, it basically focuses on improving performance. Another paper found that training sessions have proven to improve safety behavior (Ghofranipour et al., 2008) and inadequate training leads to higher number of accidents (Lin and Mills, 2000). This type of intervention is suitable for cases where the instructions which need to be given are precise and one to one (Gellar, 2005).

Supportive intervention refers to when a person learns a right method to do something, this behavior becomes a natural routing with practice and continued practice makes it a habitual behavior. People need to be supported on this that they are doing the right thing, as this encourages them to move further. The organization support or support from supervisors has also proven to improve the behavior (Mearns and Reader, 2008). The management commitment towards safety programs also contribute to a good safety behavior (Dominic, 2006). This type of intervention is not based on activators. Therefore, self-directed behavior does not require an antecedent (Gellar, 2005).

Motivational intervention refers to the situation when a person knows what to do but does not perform it as they need some external encouragement to perform. Instruction is not sufficient in forcing the people in performing the task as they are doing it knowingly. In this case, incentives are given to the individuals for performing the task. This study also discusses penalties which may be given to improve the intervention but they may have negative results (Gellar, 2005).

A publication about employee participation in health promotion explains that, a safety program may be accepted at the start but once the employee loses the curiosity, the employee participation will drop significantly.

The paper explains the importance of using incentives to get employees involved in such programs and has stated that "the relative effectiveness, or overall participation levels, is directly related to the dollar value of rewards" (Chapman, 2006).

Dependent variable

The dependent variable in this study is the acceptance or usage of safety programs in organization. The safety programs may be behavioral change. The literature revised showed that behavioral based safety programs

have a relation with safety culture. The behavior based safety program refers to any change in the behavior which is aimed at improving the safety of the individual. For example: wearing safety gloves and safety goggles.

Hypothesis

The literature review gave an overview of all the attributes which may have an influence on the behavior of employees. The various attributes are broadly classified under the ABC model of behavior. Hence, there are mainly two independent variables, Activator or Antecedents and Consequence, which has given rise to two hypotheses.

H_1: There exist a positive relationship between the safety behavior and antecedents.
H_2: There exist a positive relationship between the safety behavior and consequences.

METHODOLOGY

Research design

The purpose of this study is hypothesis testing, that is, to test the relationship between the dependent variable and independent variables. The study focused on individuals in the organizations. The investigation was done using regression. The sampling was based on probability that the sample size represented the population. The research was performed with minimum interference that is no controlled environment and is performed in one time. The data was collected using questionnaires with interval scale, nominal scale for most of the measurements, while gender was measured using ordinal scale. The data analysis was performed using hypotheses testing.

The sample consisted of employees working in manufacturing companies. The sample was picked randomly across different levels in different organizations around India. The researcher approached the organization and explained to the employees about the study, and also translated the questionnaire to other Indian languages such as Tamil and Hindi, to get responses from employees who were unable to understand the questionnaire.

The questionnaire used 5-point Likert scale for most of the questions. Sample size greater than 30 and less than 500 is suitable for most researches and also generally the number of samples should be 10 times the number of variables studied (Sekaran, 2008).

Pilot study

The questionnaire was constructed based on the literature review, more precisely the ABC model of behavior. A pilot study was conducted in which questionnaires were randomly distributed to all the manufacturing based organization located in Guindy Industrial area, Chennai. A response of 24 samples was collected. The reliability was tested, and the Cronbach alpha was found to be more than 0.5, which indicated the questionnaire was reliable.

Final study

In the final study, the questionnaires were randomly distributed to

manufacturing based organizations throughout India except Guindy Industrial Area, Chennai. This is to ensure that respondence from the pilot study was excluded from the final study. A total of 500 questionnaires were distributed and feedback from 204 respondents was obtained. The collected questionnaires were subjected to factor analysis, and then followed by reliability analysis to test the validity and the reliability of the questionnaires.

FINDINGS AND ANALYSIS

Demographic analysis of the respondents

There were a total of 204 employees in various groups who provided their responses for this study. The demographic profile of the respondents is explained as follows (Table 1) :

Age

The 204 respondents who took part in the study were classified into four groups. Respondents who were lesser than 25 years old constituted 16.3% of the total sample, while respondents between the age of 25 years and 35 years constituted another 32%, and respondents in the groups of 36 years to 45 years and more than 45 years constituted 27.1 and 24.6%, respectively.

Gender

In respect to the gender, there were only a total of 8 females who participated in the study. This can be attributed to the nature of the industry, as most of the employees in manufacturing involve males.

