Construction Site Cost Estimation System

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***Abstract*- Adequate construction cost estimation is main factor in any type of construction projects. Forecasting cost of construction projects can be considered as difficult task. In this paper, Ordinary Least Square (OLS) method which is type of simple linear regression model is proposed to forecast future cost of construction projects. Ordinary Least Square method can be used to produce best solution and performs well when the dataset is small. Construction managers do a lot in thinking and planning, making every project component organized. By outlining a project schedule, efficiency of time is regulated, making every event of delays, changes and disputes nil. Because construction managers do study existing situation, optimum use of worker skills are achieved, affecting a construction quality. The growth of number and variety of devices that are connected to the internet and are collecting data is incredibly rapid. Today more than two billions consumers worldwide use an internet connection in order to browse content send and receive information in the form of emails and instant messages, access various multimedia resources and among others make social networking. Task management is the most tedious task to do. Managing of task, assigning of task and reporting of task are very critical thing to do. So by using the task manager it will be easy to manage the entire task. In this proposed system we are using the tracker system for the tracking of employee. As the allowance is given to the employee so it is very necessary to track employee through GPS and _nd their current location. In Today's world informing all the employees about meetings or any other important work is became easier by using the messaging and broadcasting. Either we can send a message to a particular employee or broadcast to a bunch of employee. This all is depend upon a employer. This is dynamic in working both the employee or an employer can use this. Image case capturing became the need of the construction site. It is important to every employee to capture their everyday's work status. It shows the work status of the construction site and the day by day progress of it. Meetings are the most essential part of any organization. In construction system every employer has to take meetings for gathering the information and spreading the knowledge. In the proposed system the meetings will help us to hold the record of the meetings that are taken in the past, and meetings which are have to be taken. Nowadays, many companies offer IoT Platforms and all of them offer some level of analytic reports but the similarities end there as they are entirely different software applications. For someone new in this field it may not be easy to understand that this term refers to a complete and mature IoT cloud platform. More so, there are some software applications that have been stretched to the point of being called IoT platforms even when they describe just an element of a platform or even something completely different. Managing data and documents is a tedious task especially when handling large amount of data. The institution itself must have no room for mistake when it comes to managing important documents. In this modern world the IoT is useful for embedding the appliances, machines with the software's and sensors which enables and object to connect with them and exchange the data. Each thing is uniquely defined through its implant computing system but is able to inter-operate within the existing Internet infrastructure. No one is unaware of unmatched power of nature and its ever changing and uncertain persona which leaves us unsure of what turn it may take next. The nature is very unpredictable and has many secretes that are beyond imagination. So the prediction of nature has changed from traditional to modern method that is by using Internet on Things. All this data will be collected by the sensors that underpin the Internet of Things: Temperature, pressure, moisture and light sensors as well as motion sensors such as accelerates and gyroscopes. Many of these sensors are already in your cell phones, and will soon to be just about everywhere. This means weather measurements will also be everywhere and this will improve the precision of weather condition reports and forecasting. The IoT permit objects to be sensed or controlled remotely over the existing network infrastructure, and making an opportunities for more direct combining of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human involvement.**

Index Terms- Java, ERP, Resource Management, Construction, Estimation

I. INTRODUCTION

In this modern world the IoT is useful for embedding the appliances, machines with the software's and sensors which enables and object to connect with them and exchange the data. Each thing is uniquely defined through its implant computing system but is able to inter-operate within the existing Internet infrastructure. No one is unaware of unmatched power of nature and its ever changing and uncertain persona which leaves us unsure of what turn it may take next. The nature is very unpredictable and has many secretes that are beyond imagination. So the prediction of nature has changed from traditional to modern method that is by using Internet on Things. All this data will be collected by the sensors that underpin the Internet of Things: Temperature, pressure, moisture and light sensors as well as motion sensors such as accelerates and gyroscopes. Many of these sensors are already in your cell phones, and will soon to be just about everywhere. This means weather measurements will also be everywhere and this will improve the precision of weather condition reports and forecasting. The IoT permit objects to be sensed or controlled remotely over the existing network infrastructure, and making an opportunities for more direct combining of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human involvement.

The project construction estimator is made especially for builders and developers to estimate the raw materials and labor required to make a construction project (building, society, mall.etc). The main difficulty arises during construction is to decide the quantity of raw materials, labors and resources required in future.

The construction estimator system works as follows:

1. The system is fed with an estimate of the raw materials and other estimates that help a builder to estimate the amount of materials that are required to construct a building.
2. The system is also fed with the cost of various raw materials, so it automatically calculates the cost of those materials.
3. The system also consists of an estimate of the labor power needed to make the project.
4. It is also capable of calculating the number of days needed in project completion.
5. Construction estimator then calculates the labor per day cost with the number of days to calculate the labor cost estimate.
6. Thus the system then gives a final excel sheet that helps the builder to estimate the total project cost within minutes.

