Roadway Project Cost Estimation Using Linear Method

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Abstract

The cost is very important role in construction project. Project management is no small task. It has a definite beginning and end. It is not a continuous process. So, this system implemented by using project management theory. Project management uses various tools to measure accomplishments and track project tasks. Project management reduces risk and increases the chance of success. Motor roadway is essential fiction for the development of the nation as national economy point of view. Only when the road is the best, the communication between the places will be the best. To become a better transportation, roadway is one of the most important part for the development of the nation. So, this paper is implemented to manage the project and to estimate the cost of roadway.

1. Introduction

Transportation plays a vital role in regional development and so the government has been made endeavors in constructing roads. The government is undertaking construction of roads with noble good will be equitably developed all the regions of country. So the country will have better transportation leading to economic progress [1].

Roadway is an identifiable route, way or path between two or more places. Roads are typically smoothed, paved, or otherwise prepared to allow easy travel. Many roads were not recognizable routes without any formal construction or maintenance. In urban areas roads may pass through a city or village and be named as streets, serving a dual function as urban space easement and route. Economics and society depend heavily on efficient roads. Road construction requires the creation of a continuous right-of-way, overcoming geographic obstacles and having grades low enough to permit vehicle or foot travel. A variety of road building equipment is employed in road building. Roadways are designed and built for primary used by vehicular and environmental considerations that are a major concerned. Erosion and sediment controls are constructed to prevent detrimental effects. This paper can be calculated two kinds of costs. They are fixed cost and variable cost. This system is defined temporary tank into fixed value. Variable costs are manpower cost and material cost for each requirement.

Project management is the discipline of planning, organizing and managing resources to bring about the successful completion of specific project goals and objectives. Project management has given way to a project management diamond with time, cost, scope and quality, the four vertices and customer expectations as a central theme. The time constraint refers to the amount of time available to complete a project. For analytical purposes, the time required to produce a deliverable is estimated by using several techniques. Time is not considered a cost nor a resource since the project manager cannot control the rate at which it is expanded. This makes it different from all other resources and cost categories. It should be remembered that no effort expanded will have any higher quality than that of the effort- expanders.

The cost constraint refers to the budgeted amount available for the project. Cost to develop a project depends on several variables including resource costs, labor rates, material rates, risk management (such as cost contingency), Earned value management, plant (buildings, machines, and so on), equipment, cost escalation, indirect costs and profit. But beyond this basic accounting approach to fixed and variable costs, the economic cost that must be considered includes worker skill and productivity which is calculated by variation to project cost estimates. This is important when companies hire temporary or contract employees or outsource work.

The scope constraint refers to what must be done to produce the project's end result. Requirements specified for the end result. The overall definition of what the project is supposed to accomplish and a specific description of what the end result should be or accomplish. A major component of scope is the quality of the final product. The amount of time put into individual tasks determines the overall quality of the project. Some tasks may require a given amount of time to complete adequately, but given more time could be completed exceptionally. Over the course of a large project, quality can have a significant impact on time and cost [2].

Quality can be defined as meeting the customer's expectations or exceeding the customer expectations achieved by way of deliverables and or activities performed to produce those deliverables. Project quality plan can be defined as a set of activities planned at the beginning of the project that helps achieve quality in the project being executed. The purpose of the project quality plan is to define these activities tasks that intend to deliver products while focusing on achieving customer's quality expectations. These activities tasks are defined on the basic of the quality standards set by the organization delivering the product [3].

Cost estimating is one of the most important steps in project management. A cost estimate establishes the base line of the project cost at different stages of development of the project. A cost estimate at a given stage of project development represents a prediction provided by the cost engineer or estimator on the basic of available data.

Today road, bridge and building are built and maintaining to develop and modernize. Constr-uction new roads and maintaining old road are playing important role in the projects.