Education

The respondents were broadly classified into five groups. It can be noted that none of the respondents who participated in the study, were holding qualification higher than Masters. Non graduates – skill training, which refers to people who have no education in school level but have acquired the skills through years of experience and practice, constitute 17.2%.

Non graduates- vocational school refers to people who have attained school education for few years, but have not reached a level to be given any award for and they constitute 8.95%. The next group is certificate holders, who constitute 6.4%. The other groups which are diploma, degree and masters constitute 25.6, 31, and 10.8%, respectively.

Position

Position refers to the position in which respondents are

Table 1. Summary of demographic profile.

Demographic profile	Description	Frequency	Percentage (%)
Age	Less than 25 years	33	16.3
	25 to 35 years	65	32.0
	36 to 45 years	55	27.1
	More than 45 years	50	24.6
Gender	Male	195	96.1
	Female	8	3.9
Education level	Non graduate- skill training	35	17.2
	Non graduate- vocational school	18	8.9
	Certificate	13	6.4
	Diploma	52	25.6
	Degree or graduate	63	31.0
	Masters	22	10.8
Position	Manual labor	18	8.9
	Operator	66	32.5
	Floor supervisor	35	17.2
	General supervisor	51	25.1
	Production head	16	7.9
	Divisional department head	17	8.4
Tenure	Less than 5 years	75	37.4
	5 to 10 years	48	23.6
	11 to 20 years	36	17.7
	More than 20 years	43	21.2
Size of organization	Less than 50 employees	20	9.9
	50 to 100 employees	71	35.0
	100 to 200 employees	35	17.2
	More than 200 employees	77	37.9

working in the organization. The position is classified into six groups, that is, manual labor, operator, floor supervisor, general supervisor, production head and divisional department head. The aforementioned groups constitute 8.9, 32.5, 17.2, 25.1, 7.9 and 8.4%, respectively.

Tenure

Tenure refers to the number of years the person has been in the position aforementioned. It is classified into four groups; they are lesser than 5 years, 5 to 10 years, 11 to 20 years, and more than 20 years, respectively. They constituted 37.4, 23.6, 17.7 and 21.2%, respectively.

Size or strength of organization

It refers to the total number of employees working in the

organization. It is classified into four groups, that is, less than 50 employees, 50 to 100 employees, 100 to 200 employees and more than 200 employees. They constitute 9.9, 35, 17.2 and 37.9%, respectively.

Frequency distribution of dependent variable

There are two questions in the questionnaire which measure the safety behavior of the employees. The response for this question was measure by a 5-point Likert scale, with the lowest score pointing to "never" and the highest score being "always". The first question enquires if the employees follow the safety behavior as per the instruction. The response for this question was 2 respondents chose never, 4 respondents chose rarely, 25 respondents choose sometimes, while 107 respondents and 65 respondents choose often and always, respectively.

Table 2. Summary of dependent variable.

Question	Description	Frequency	Percentage (%)
23. In your opinion, do you think you follow the safety behavior as instructed?	Never	2	1.0
	Rarely	4	2.0
	Sometimes	25	12.3
	Often	107	52.7
	Always	65	32.0
24. Do you skip a safety behavior even though you are aware of its dangers?	Never	95	46.8
	Rarely	55	27.1
	Sometimes	32	15.8
	Often	10	4.9
	Always	11	5.4

The second question enquires if the employees skip a safety procedure even though they are aware of its dangers. The response for this question was 95 respondents choose never, 55 chose rarely, 32 chose sometimes, while 10 respondents and 11 respondents chose often and always, respectively. This data (Table 2) shows that there are still a significant number of people who either skip or neglect the safety behavior.

Factor analysis

Factor analysis is a statistical technique which is used to find if the variable observed are related to an unobserved variables generally called as factors. Using this technique, we generally summarize the variance into smaller set, which contains the key information of the variables. It is performed as a test of validity of measures for independent variables.

Confirmatory and exploratory factory analysis

A paper about the comparison of the two powerful techniques has explained the benefits and implications of the two methods. Exploratory factor analysis is used to analyze a possible underlying structure of set variables and also the number of latent constructs. It also does not impose any preconceived structure on the outcome. Confirmatory factor analysis is used to test a hypothesis, which is a relationship between observed variables and underlying constructs. The researcher uses theoretical knowledge to create a pattern grouping the variables. As this research involves hypothesis testing, we will use the method of confirmatory factor analysis (Suhr, 2006). As we are performing confirmatory factor analysis, we will group each domain in the independent variable and perform factor analysis for it.

Reliability analysis

We perform reliability analysis for each independent variable, similar to the way we performed the factor analysis.