1.2 Problem Definition

To design the resource management system for construction site of civil work like bridge, house, buildings etc. to estimate the cost of construction.

II. LITERATURE SURVEY

Prediction of construction cost estimation involves so lots of multivariate statistical methods. Linear regression models and artificial neural network models are used to predict the cost in construction projects such as apartments [4], buildings [1], [3], [6]-[7] and roads [5], [9]. Kim et al. [5] experimented three algorithms namely regression, neural network and case based reasoning for cost estimation of road construction projects. The models are based on year, gross floor area, storeys, total unit, duration, roofs types, FND types, usage of basement, finishing grades as input parameters and actual cost as output parameter. Proposed 75 neural network models are measured using estimation error. Proposed 75 neural network models are presented with varying parameters such as number of neurons in hidden layer, learning rate and momentum. Best results are obtained by NN model with 12-25-1(0.6-0.6), where 12, 25, 1, 0.6 and 0.6 are the input neurons, hidden neurons, output neurons, learning rate and momentum respectively.

Kim et al. [6] presented three algorithms namely Regression, Neural Network and Support Vector Machine for cost estimation of building construction projects. The model is based on year, budget, school levels, land acquisition, class number, building area, gross floor area, storey, basement floor and floor height as input parameters and total construction cost as output parameter. Proposed neural network model is measured using actual error rate, mean absolute error (MAER) and standard deviation. MAER of three results are then compared using analysis of variance (ANOVA). Best results are obtained by NN model with 5.27 MAER and 4.13 standard deviation.

Mahamid and Bruland [9] developed multiple and linear regression for cost prediction of road construction projects. The model is based on road length (km), pavement width (km), pavement thickness after compaction, haul distances, pavement area as input parameters and total cost of asphalt works, the second is the cost/m, and the last one is the cost/m2 as output parameter. Proposed multiple linear regression model are measured using coefficients of determination (r2), p-value and F value. Best results of multiple and linear regression model with coefficient of determination ranging from 0.57 to 0.96 and p-value for each model is less than 0.05 which means that the use of dependent variable in the model is significant.

In [1], authors presented evolutional fuzzy hybrid neural network cost estimation for building construction projects. The proposed model uses impact factors from seven engineering categories. Proposed evolutional fuzzy hybrid neural network (EFHNN) model incorporates four artificial intelligence approaches such as neural network, high order neural network, fuzzy logic, and genetic algorithm. Performance is measured using estimation error. Proposed EFHNN models is presented with varying parameters such as number of neurons, number of hidden layer, activation function, crossover rate and mutation rate.

Cheng et al. [3] experimented integrated rough set theory and artificial neural network for cost prediction of building construction projects. The model is based on total height, standard layer area, type of structure, project management level, period, basement area as input parameters and building construction cost as output parameter. Proposed neural network models are measured using estimation error. Proposed neural network model are presented with varying parameters such as number of neurons in hidden layer, learning rate and expectative error. Best results are obtained by NN model with 6-5-1, where 6, 5 and 1 are the input neurons, hidden neurons and output neurons, respectively with performance of 0.0009956, where expectative error is 0.001 with training time only 0.405 seconds. Luu and Kim [4] experimented neural network for cost prediction of apartment construction projects. The model is based on storey, total area, building level, year, gasoline cost, steel cost, cement cost as input parameters and total cost of building as output parameter. Proposed neural network model is measured using mean percentage error (MPE) and mean absolute percentage error (MAPE). Proposed neural network models are with varying parameters such as number of neurons, number of hidden layer, activation function and adaption learning function. Result shows that neural network has potential to improve the cost estimation model for apartment projects.

Günaydın and Doğan [7] proposed neural network model for cost estimation of structural systems of buildings construction projects. The model is based on total area of the building, ratio of the typical floor area to the total area of the building, ratio of ground floor area to the area of building, number of floor, console direction of the building, foundation system of the building, floor type of building, location as input parameters and cost of the structural system per square meter as output parameter. Proposed neural network models are measured using cost percentage error (CPE) and mean square error (MSE). Proposed neural network models are presented with varying parameters such as number of neurons in hidden layer, learning rate and momentum. Best results are obtained by NN model with 8-4-1, where 8, 4 and 1 are the input neurons, hidden neurons and output neurons respectively.

Deep-learning methods are machine learning algorithms [10] with multiple levels of representation are representation-learning methods, which are obtained by composing simple modules that each transforms the representation at one level into a representation at a higher, slightly more abstract level [11]. There are supervised learning algorithms namely recurrent network [12], convolutional neural network [13] and multilayer perceptron [14]. In [14] [17], authors presented multilayer perceptron (MLP) for prediction problems such as breast cancer [14], wind forecasting [14] and heart disease [16] [17].

