

Cost Variances: Identification and Remediation

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Abstract

An ongoing concern within the construction industry is the ability to control costs. The objective of the study was to identify areas that are relatively difficult to estimate accurately. The study findings lead to prediction of those Construction Specifications Institute (CSI) divisions, which tend to have higher cost variances. Site Work and General Requirements divisions are the most likely areas for cost variances in most projects. Based on the analysis conducted, estimating inaccuracies in the two divisions were found to be the most likely cause of cost variances in projects ranging from \$5 million to nearly \$60 million.

Keywords

CSI divisions, Cost variance, Estimate, Site work, General requirements

1. Introduction

In order to better control costs, project managers need to focus more in areas that are likely to have cost variances in order to minimize cost overruns in projects. In this study cost variance was the difference between the estimated and the actual costs incurred on a project. Cost analysis carried out in this study used the work breakdown structure of Construction Specifications Institute (CSI) Divisions. A review of twelve (12) construction projects performed by a single team of estimators determined that the two CSI divisions with the greatest cost variances were Site Work and General Requirements. Feedback from the project managers of these projects assisted to identify the causes of these construction variances. Findings from another study confirmed that the primary cause of cost variances of General Requirements is the usage of General Requirements as a percentage of hard costs as opposed to viewing them as being related to schedule duration variances (Madni 1998). There are actions that can be taken to assist in minimizing these variances.

2. Assumptions, Definitions, and Data Collection

Twelve (12) projects were selected from a single general contractor for different clients to enable compare cost variances for each project by CSI divisions. In this study, all projects were commercial construction projects awarded through a competitive bidding process. The projects' costs ranged from \$5 million to \$58 million. The general contractor had a total of sixty-two (62) active projects, mainly in Atlanta area, in the calendar year 2000 ranging in volume between \$ 5 to \$ 95 million. Twelve projects represent approximately 20% of the active projects for the general contractor in the year 2000. The

volume sizes of the projects were selected based on the volume sizes of the general contractor's projects. Of the twelve (12) projects, four (4) were between \$5 million and \$10 million, three (3) were between \$10 million and \$20 million, and 5 (five) were over \$20 million. For each project, a cost variance by CSI division was established. For the purpose of comparing project to project, this variance amount was then converted to a variance percentage. The variance percentage used for comparison was calculated by dividing the total variance by the estimated amount. Once a variance percentage was calculated for each CSI division for each project, it was determined that some of the variance percentages should be disallowed for the purpose of calculating an average variance percentage (APV) for each CSI division. After a thorough review of each project, it was determined that some of the variance amounts were caused primarily by irregularities in reporting. The calculated variance percentages for specific CSI divisions of each such project, where such irregularities were detected, were not considered in the calculation for APV of the CSI division. After these irregularities were identified and rectified, then the single highest percentage variances and the single lowest percentage variances for each for each CSI division were disallowed for the purpose of calculating the APV for each CSI division. An example of this process would be CSI Division 15-Mechanical where Project #03 was found to have a variance percentage of 27.4% that was primarily due to reporting irregularities and Project #08 had the highest remaining variance percentage of 10.9% and Project #10 had the lowest variance percentage of 0.0%. Thus for Mechanical trades, all three (3) of these projects were disallowed in calculating the APV and it was based on nine (9) projects. For reasons of achieving robust results, from the study, only central distribution was considered and outliers were taken off from calculations.

3. Results and Inferences

After all APVs for each CSI division were calculated, they were consolidated in a table to identify APVs for each CSI division. This was accomplished through the use of a graph showing each division and the related APV (see Figure 1). The results of the study indicate that the CSI divisions that had the highest APVs, based on the selected projects, were Site Work and General Requirements.

As mentioned earlier the results for CSI Division Site Work were based on the twelve (12) projects selected. The remaining nine (9) projects were used to calculate the APV of 13.5% for Site Work.

