JOHNS HOPKINS

Module 5 Assessment

Cost & Schedule Management

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Module 05 Assignment: Cost & Schedule Management

Problem Statement (Part 1)

You are the Software Project Manager for the Banking Image Project at International Image Corporation. The Program Manager is providing you a WAD for 9000 hours over six months. You are taking a snapshot now at the end of three months. Determine the cost and schedule variances for parts a, b, c, and d. Then analyze and summarize for parts e, f, and g. Base your estimates on 160 hours per month.

a) Percent Start/Percent Complete 20/80 - Task A starts on day 1 and is allocated 800 hours; it is scheduled to be complete in two staff months but actually takes 2 1/2 months to complete using 1050 hours of labor.

b) Percent Complete - Task B is allocated 1200 hours (600 hours for first month, 350 hours for month two and 250 hours for month three) and is scheduled to start at the beginning of the project and complete at the end of month three. Due to a schedule slip the project actually starts two weeks late. You determine that the project can claim 45% done at the end of the first month, an additional 30% done at the end of the second month and an additional 15% done at the end of month three. Actual hours expended were 550 labor hours in the first month, 360 labor hours in the second month and 150 labor hours in the third month.

c) Milestone Weights - Task C is allocated 1000 hours (300 hours for first milestone, 325 hours for second milestone and 375 hours for third milestone), where the next milestone cannot start until the previous one is complete. The first milestone when complete claims 300 hours. The second milestone can claim 325 hours and the third milestone can claim 375 hours. The first milestone's activities start at the beginning of the month two; each milestone should take less than four weeks to complete. Use the data below to determine your answer.

Employee	Milestone	Month Charged	Hours Charded
Jerry Silver	one	month two	75
Roger Smith	one	month two	200
Michael jones	two	month three	100
Lisa Richards	two	month three	200

Table 1: Employee time charging summary

d) 0/100 - Task D is allocated 200 hours to begin in month four. It was able, due to a stroke of luck, to start and finish in month three using 175 hours of labor.

e) What are the total cost and schedule variances at the end of month three?

f) How would you rate the progress of the project?

g) Which task has the biggest weakness?

Assumptions

One assumption that must be made to do the requested computations is that we must assume that earned value is equivalent to the initial estimate for the task. Sometimes the estimate for the time it will take to complete a task can be skewed due to either over-estimation or under-estimation of the actual amount of work performed. Regardless of poor estimation, the cost variance and schedule variance must be made in reference to the initial estimate for the applicable equations to work. Changing the estimate to match the actual cost can reduce the cost and schedule variance, but does not paint a clear picture of the uncertainty related to the estimate.

Each section assumes a different computation method for earned value. As earned value is a component of both the cost and schedule variance, computing earned value according to percent complete will often give a very different answer than percent start/percent complete 0/100, for example. For each of the sections, baked into the problem is the assumption that the specified method of computing earned value is the most appropriate for that task.

Computations

For parts a-d, we need to determine the cost and schedule variance for each of the given scenarios. To compute the cost and schedule variance, we will use the following formulas:

$$Cost\ Variance\ (CV) = Earned\ Value - Actual\ Costs \quad (Eq. 1)$$

$$Schedule\ Variance\ (SV) = Earned\ Value - Budget \quad (Eq. 2)$$

These equations will be used to compute the cost variance and schedule variance based on the task estimation and current state.

Part a):

For part a we can simply plug in the values for earned value, actual costs, and budget into Eq. 1 and Eq. 2. The budget is 800 hours, and the actual costs are 1050 hours. Thus the cost variance can be computed as:

$$CV = 800 - 1050 = -250\ hours$$

For the schedule variance the problem specifies that we should use the Percent Start/Percent Complete 20/80 method. We are taking a snapshot at the end of month three, when the task is complete. Thus the earned value for schedule is 800 * 100% = 800 hours. With a budget of 800 hours complete at the end of three, we get the following for schedule variance:

$$SV = 800 - 800 = 0\ hours$$

Thus, even though at the end of two months we were behind schedule on the task, at the end of three months we were back on schedule, since the task was scheduled to be complete and the task was complete. At the end of two months, we only would have been able to take the 20% task start earned value, thus would have a schedule variance of SV = (800*0.2)-800=-640 hours. But at the end of month three we have a schedule variance of 0.

