

Proactive System for Real-Time Safety Management in Construction Site

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Abstract: The purpose of this paper is presenting a new advanced hardware/software system, boasting two main features: first it performs real time tracking of workers' routes in construction sites; then it implements an algorithm for preventing workers to be involved in hazardous situations.

Keywords: proactive system, real time safety management, safety.

1. Introduction

The construction industry is a vehicle through which a nation's physical developments are activated by initiating projects from the blue print stage to the implementation. The implementation and materialization of such projects inevitably can bring about benefits to the people and the nation, thus satisfying the aspiration of national progress and growth and in uplifting the status of the nation. In a high-hazard industry like construction, safety is an investment that provides real benefits. A safe work environment helps to keep skilled employees on the job and projects on track by reducing accidents that result injuries and schedule delays, while also reducing the risks of litigation and regulatory action. A strong safety record enhances a company's reputation, makes it more competitive and helps to manage insurance costs over time. Fostering a successful safety culture, however, is a company wide effort that requires commitment and participation from the chief executive to project managers, superintendents, foremen and individual workers on the job site.

2. Aim

The concept of safety culture is a very useful and relevant way of understanding how an organization influences the safety behaviour of its employees and contractors. Safety culture is used to characterize the safety beliefs, values, and attitudes that are held by an organization.

- To develop a comprehensive knowledge about the safety control within a construction industry.
- To identify the role of each and every individual in construction
- To find any relationship between each of the factors

3. Model development

A. Ranking

Relative Importance Index (RII) is a method used to determine the weight age of a particular variable when there are multiple responses under that variable. RII helps in determining the contribution of a particular variable that makes to the prediction of a criterion variable both by itself and in combination with other predictor variables. Relative Importance Index can be computed by using the equation,

$$\text{Formula: } \text{RII} = \frac{\sum W}{H * N}$$

Where $\sum W$ is the summation of all the response of the variable, H is the highest value of the variable and N is the number response in a variable. The Tables shows that the list of number of responses given for the each factor and finding the relative importance index value for factors and from that find ranking for each factor in that ID-F8 (Are construction lifecycle concerned with green policies) Factor get the 1st ranking and the RII value (70.33333) then followed

B. Development of regression model

The main objective of study is to develop models to predict cost performance, schedule performance, quality performance and satisfaction level. Four models were developed for each of the performance metrics. Multiple Linear Regression (MLR) and Artificial Neural Network (ANN) technique were used to construct the models to predict project performance, and these models are then compared and validated.

C. Development of regression model

A regression analysis is proposed which assumes a cause-and-effect relationship between the variables. In a simple regression, there is one dependent and one independent variable whereas in multiple regressions there is one dependent and at least two independent variables. A linear relationship between the dependent and independent variables is assumed. The overall fit of the regression is given by R^2 that is called the coefficient of determination and is a measure of the explanatory power of the model. The value of R^2 lies between 0 and 1. The closer the value of R^2 to one, the better is the goodness of fit. The significance of R^2 is carried out by using the F statistic. Regression is a data oriented technique because it deals directly

with the collected data without considering the process behind these data. Regression is a mature technique that has been used in many scientific applications. Regression models can be linear or nonlinear, which represent a relation between dependent variables and independent variable. Regression models for the construction project performance consider one dependent variable (cost growth, schedule growth, quality performance, satisfaction level) against several independent variables.

D. Building of regression models

The SPSS Software has been used to build all the regression models. The statistical terms can be used to check the model's statistical competence. In order to examine how the obtained linear regression equation represents the data, two sets of parameters, R and R² are calculated. Firstly, the linear correlation coefficient, R, measures the strength and the direction of a linear relationship between two variables. The value of R ranges between -1 and +1. R value close to +1 indicates that two variables have strong positive linear correlation. The value of R² lies between 0 and 1 (both values inclusive). The closer the value of R² to one, the better is the goodness of fit.

5.1.2 Data analysis using SPSS Regression is a data oriented technique because it deals directly with the collected data without considering the process behind these data. Regression is a mature technique that has been used in many scientific applications. Regression models can be linear or nonlinear, which represent a relation between dependent variables and independent variables. The regression methodology models the distribution of a dependent variable with the help of one or more independent variable. Simple regression analysis involves only one predictor when investigating its relationship with the dependent variable. For simple linear regression, only two variables, independent and dependent variables, the fitted linear equation is written as

$$Y = a + bX$$

The coefficient of determination, R², is a statistic that is widely used to determine how well a regression fits the data. R² represents the fraction of variability in the dependent variable, Y, that can be explained by the variability in the independent variable, X. In other words, R² explains how much of the variability in the dependent variable can be explained by the fact that they are related to the independent variable. Regression models for the project performance consider one dependent

variable cost growth, schedule growth, quality performance, and satisfaction level against several independent variables.

Table 2
DETNO

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	21	75.0	75.0	75.0
	1	7	25.0	25.0	100.0
	Total	28	100.0	100.0	

Here accident number and death number is high.

4. Conclusion

Construction industry remains a dangerous business, accounting for the second most fatal work injuries of any sector after transportation and warehousing. In order to acquire an accident free construction project, some proactive measures are to be adopted properly. In this study proactive methods normally resorted for reducing accidents are identified and discussed. It includes the participation of top level management in safety control, safety in the planning stage, pre-qualifying sub-contractors for safety, training for workers, fall management etc. various proactive safety control, it is very difficult to create a zero injury project. The top level managers will be not able to concentrate on safety control because of their management.

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Table 1
ACCNO

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	9	32.1	32.1	32.1
	1	7	25.0	25.0	57.1
	2	7	25.0	25.0	82.1
	3	3	10.7	10.7	92.9
	4	1	3.6	3.6	96.4
	5	1	3.6	3.6	100.0
Total		28	100.0	100.0	