There were two primary causes for the variances in the CSI Division Site Work. The first cause for variances between estimated costs and actual costs was because of excavation, one of the sub-categories of Site Work. Out of the nine (9) projects reviewed, this variance was greater than 2% in six (6) of the nine (9) projects. The variances in excavation accounted for approximately 4% of the 13.5% APV Site Work. The second primary cause of the variances stemmed from project management's decision to avoid lodging a claim for payment for additional excavation that was not clearly described on the drawings. Out of nine (9) projects reviewed, the second type of variance occurred in two (2) of the projects. The variance due to this accounted for approximately 6% of the 13.5% APV for Site Work. Both the projects where this variance occurred were Guaranteed Maximum Price (GMP) contracts and did not affect profits at the end of the project. An earlier study also reported that the primary cause of estimating inaccuracies within Site Work was related to the work being labor and plant intensive along with the duration being difficult to determine (Smith 2000)

The results for General Requirements were based on the twelve (12) projects selected. Out of the twelve (12) projects selected, two (2) were disallowed for the purpose of calculating the APV. The project with the highest percentage variance was not factored into the calculation of the APV.

Table 1: Variance Analysis by CSI Division (Summary Of 12 Projects)

CSI Division Number	CSI Division	Percentage (%) Variance
01	General Requirements	8.5
02	Site work	13.5
03	Concrete	4.8
04	Masonry	4.6
05	Metals	7.5
06	Woods & Plastics	6.4
07	Thermal & Moisture Protection	6.0
08	Doors & Windows	5.0
09	Finishes	4.4
10	Specialties	4.4
11	Equipment	6.3
12	Furnishings	2.9
13	Special Construction	0.3
14	Conveying Systems	5.2
15	Mechanical	1.7
16	Electrical	2.1