Part b):

To solve part b we need to compute the total number of hours worked and the percent complete. The total number of hours worked over the three month period is 550+360+150=1060 hours worked, and the percent of the task that is complete is 45%+30%+15%=90% complete. We can use the percent complete method to fill in values to Eq. 1 and Eq. 2 to compute the CV and SV for the project.

For cost variance we have completed 90% of a task that should have taken 1200 hours, and we have worked 1060 hours. Thus the cost variance is:

$$CV = (0.9 * 1200) - 1060 = 20\ hours$$

Thus we are 20 hours ahead in terms of productivity per hour.

However, at the end of three months, all 1200 hours were supposed to be complete, however just 1060 hours are complete. The schedule variance, which will show we are behind schedule, can be computed as:

$$SV = 1060 - 1200 = -140\ hours$$

Part c):

First we analyze the total number of hours charged. The employees in the group charged 75+200+100+200=575 hours. Using the milestone weights method, each milestone can only be claimed as earned value once the milestone is complete. For this task, we can claim the first milestone, since the group worked more than 300 hours. However, we cannot claim the second milestone, since we did not work the additional 325 hours required for the second milestone. Thus, we can only claim the first milestone complete with an earned value of 300 hours at the end of month three using the milestone weights method of computing earned value. Using this figure, we can compute the cost and schedule variance. Cost variance is as follows according to Eq. 1 and Eq. 2:

$$CV = 300 - 575 = -275\ hours$$

Schedule variance can also be computed using the milestone weights method at the end of the three months. Since each milestone should take less than 4 weeks to complete, a conservative estimate would project at least milestone 2 to be complete at the end of month three. Thus the schedule variance is:

$$SV = 300 - (300 + 325) = -325\ hours$$

Thus, according to the cost and schedule variance equations and the milestone weights method of computing earned value we are behind in both cost and schedule. However, much of this perceived variance can be alleviated by working the extra 50 hours to complete milestone 2.

Part d):

This project is in pretty good shape, considering it was complete in less than the estimated amount of time. And using the 0/100 percent start/percent complete method with a completed task we can claim all 200 hours for the task as earned value. We can compute cost variance as shown below:

$$CV = 200 - 175 = 25\ hours$$

Thus we saved 25 hours on cost. Given that all 200 hours were scheduled to be worked in month 4, and all of the task was complete in month 3, then we can say that the project was complete 200 hours ahead of schedule.

$$SV = 200 - 0 = 200\ hours$$

Discussion/Conclusions

Part e):

To get the total cost and schedule variance for the project, assuming the only ongoing tasks are summarized in parts a-d, we can simply tabulate and do a summation of the cost and schedule variance for each task. A summary of each is in the table below:

	Cost Variance	Schedule Variance
Task a)	-250	0
Task b)	20	-140
Task c)	-275	-375
Task d)	25	200
Totals:	-480	-315

Table 2: Summary of cost and schedule variance for all project tasks

Thus it can be concluded that as a whole, the project is behind in both cost and schedule.

Part f):

As specified in table 2, the project was determined to be behind in both cost and schedule. However, I may argue that we are not as behind as the cost and schedule variance equations may have you to believe at the end of month 3. For example, a lot of the cost and schedule variance is driven by task c, which was inflated due to the fact that task c milestone 2 could not be complete at the time of the snapshot. Not being able to claim task 2 added 325 hours to each of the cost and schedule variance negative balances, and we could have claimed those hours by working just an additional 50 hours, and hopefully get back on track for month 4.

Some of the tasks had negative cost and schedule varience, however for both schedule and cost variance, half of the tasks had even or positive variance, indicating expected or better than expected progress. While we want to eliminate those tasks with negative variance, tasks with even or positive variance should be highlighted as general positives.

Thus we can rate the progress of the project. According to a subjective 0-10 scale, with 0 being a complete disaster and 10 being a project where everything is complete perfectly to estimate, I give this project a 6/10, which corresponds to “ok, not great”.