2. Types of Construction Cost Estimates

Construction cost constitutes only a fraction, though a substantial fraction, of the total project cost. However, it is the part of the cost under the control of the construction project manager. The required levels of accuracy of construction cost estimates vary at different stages of project development. Since design decisions made at the beginning stage of a project life cycle are more tentative than those made at a later stage, the cost estimates made at the earlier stage are expected to be less accurate. Generally, the accuracy of a cost estimate will reflect the information available at the time of estimation.

Linear method for cost estimation equation is $y = a + bx$. Let x be a variable representing the facility capacity, and y be the resulting construction cost. Where a and b are positive constants to be determined on the basic of historical data. In general, this relationship is applicable only in a certain range of the variable x, such as between $x = c$ and $x = d$. If the values of y corresponding to $x = c$ and $x = d$ are known, then the cost of a facility corresponding to any x within the specified range may be obtained by linear interpolation. For example, the construction cost of a road construction can be estimated on the basic of a linear relationship between cost and road area if the unit cost per volume foot of road area is known for road construction within certain limits of length.

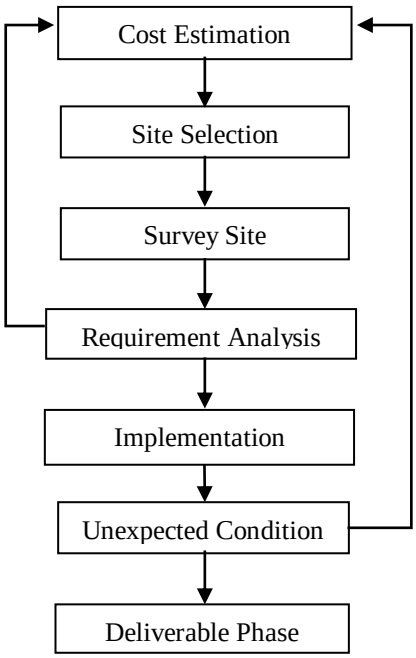
Some of the common features of computer aided cost estimation software include: Databases for unit cost items such as worker wage rates, equipment rental or material prices. These databases can be used for any cost estimate required. If these rates change, cost estimates can be rapidly re-computed after the databases are updated. Databases of expected productivity for different components types, equipment and const-ruction processes. Import utilities from computer aided design software for automatic quantity-take- off of components. Alternatively, special user interfaces may exist to enter geometric descriptions of components to allow automatic quantity-take-off. Export utilities to send estimates to cost control and scheduling software. This is very helpful to begin the management of costs during construction. Version control to allow simulation of different construction processes or design changes for the purpose of tracking changes in expected costs. Provisions for manual review, over-ride and editing of any cost element resulting from the cost estimation system. Flexible reporting formats, including provisions for electronic reporting rather than simply printing cost estimates on paper. Archives of past projects to allow rapid cost-estimate updating or modification for similar designs.

A typical process for developing a cost estimate by using one of these systems would include: If a similar design has already been estimated the old project information is retrieved. Cost engineers modify, add or delete components in the project information set. If a similar project exists, many of the components may have few or no updates, thereby saving time. A cost estimate is calculated by using the unit cost method of estimation. Productivities and unit prices are retrieved from the system databases. Thus, the latest price information is used for the cost estimate. The cost estimation is summarized and reviewed for any errors [4].

Cost estimation is an essential component of infrastructure projects. Accurate estimation will assist project managers to choose adequate alternatives and to avoid misjudging of technical and economic solutions. The accuracy of cost estimation increases toward the end of the project due to detailed and precise information. The conceptual phase is the first phase of a project in which the need is examined, alternatives are assessed, the goals and objectives of the project are established.

Major difficulties which arise while conducting cost estimation during the conceptual phase are lack of preliminary information, lack of database of road works costs and lack of up to date cost estimation methods. Parametric cost estimation or estimation

based on historic database during the conceptual estimate phase is widely used in developed countries. However, developing countries face difficulties related to the creation of a road work costs database which may be used for cost estimation of roadway construction [4].



