A CRITICAL COMPARISON OF QUANTITY ESTIMATION FOR GATED COMMUNITY CONSTRUCTION PROJECT USING TRADITIONAL METHOD VS PLAN SWIFT SOFTWARE: A CASE STUDY

Aditya Varma K.V
Department of Civil Engineering, KL University, Andhra Pradesh, India

Manideep T
Department of Civil Engineering and Construction, Bradley University, IL, USA

SS. Asadi
Associate Dean Academics, Department of Civil Engineering, KL University, Andhra Pradesh, India

ABSTRACT

A Construction Estimator primarily focuses on estimating the cost of building before construction and gives general idea of construction cost before the construction. This process involves taking quantity take offs and calculating overall cost accordingly. The job of quantity take offs requires painstaking efforts and huge time to maintain accuracy. A mid-size contractor generally submits 20-25 bids every month, and every bid needs quantity take off to be done to arrive at the estimated cost of project. This poses a challenge to the estimators to complete the estimation work in short time. Even today, most of the estimators use Microsoft Excel Sheets to compute the take offs. The writer of this paper suggests the estimators to use a quantity take off software named Plan swift to do quantity take offs effectively. The Objective of this paper is to analyze the effectiveness of various cost estimation methods by comparing Traditional and Plan Swift method to do quantity take offs through a case study in Hyderabad.

Key words: Quantity Takeoff, plan swift, spread sheets, Construction Estimator.

http://www.iaeme.com/IJCIET/issues.asp?JType=IJCIET&VType=7&IType=6

1. INTRODUCTION

A construction cost estimate is a prediction of total cost of a construction project (Adafin, Johnson, Suzanne Wilkinson, James OB. Rotimi, and Henry Odeyinka 2014). Accuracy of cost estimate for any construction project is a crucial factor that could affect the overall cost of a project. So, utmost care should
be taken while construction cost estimation is prepared. A wrong (or) inaccurate estimate might result in consequences such as delay of construction, missing milestones, cost escalations, claims and changes. All of these consequences will have a direct impact on the overall cost of the project which affects the project negatively (A. K. Munns, K. M. Al-Haimus 2000).

Considering the importance of a cost estimate for any project, the writer of this paper firmly believes that construction cost estimation is highly important for the project to be within time and budget allocations. The time spent for quantity takeoff is based on the project specifications, from the past research data nearly 50% to 80% is spent on quantification (AIA and Rundell 2006). The estimator mainly forecasts the materials and quantities required estimated cost of the building before the construction. An experienced estimator can predict the approximate cost of a building before its construction by using basic inputs such as square feet, no. of floors, rooms, construction cost per sq. feet etc. Today, in India most of the estimators prefer using Microsoft Excel Spreadsheets to estimate the cost of construction by manual interpretation of the quantity take off’s and cost of all the materials involved in the construction. It requires laborious efforts and long time by the estimator on cost estimate to complete an accurate estimate. A typical construction contractor generally prepares cost estimates very frequently to bid for new projects. Also, Cost estimation is an essential task for budgeting and bid preparation for any project. This presents a challenge to an estimator who has to prepare several activities in very short time. Stark (1983) specified that actual quantities in a project often differ from the estimated quantities which are listed in the proposal, and due to these variations, it obviously shows an impact on the contractor’s cash flow. Usually, the client provides quantities that may contain many errors, which can be hopefully identified during the bidding process. The physical routine of determining the bill of quantities before beginning a project begins simply after the finishing of all the significant works like working drawings and with the readiness of a draft of the general particulars. To make this exhausting employment effectively, a point by point drawing’s clear general details, and a sharp estimator are required (Ogunlana 1991).

The preparation of a cost estimate involves collecting, analyzing and summarizing all available data for a project. The quality of a cost estimate depends on various factors such as time spent by the estimator in a particular estimate, estimators experience, wide range of assumptions, accuracy of the detailed drawings given etc. In recent years, the construction industry has become more competitive than ever. The manual method of estimating quantities in construction projects has modeled possible problem areas on building work that is undertaken. In addition to this the quantity surveying levies a high cost because it requires a large number of professionals needed for estimation, and the reliability of manual estimation is also low which indicates differences in the accuracy of manual quantity surveys in the literature review (Barbour 1980; MacDougall 1983; Mauro 1985; Harper 1986; Fee 1987; Bledsoe 1992).

According to Peng Alex et al, a cost estimation should be prepared by making a schedule that represent every type of work’s quantity based on the rules of measurement, that schedule can also be termed as Bill of Quantities(BQ). The calculation of BQ requires huge time to be spent on take off’s. Hence it is understood that take off’s is a herculean task that requires lot of time and minimization of time required to do takeoff’s using relevant software must be employed. Considering the pain staking efforts and time spent on the estimates which are uncertain of winning the bids, the writer strongly feels the efforts and times that are spent on this estimation activity must be minimized. This paper is an effort to address these issues.