Part g):

To determine which task has been the biggest weakness, we can utilize a matrix to map the cost and schedule variance to see if it is positive or negative and assign each task to a section of the matrix. Each square in the matrix is color coded (green=good, red=bad, yellow=not ideal) and labeled with what it means, as well as the tasks that fall under that category in the matrix. This will help us determine the biggest weaknesses for the project. See the cost and schedule variance matrix below:

	Positive/Neutral Cost Variance (under running cost)	Negative Cost Variance (over running cost)
Negative Schedule Variance (behind schedule)	**Behind schedule / under running cost – not ideal** Task b	**Behind schedule / over running cost – bad** Task c
Positive/Neutral Schedule Variance (ahead of schedule)	**Ahead of schedule / under running cost – great!** Task d	**Ahead of schedule / over running cost – not ideal** Task a

Table 3: Cost and schedule variance status matrix

Assorting each of the tasks in this way gives us an easy way to identify tasks that are going poorly (even though this does not take actual value into account). Since task c is the only task in the red, we can conclude task c is the task which is the biggest weakness. Task c should be the target of additional focus in month 4 of this project to get it back into yellow or ideally green territory.

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Problem Statement (Part 2)

You are given the following information contained in a WAD for the Smart Highway Project:

- WAD opens on July 1, 2015
- WAD closes on December 31, 2016
- WAD contains 6050 hours
- WAD includes five work package tasks as follows:
    - WP1 will require 900 hours beginning at the start of the Smart Highway Project and spread evenly over 12 months
    - WP2 will require 1 full-time equivalent head (FTE) in the first month of the project, 2 FTEs in the second month, 3 FTEs in the third month, and 1 FTE in the fourth month
    - WP3 will require 2 FTEs in each of months 5 through 10
    - WP4 will require 2 FTEs in each of months 13 through 18
    - WP5 will require 500 hours over the last 3 months of the project

It is May 2015 and you assume you will have the staff to apply to the project as needed. Depict a Cost Account Schedule (CAS) for the first six months and the later months (include each Work Package Task). Show the Cost Account Plan (CAP) for the entire Smart Highway Project in six-month increments. Assume the calendar month is the accounting month. Assume a staff month (full-time equivalent) is 150 hours per month for a full-time equivalent head.

Assumptions

Not too much to include in the assumptions section for this problem. Some basic assumptions include the fact that the CAS and CAP are only estimates for how much work should be done, and can change based on actual work done, delays, etc. Further, assumptions baked into the problem include assuming the calendar month is the same as the accounting month and that a staff month is 150 hours.

Computations

According to the information given in the problem, we can aggregate that information into a cost account schedule quite easily for each of the work packages. I broke my CAS into 6 month increments so that it could be easily viewed in document form. Below is the CAS for months 0-6, 6-12, and 12-18:

Month	1	2	3	4	5	6	(totals)
WP1 (hours)	75	75	75	75	75	75	450
WP2 (hours)	150	300	450	150	0	0	1050
WP3 (hours)	0	0	0	0	300	300	600
WP4 (hours)	0	0	0	0	0	0	0
WP5 (hours)	0	0	0	0	0	0	0

Table 4: CAS months 0-6

Month	7	8	9	10	11	12	(totals)
WP1 (hours)	75	75	75	75	75	75	450
WP2 (hours)	0	0	0	0	0	0	0
WP3 (hours)	300	300	300	300	0	0	1200
WP4 (hours)	0	0	0	0	0	0	0
WP5 (hours)	0	0	0	0	0	0	0

Table 5: CAS months 6-12

Month	13	14	15	16	17	18	(totals)
WP1 (hours)	0	0	0	0	0	0	0
WP2 (hours)	0	0	0	0	0	0	0
WP3 (hours)	0	0	0	0	0	0	0
WP4 (hours)	300	300	300	300	300	300	1800
WP5 (hours)	0	0	0	166.67	166.67	166.67	500

Table 6: CAS months 12-18

We can further summarize these results into the CAP, which gives a higher level view on the hours breakdown for a given period. Given a period of 6 months (which lines up nicely with the Tables 4-6) we can calculate the total number of hours for each period. Below is the CAP:

Hours	2100	1650	2300
Months	0-6	6-12	12-18

Table 7: CAP months 0-18

Discussion/Conclusions

This exercise is fairly simple, since all we are doing is aggregating information from the WAD into the CAS and the CAP. While the WAD is used to contain the tasks and breakdown the phases of the project lifecycle, the CAS is used to schedule milestones, and the CAP is used to show the contract hours, all three documents should be aligned at all times, and should show the same information, just broken down in different ways. It is usually helpful to check that the number of total hours (6050) match in all three of the WAD, CAS and CAP just to ensure there are no trivial mistakes.