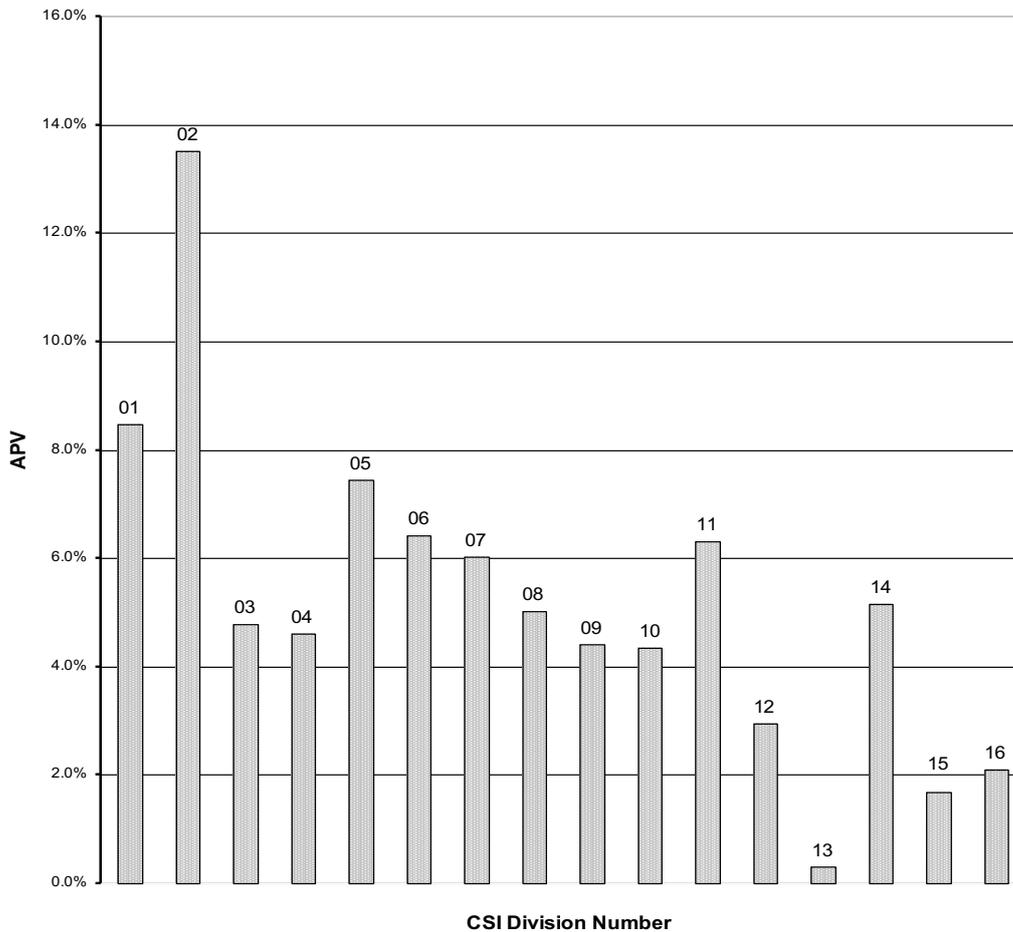


Figure 1: Average Percentage Variance (APV) By CSI Division

Similarly the project with the lowest percentage variance was also not factored into the calculation of the APV. The remaining ten (10) projects calculated the APV of 8.5% in the General Requirements division.

The cost variances of CSI Division 01-General Requirements were primarily caused by costs associated with project duration or schedule based variances. Out of the ten (10) projects reviewed, it was discovered that project duration was the primary cause of variances in eight (8) of the projects. The single largest component of this cost variance came from the cost of the staff deployed on the project. The total cost variances, which stemmed from project schedule extension accounted for approximately 7.5% of the 8.5% APV for General Requirements.

4. Conclusions

The cost variances of CSI Division 01-General Requirements were primarily caused by costs associated with project duration or schedule based variances. Project duration was the primary cause of variances in most of the projects. Project schedule extension accounted for approximately 8% Average Percentage Variance. The single largest component of this cost variance came from the cost of the staff deployed on the project for General Requirements.

Findings from the study also indicate that cost variances for a construction company were not necessarily only a function of the estimating inaccuracies, but also stemmed from management decisions. The variances in excavation that were related to estimating were relatively small. None of the twelve (12) projects reviewed were lump sum contracts and none of the projects that were GMP contracts exceeded the GMP amount. Thus, management decisions that led to cost variances ultimately had very little impact on profits.

5. Recommendations

As an effective remedy for cost variances project managers need to reevaluate those decisions that could have a bearing on project profits. Remedy for cost variances is expected to minimizing in cases when a contractor may be entitled to additional claims through change orders, project manager must evaluate pros and cons of their decision to submit a change orders, based on likely consequences of their decision on project outcome including profits and delays. Management should also consider the merits and demerits of including additional staff time in the bid estimate depending on the type of contract, competition, and anticipated individual owner response.

Through interviews with project managers with companies not considered in this study, it was found that different companies might require customized approaches for different CSI divisions in improving their respective estimating performance. Construction companies who prefer to improve their estimating practices need to carry out individual studies similar to the study to enable them identify specific CSI divisions or areas that needs to be estimated in greater detail. This information can then be used to develop new training programs, thumb rules, and estimate review methodology for such divisions to minimize losses in future.

6. Acknowledgement

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7. References

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8. Appendix: Survey Questionnaire for Interviews

- 1) What trades on your projects typically have the greatest cost variances from the estimated amounts?
- 2) What percentage of cost variance from the original estimate would you consider acceptable?
- 3) Do you feel there is an explanation of why the cost variances tend to occur in the trades mentioned above?
- 4) Who primarily performs the estimating on your projects (an estimating department, project managers, combination of above, other)?
- 5) Does this person/people have further involvement with the project after the estimating function is complete?
- 6) What percentage of the project volume would subcontractors submit pricing or help your company with an estimate prior to your company bidding a job?