III. SYSTEM DESIGN

A. System Architecture

1. Admin login: The developers would be provided with system login. They can then access the system for finding out total expenses needed during construction. Admin has to provide some inputs into the system regarding building and premises information such as the number of floors, lifts, gym,

swimming pool and other facilities that would be constructed.

2. Resource calculation: The system finds out the total raw materials required in construction with respect to the input provided by the admin.

3. Labor calculation: Based on the number of buildings to be constructed and in a specified time provided by admin, the system gives an estimated labor strength required.

4. Day calculation: The system even calculates the total number of days required to complete the construction.

5. Cost calculation: By considering the labors, resources, days required for construction, the system evaluates the total expense needed for construction.

6. Report: At the end the system generates a brief and organized report stating all the calculated things required in construction for developers convenience.

7. Task Assignment and Follow Up:
Task management is the tedious task to do. It is nothing but the process of task through is life-cycle. It is the part of process management and project management for the efficient work flow of the project. In this proposed system the User can assign task to the particular person. User can put up for task. This will give interface like chatting for a particular task. User can send image, PDF, etc in follow ups.

8. Case Image Capture: Image capture enables user to capture images and directly send through the network which is intranet. Using this application one can capture image of a site with specific address attached with it.Image case capturing became the need of the construction site. It is important to every employee to capture their every day's work status. By simply clicking on particular image app will navigate user through that site.

9. Meeting: The meetings are the most essential part of the any organization or in anywhere. Meeting management is used to ensure the valuable contribution of employee to find out the best solution for the any problem. The proposed system will hold record for all the meeting held. In construction system every employer have to take meetings for gathering the information and spreading the knowledge. In the proposed system the meetings will help us to hold the record of the meetings that are taken in the past, and meetings which are have to be taken. As a leader there are so many things to do in meeting so this phase will store meeting agenda, comment, and start time, end time and date of meeting. All the meetings are arranged here by the employer.

10. Tracker: Tracking is Location-based services or LBS is a term that is derived from the telematics and telecom world. The combination of A-GPS, newer GPS and cellular locating technology is what has enabled the latest LBS for handsets and PDAs. Line of sight is not necessarily required for a location fix. This is a significant advantage in certain applications since a GPS signal can still be lost indoors. As such, A-GPS enabled cell phones and PDAs can be located indoors and the handset may be tracked more precisely. In this proposed system this is generally introduced for tracking the employee visit to a site, company needs to give allowance for employee visit. So this tracker functionality will keep record of source and destination address of every visit. And give allowance as per that.

11. Internal Planner : Internal planning is very important in organization to keep track on all employee, their training, meeting planning, task assessment and many more which helps to produce more effective productivity. In this proposed system it allows user to make internal planning for future work like budget, skill level of employee, productivity, compliance. They can make their planning over here. All the planning regarding to the planning is done by the employer.

12. Message / Broadcast : The message is nothing but a way of communication. The Broadcasting of message is sending the same message to the entire subscriber and the selected subscriber at once. So the proposed system will allow application user to send message to another user of the application. A user can broadcast message as well. Broadcast message will be shown to every user of application.

13. Vendor: Vendors are nothing but the supplier who offers something for selling purpose it can be a person or a company. Here in the proposed system the vendors and employer can communicate with each other for the selling and buying purpose. It will take the note of all the sailed raw material which is used in construction. All the data is managed here.

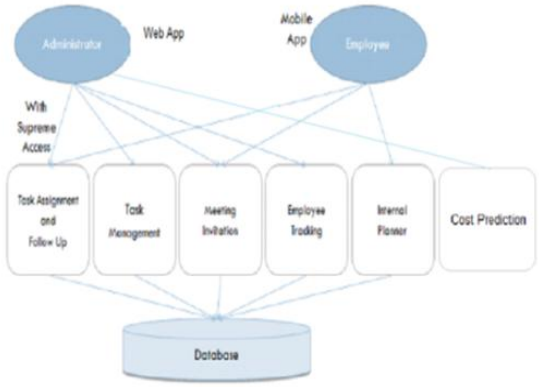

Figure: System Architecture

IV. CONCLUSION

The proposed system will provides overall solution for employer to manage its employee and task assignment for each employee. This helps in proper reimbursement for travel allowances. Provides ease of sending message as well as broadcast message for emergency announcements This application will help to reduce the efforts of employer and employee, quickly analyze data and share this data when they need to. The proposed system is based on the intranet service by using this the organization will work efficiently, it helps to manage data under a network. The neural network has got more and more attention in the economic owing to its non-linear mapping ability and approaching ability for any function. This project uses the artificial neural network to extract the relation between the project's features and the estimation of fabrication cost from the large number of past estimation materials and sets up the estimation's neural network model.

APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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