''Figure 1. Cost estimation of roadway construction chat''

3. Type of calculate cost

Survey and foundation is first step of concrete road construction. Example, in 1 feet concrete road construction we must need 1.67 feet for survey and foundation amount of feet. Because, construction office's sample unit is 1.67 feet for 1feet concrete road's survey and foundation step. So, variable costs of first step are multiply results of total square feet of road (or) volume of road and amount of sample unit for 1 feet and unit price. In this way step bye step calculate cost for total roadway project's variable cost. And than, fixed costs and variable costs are add. So, this system used linear method .linear method is y = a + bx.

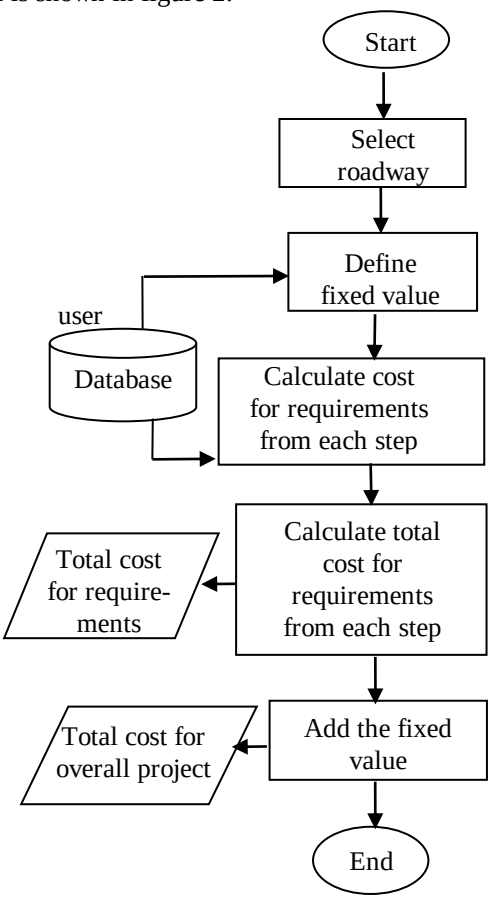
a = fixed cost , b = variable cost, x = volume of road, y = overall project cost

4. Requirements of roadway project

Roadway construction for concrete road, macadam road and bituminous road consists of many kinds of requirements. They are survey and foundation, ground digging, fitting stones, sanding, 1.5in MS, expansion, 1-2-4 RC concrete, sampling, exceed mounting, 9in cement concrete, 2in-4in cement concrete, 1in-2in cement concrete, 3in high sanding, 3in small gauge stoning, sidewalk mounting, cleaning for man power requirements. And than material requirements for three kinds of roads are cement, sand, chipping stone, heavy stone, teak, 1.5in iron, wire, 2in-4in stone, 1in-2in stone, small stone, machine oil, gear oil, hydraulic oil, lubricant, bituminous. Fixed requirements are temporary tanks (or) offices.

5. Design of the system

This system implements the cost estimation of roadway project. When we start the system, the user chooses the desired roadway (e.g., concrete road, macadam road, bitumenous road).After the user chooses the survey roadway, this system is needed to define fixed value(e.g., cost of temporary tank) from database. And then calculate cost (e.g., manpower cost and material cost) for each requirement from database. After this system calculates the total cost of requirements that does not involve the cost of fixed value and generates the total direct cost. Moreover, this system adds the total cost of requirements and fixed value and then produces total cost for a roadway project. This design of the system is shown in figure 2.

