ARTIFICIAL INTELLIGENCE IN CONSTRUCTION INDUSTRY

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Abstract

Delay in construction projects is considered one of the most common problems causing a multitude of negative effects on the construction projects. Construction delays can be minimized only when their cause is identified. Theobjective of this study was to identify the major causes ofconstruction delays. These factors have been used asinputs in ANN model and all data is extracted from the historical projects, the model has been developed and trained for 70 projects and compared the actual cost withpredicted cost.13- 17- 1 model was the best between 15 models are developed, 6% is the mean absolute percentage error for model is tested. The results are clearly provided a good indicator for predicting the construction buildings costs in the future with high degreeof accuracy.

1. Introduction

Artificial neural network (ANN) is a mathematical model for predicting system performance (i.e., system output) inspired by the structure and function of human biologicalneural networks [13]. The ANN is developed and derived to have a function similar to the human brain by memorizing and learning various tasks and behaving accordingly. It is trained to predict specific behavior and to remember that behavior in the future like the human brain does. Its architecture also is similar to human neuronlayers in the brain as far as functionality and inter-neuron connection. ANN has been successfully used in various applications.

2. Literature Review

Rafiq. Choudhry, Dongping, Fang, Sherif, Mohamed
[1] presents a robust conceptual model that has its roots firmly entrenched in pertinent academic and applied literature. This study revealed a conceptual model that recognizes human, technical, situational, andorganizational elements as well as their interactions. The model is anchored in three fundamental conceptual categories, namely safety climate, behavior-based safety, and safety system. The results of this study clearly indicatethat the model serves as the logical basis for determining what and how to analyze and assess the different aspects ofconstruction safety culture. It offers the opportunity to adopt a goal-setting paradigm by pursuing multiple sub goals. This gave them the conclusion that Employee perceptions, safety behaviors, and environmental or situational features could be accessed through safety climate surveys, peer observations, and systems audits/inspections

Choudhry; Jeong-Il. Park; Simon. Washington [2] presents the results of a structural equation model SEM thatdescribes and quantifies the relationships between corporate culture and safety performance. The SEM and the latent variables describe to constitute a powerful framework for defining, measuring, and improving upon corporate safety culture. The SEM is estimated using 196 individual questionnaire responses from three companies with better than average safety records. Analysis of data from the 54 measurable characteristics revealed that 19 could be used todescribe a final set of

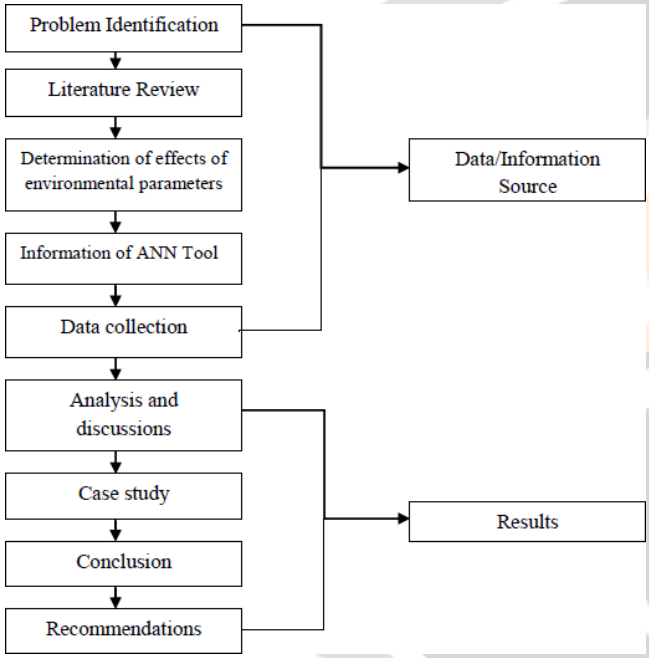
five latent variables. This gave them the result and conclusion that these five latent variables can be considered characteristics of corporate safety culture andmay be used as indicators of safety.

Laufer; M. Asca; William B. Ledbetter. Asca [6]
We collected the data with the help of multiple surveys**,** in successfully achieving main objective of the study, one of the most important phases is collection of accurate data. Data collection is a procedure of collecting crucial data records for a certain sample or population of observations inthis research work, first we collect a survey data from different sites with multiple questionnaires related to safe behavior during the construction.

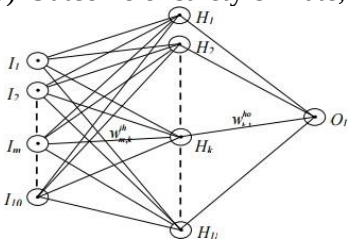
3. Methodology

Throughout this section, we have explored a range of physical and chemical characteristics of Aggregate andother substances. The concrete mixture was formulatedusing M30 grade and consisted entirely of Aggregate. Subsequently, curing was carried out for durations of 7,14, and 28 days, respectively.