2. OBJECTIVES

- To compare the various cost estimation methods.
- To analyse the effectiveness of various cost estimation methods.
- Recommend the suitable method for cost estimation.
3. DESCRIPTION STUDY AREA

As per the methodology explained in this paper, the author has selected a gated community project near Hyderabad to take up this study of comparing the take-off quantities by using Plan Swift software and by traditional method. This project is located in Tukkuguda village in Maheswaram Mandal which is one of the fast-developing areas around Hyderabad. The total area of the proposed layout is about 8.1 acres in which gated community will have 64 villas with all the amenities and facilities such as water supply, drainage system, pre-primary school, parks, community hall, shopping – centers, etc. A gated group is a type of private group which contains entirely controlled doorways for people on foot, bikes and cars. The gated groups are frequently imperiled by wall and security guard's. Gated people group are regularly very costly regions, which give selective comforts to occupants as method for making a group feeling. Some gated groups, typically known as watch gated groups, since they are staffed by private security monitors. These are frequently home to high-esteem properties, or set up as retirement towns. Gated people group typically comprise of little private roads and incorporate different civilities so, as mentioned in the methodology, initially the Bill of Quantities and cost estimates of this entire gated community were calculated using traditional method by employing Microsoft Excel Spread sheets. Using the traditional method, the author of this paper arrived at the cost estimate by taking take off for all structural elements including beams, columns, foundations, slabs, excavations, earth works, concrete works, steel and form works, metal works, block works, kerbs, foot paths, road works, external works, etc.

4. METHODOLOGY

The methodology employed was to first compute all quantity take offs for a case study project using traditional method and compare the accuracy of the same with a new software approach. We have selected Plan swift software to compute the take offs. The accuracy of both these methods is compared. Along with accuracy, several other factors such as time required to compute the take offs, efforts required by the estimator, experience of the estimator, quality of the output, etc using both traditional and Plan swift method.

In the traditional method, we have collected the drawings of the gated community. Cost estimation can also be done by using traditional method. In this method, first we have to select a drawing to which we have to calculate the quantities. Calculation of quantities can be done by finding out the areas and volume of the required work. Therefore, from the obtained areas and volumes we can find the Bill of Quantities (BOQ).

In the Plan, swift software, we have to upload the drawings of the gated community in the software. First, we have to select a work to which we have to find out the quantities. Now we have to mark all the boundaries in the plan to which we are going to calculate the quantities. After marking the boundaries, we can get the area directly from software. Once we get the areas to calculate the cost estimation we have to upload the resources and per unit cost rates. Import the quantity takeoff from plan swift to spread sheets.

Now after calculating the quantities and cost estimates from both the methods we will compare the obtained results. From the two methods, the best alternative method is proposed and recommended for the quantities estimation in construction industry.
A Critical Comparison of Quantity Estimation for Gated Community Construction Project Using Traditional Method Vs Plan Swift Software: A Case Study

Collection of gated community drawings

Cost estimation from the collected drawings

Traditional method
Selection of external work drawings
Calculation of areas and volumes
Finding out the required qualities
Calculation of BOQ

Plan swift method
Uploading of drawings
Marking of external work lines
Finding out the areas
Uploading the resources and their cost details
Import the takeoff from plan swift to spread sheet

Comparing the cost estimations
Proposal of best alternatives
Recommendations

Figure 1 Represents the flow chart of detailed methodology

http://www.iaeme.com/IJCIET/index.asp 710  editor@iaeme.com
5. RESULTS AND DISCUSSIONS

After the entire takeoffs were taken, a Microsoft excel spreadsheet formula has been developed to calculate the final cost estimate by inputting the quantities and individual unit cost prices. A spreadsheet used by the author for quantity takeoffs of beams is shown below table 1 to give an idea to the readers.

Table 1 showing quantity takeoff calculated for beams using spreadsheet.

<table>
<thead>
<tr>
<th>S.no</th>
<th>Description of Beams</th>
<th>Unit</th>
<th>Length(M)</th>
<th>Breadth(M)</th>
<th>Depth(M)</th>
<th>Quantity</th>
<th>Shuttering</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B1</td>
<td>M3</td>
<td>2.5</td>
<td>0.2</td>
<td>0.5</td>
<td>0.25</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>B2</td>
<td>M3</td>
<td>3.1</td>
<td>0.2</td>
<td>0.5</td>
<td>0.31</td>
<td>3.72</td>
</tr>
<tr>
<td>3</td>
<td>B3</td>
<td>M3</td>
<td>4.7</td>
<td>0.2</td>
<td>0.5</td>
<td>0.47</td>
<td>5.64</td>
</tr>
<tr>
<td>4</td>
<td>B4</td>
<td>M3</td>
<td>5.5</td>
<td>0.2</td>
<td>0.5</td>
<td>0.55</td>
<td>6.6</td>
</tr>
<tr>
<td>5</td>
<td>B5</td>
<td>M3</td>
<td>5.8</td>
<td>0.2</td>
<td>0.5</td>
<td>0.58</td>
<td>6.96</td>
</tr>
<tr>
<td>6</td>
<td>B6</td>
<td>M3</td>
<td>5.7</td>
<td>0.2</td>
<td>0.5</td>
<td>0.57</td>
<td>6.84</td>
</tr>
<tr>
<td>7</td>
<td>B7</td>
<td>M3</td>
<td>4.7</td>
<td>0.2</td>
<td>0.5</td>
<td>0.47</td>
<td>5.64</td>
</tr>
<tr>
<td>8</td>
<td>B8</td>
<td>M3</td>
<td>2.5</td>
<td>0.2</td>
<td>0.5</td>
<td>0.25</td>
<td>3</td>
</tr>
</tbody>
</table>