Dependent variable

As there are only two questions which are measuring the safety behavior, we cannot perform reliability analysis or factor analysis. Hence, we will convert it into a dichotomous variable, which is a variable having only 2 possible values. This is done by adding the results of both the questions, and measuring the median for it. The values which are greater than or equal to median are taken as one result and the rest as another one. In this case, the values greater than or equal to median are taken as people who follow the behavior and the rest are people who do not follow the behavior.

Discriminant analysis

Discriminant analysis is a method used for testing the relationship between dependent variable and independent variable. This method is very much similar to the binary logistic regression, however there is one difference; the dependent variable need not be categorical variable like in the case of logistic regressions. The dependent variable can take 2 values, and the values should be mutually exclusive (Lawler, 2011).

Analysis using discriminant analysis

The data was analyzed using discriminant analysis, and we found that all the domains were significant. The value for significance for each and every domain was lesser

than or equal to 0.05. Hence, the antecedents which are significant in discriminant analysis are instructional intervention, supportive intervention, motivational intervention and post implementation analysis of behavior. The consequences which are significant are direct involvement, primary knowledge and secondary knowledge.

Interpretation of analysis: From the results of the discriminant analysis, we can conclude the following:

(i) Higher the instructional intervention, higher the safety behavior.
(ii) Higher the supportive intervention, higher the safety behavior.
(iii) Higher the motivational intervention, higher the safety behavior.
(iv) Higher the post implementation analysis, higher the safety behavior.

The first three items, instructional intervention, supportive intervention and motivational intervention together constitute the method of implementation of safety program. Hence, we can conclude that, the method of intervention have a positive influence on the behavior.

As all the aforementioned items which constitute the antecedents have a positive influence on the behavior, we can say that antecedents have a positive influence on behavior and hence hypothesis 1 is verified. Similarly, we can also find the following results:

(i) Lower the direct involvement in accidents, higher the safety behavior.
(ii) Higher the primary knowledge about accidents, higher the safety behavior.
(iii) Higher the secondary knowledge about accidents, higher the safety behavior.

The lower direct involvement could possibly due to the following reasons:

1. The sample may not contain enough number of people who have been directly involved in accidents.
2. The interpretation of accidents may be different for the sample. They may feel that accident is one in which they are hospitalized or some which needs a high medical attention.

As there are two items out of the three which have a positive influence on the safety behavior, we can say that consequence has a positive influence on the safety behavior and hence hypothesis 2 is verified.

Conclusion

This research was based on the ABC model of behavior, which indicates that behavior is based on antecedents or activator and consequence. The antecedents constitutes
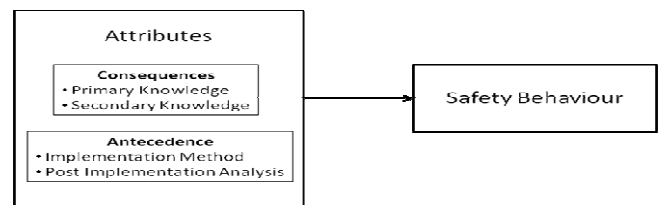

Figure 1. Final framework.

of the method of implementation of safety, and the post implementation analysis or monitoring of safety. The consequence constitutes direct involvements in accidents, primary and secondary knowledge of accidents.

The method of implementation of safety contains three stages, that is, instructional intervention, supportive intervention and motivational intervention. From the analysis of questionnaire based on discriminant analysis, we were able to find that the method of implementation of safety and post implementation analysis or monitoring of safety which together constitute antecedents have a positive influence. The higher the implementation method and the higher the post implementation analysis of monitoring of safety, the better the safety behavior will be.

Similarly, higher primary knowledge and secondary knowledge of accidents lead to better safety behavior. It was noted that, the behavior was high in people who had low first hand experience in accidents, that is, direct involvement in accidents, had a high safety behavior. This could be because the sample contained less number of people who were involved in accidents; and also, their perception of safety behavior is different.

Hence, we can say that both the independent variables, antecedents and consequence have a positive influence on safety behavior. So, both hypotheses are verified in this study. The final framework of this research was established as per Figure 1.

FUTURE RESEARCH

As this research focused on general manufacturing or heavy manufacturing industries, future research can focus on specific industry. Future research should also be carried out on what are the causes which lead an employee to skip a safety behavior. An empirical study can also be performed, where education about safety behavior is provided, and the results of the education should be also recorded. All the aforementioned topics will give us a better insight on the factor which may influence the employees to follow the safety behavior voluntarily.

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