3.1 Flow Chart



An Artificial Neural Network (ANN) is an information- processing system that has been established as overviews of calculated representations created on hominoid neural biology. An ANN is serene of nodes related by directed links. Each link has a numeric weight as shown in Figure
3.3. ANNs have many advantages over traditional methodsfor modeling due to their distinct features. ANNs determine complicated relationship among a set of data and where therelationship between data is highly unknown. ANNs are data obsessed and self-adaptive devices because they can seizure subtle purposeful contacts among the figures uniform if the causal affiliation
(1) Antecedents to safety climate (constructs of safetyclimate),
(2) Safety climate, and
(3) Outcome of safety climate, as safe work behavior of workers.



4.1 Design Process

In the remaining sections of this topic, you will follow the standard steps for designing neural networks to solve problems in four application areas: function fitting, pattern recognition, clustering, and time-series analysis. The work flow for any of these problems has seven primary steps. (Data collection in step 1, while important, generally occursoutside the WEKA environment.)

1. Collect data
2. Create the network
3. Configure the network
4. Initialize the weights and biases
5. Train the network
6. Validate the network
7. Use the network

4.2 Analysis

Step 1: To select the Artificial Neural Network Tool withmultiple inputs.

Step 2: To select the data and train the tool. It is neuralnetwork or data set type.

Step 3: By training all the parameters get the output. Thevalue of output is between 0 to 1. Each parameter is connected to each hidden layer and apply multi-layer perception from weak cluster.

3.5.2 The development process for an ANN applicationhas eight steps

Step 1: (Data collection).
Step 2: (Training and testing data separation) For a moderately sized data set, 80% of the data are randomly selected for training, 10% for testing, and 10% secondary testing.
Step 3: (Network architecture) Important considerations arethe exact number of perceptions and the number of layers.
Step 4: (Parameter tuning and weight initialization)
Step 5: (Data transformation) Transforms the applicationdata into the type and format required by the ANN.
Step 6: (Training).
Step 7: (Testing).
Step 8: (Implementation) Now a stable set of weights areobtained.

4.3 Validation of results

For the validation of proposed study, we evaluate our results with real time construction projects. The finally weshows current scenarios for safe environment in real time construction. We have validated the results with VaishnaviDevelopers, the tables 4.4.1 is the rank result with each parameter.
For this survey we have collected around 12 parameters data from each site. These are below
(1) Commitment
(2) Communication
(3) Safety rules and procedures
(4) Supportive environment
(5) Supervisory environment
(6) Workers' involvement
(7) Personal appreciation of risk
(8) Appraisal of physical work environment and work hazards
(9) Work pressure
(10) Competence
(11) Working hours
(12) Life covers

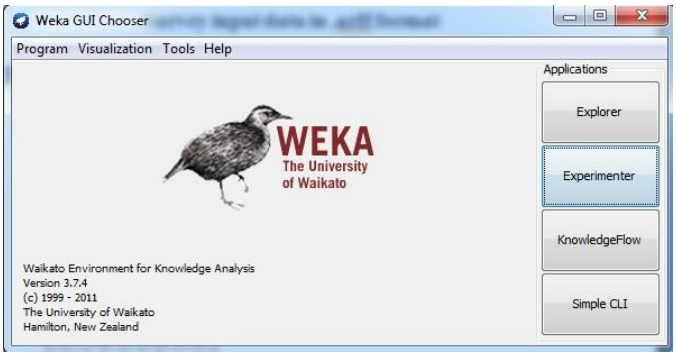


Figure 3.4.1: Weka simulation creation page

We collected the data with the help of multiple surveys**,** insuccessfully achieving main objective of the study, one of the most important phases is collection of accurate data. Data collection is a procedure of collecting crucial data records for a certain sample or population of observations in this research work, first we collect a survey data from different sites with multiple questionnaires related to safe behavior during the construction. This initial survey denotes the twelve different factors that can be required forsafe work in construction project. During this survey we asked around 49 to 50 different questions to the site supervisor project manager as well as employees. Thesurveys show the rating to each factor as per the current scenario and requirement. Twit 60 site visits, the collecteddata we evaluate from for WEKA using ANN feed forwardapproach. Once process whole data it can be generate the distance weight after the testing, and finally we rank the allparameters using ANN weight.

4. Conclusion

1. This study found that safety rules and procedures, including around 12 different safety parameters.
2. This research developed a model based on ANN to gauge the safety work on creation projects consideringten constructs of safety climate.
3. We collect data from around 70 surveys and given input to weak tool and get recommendation usingArtificial Neural network.
4. Final re-rank all recommended parameters which is given by weak tool and apply the same recommendedparameters on Vaishnavi developers for case study.
5. Finally conclude the accuracy of recommendedparameters and validate the proposed research.

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