TOTAL BEAM QUANTITY FOR GROUND FLOOR 7.27 85.90
TOTAL BEAM QUANTITY FOR FIRST FLOOR 7.27 85.90
TOTAL BEAM QUANTITY FOR STAIR CASE 1.60 7.38
TOTAL QUANTITY 16.14 179.18

In the traditional method of cost estimation, an estimator tries to do the quantity take-off by calculating areas, volumes, no. of all building elements such as beams, columns, walls, etc. All other construction essentials such as roads, pavements, externals etc. are also included in the estimation. Refer the below table which are used by author to prepare the estimation for take-off in traditional method.

In the method proposed by the author, a software named Plan swift is used to do the quantity take offs. The author was able to take quantity take-off for all villas in the gated community including road works and external works in a short duration with more accuracy. Figure 2 and 3 shows the screenshots of the Plan swift software that is used in the quantity take off.

Figure 2 Plan of a villa in Plan swift
This software takes the drawings in (A1) formats, with the help of few inbuilt tools and reads the areas and volumes of elements to calculate the take-off. This software is extremely used in foreign countries for quick and accurate estimation of building construction. The final quantity take offs using both traditional method and by using Plan swift were approximately same. But the advantages with Plan swift are accuracy and short time required. If the estimator is naïve and not strong at his work, there might be discrepancies in his work. But, if the same work is done by using Plan swift, it is highly likely to maintain accuracy. Also, it took practically 15 hours for the author to do take offs using traditional method. Whereas, it took only 7 hours to do it using Plan swift. The final cost estimate of this gated villa is presented in below table 2.

**Table 2 final cost estimate of the project**

<table>
<thead>
<tr>
<th>S.no</th>
<th>DESCRIPTION</th>
<th>Amount Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TOTAL PROJECT VALUE</td>
<td>158,791,243</td>
</tr>
<tr>
<td>2</td>
<td>LAND VALUE</td>
<td>135,000,000</td>
</tr>
<tr>
<td>3</td>
<td>ACTUAL COST</td>
<td>293,791,243</td>
</tr>
<tr>
<td>4</td>
<td>NO OF VILLAS</td>
<td>64</td>
</tr>
<tr>
<td>5</td>
<td>ACTUAL COST PER VILLA</td>
<td>293,791,307</td>
</tr>
<tr>
<td>6</td>
<td>OVERHEADS</td>
<td>14689565</td>
</tr>
<tr>
<td>7</td>
<td>CONTIGENCIES</td>
<td>7,344,783</td>
</tr>
<tr>
<td>8</td>
<td>TOTAL</td>
<td>315,825,655</td>
</tr>
<tr>
<td>9</td>
<td>PROFIT</td>
<td>0.1</td>
</tr>
<tr>
<td>10</td>
<td>TOTAL PROFIT FOR 64 VILLAS</td>
<td>31,582,565</td>
</tr>
<tr>
<td>11</td>
<td>TOTAL COST FOR 64 VILLAS</td>
<td>315,825,655</td>
</tr>
<tr>
<td>12</td>
<td>NO OF VILLAS</td>
<td>64</td>
</tr>
<tr>
<td>13</td>
<td>PER VILLA COST</td>
<td>4,934,776</td>
</tr>
<tr>
<td></td>
<td>TOTAL AMOUNT CARRIED FOR THE PROJECT</td>
<td>Rs.315,825,655</td>
</tr>
</tbody>
</table>
6. CONCLUSION
The research carried in this paper is mainly focused on the quantity estimation process that is being used from the past few years in India. The alternative method which is proposed for quantity takeoff is by using software called Plan swift. There are many other software’s available which can be used for quantity takeoffs like On-screen takeoff, Timberline, Plan swift etc. The benefits in using plan swift software for quantity estimation are A lot of time could be saved on computing quantity take offs by employing plan swift than using traditional excel spread sheets. The result obtained from this method is accurately comparable to the result obtained from traditional method. Adopting this software for computing quantity takeoffs could significantly reduce the efforts of construction estimator. By reducing the major work of estimator, various risks that may occur in the project could also be foreseen. Also by adopting this software for estimation the money expended for paying for expertise estimators can also be reduced.

REFERENCES