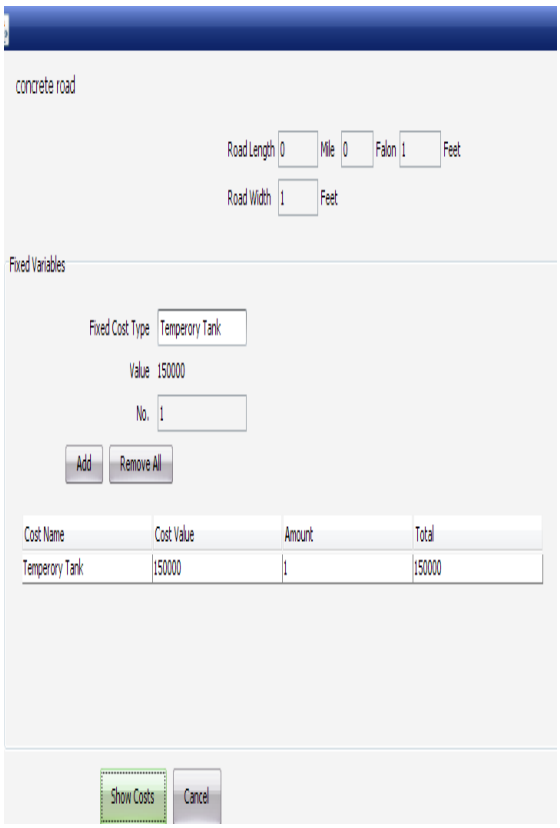


''Figure 2. Design of the system''

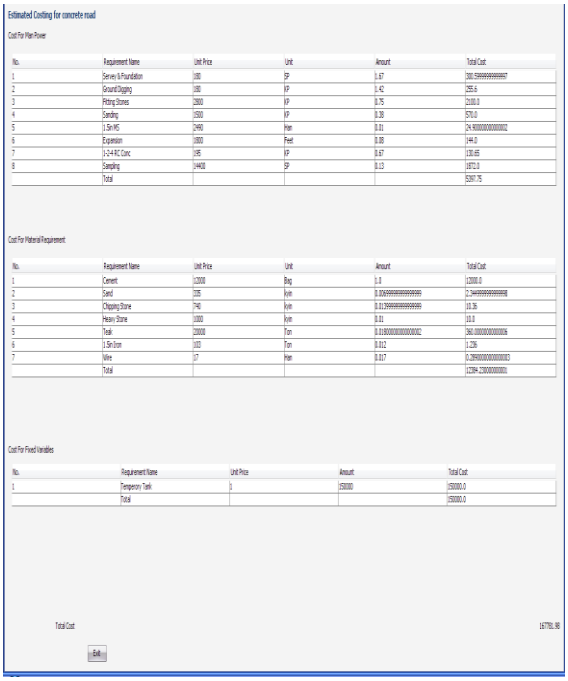
6. Results of cost estimation

The features of this software are implemented as three types of road. These roads are Concrete road, Macadam road and Bitumenous road. The user can easily choose the desired road.

After the user chooses the desired road, the user can calculate the cost of this road. If the user selects the concrete road and presses “Calculate Cost” button, this system displays the survey site for concrete road. In survey site, the user can fill road length, road width and number of temporary tank. When the user presses “Exit” button, the user can exit from this system. After the user fills the number of temporary tank , the user clicks “Add” button.And then this system adds the number of temporary tank in the Cost List. If the user presses “Show Costs” button, this system displays the result of cost estimation for roadway.When the user presses “Exit” button, the user can exit from this system.Figure4 is result of cost estimation for road length 1feet and road width 1 feet concrete road.



''Figure 3. Survey site for concrete road''



''Figure 4. Result of cost estimation for concrete road''

7. Conclusion

The system applies the concept of project management and the implication of the cost estimation for roadway project. Moreover, this system can assist the contractors, engineers, project managers and other person in performing the work. The user can be calculated three types of road such as concrete road, macadam road and bitumenous road.

In this paper, computer aided cost estimation were written by Java programming language. The main purpose of this system is investigated how to estimate the cost for road way project.

8. References

[1] C.C Su, “ *Estimation of Road Construction*,” 2003.

[2] http://en.wikipedia.org/wiki/Project-management

[3] http://www.constructioncpms.com/

[4] http://pmbook.ce.cmu.edu/05-Cost-Estimation.html