Université d'Ottawa · University of Ottawa

**School of Electrical Engineering and Computer Science**

**ELG 5100, Fall 2013**

**Assignment 2 Solution**

**Q1.**

**a)** BCWP: budgeted cost of work performed = 5 + 11 + 12 = 28000 $
ACWP: Actual cost of work performed = 4 + 11 + 13 = 28000 $
BCWS: budgeted cost of work scheduled = 5 + 11 + 12 + 12 = 40000 $

Cost performance index:
CPI = BCWP/ACWP = 28/28 = 1.0

Schedule performance index
SPI = BCWP/BCWS = 28/40 = 0.7

Critical ratio
CR = SPI * CPI = 0.7

i) From the CPI (cost performance index) we can say that the project is on budget since the index is one. We can also see by looking at the numbers that the project's actual costs are very close to the budgeted costs. However, we must keep in mind that D is not finished yet and so it is not taken into account in our calculations. Depending on D, we might have a problem with budget (or not, hopefully). A good project manager would reserve judgment until D is finished too.

ii) From the SPI (Schedule performance index) we can say that the project is late and doesn't seem to run smoothly on schedule since the index is less then 0.8, the project scheduling should be checked. We can actually see from the numbers in the table that for all 3 milestones the real values were off from the scheduled values: first milestone took 4 instead of 5 (shorter), the second 12 instead of 10 (longer), and the third 4 instead of 5 (shorter), and more importantly, the fourth one is not finished yet even though it was supposed to be done by month 25.

iii) As for the overall health of the project, the CR (critical ratio) shows a project that is not in very good health since it is less then 0.8. In this case the schedule is the problem.

**b)** If the current trend continues, the estimated time at completion is:
ETAC = Original Time / SPI = =30/0.7= 42.9 ≈ 43 months

The estimated cost at completion ECAC = BAC/CPI,
where BAC = budget at completion = 5+11+12+12+11= $51K
ECAC = 51/1.0 = 51000 $

**Q2.**

**a)** Modularity = Cumulative number of broken SLOC due to N defects,
where N = C0+C1+C2.
Modularity = B/N = (500+5000+300)/(20+100+20) = 5800/140 = 41.43 SLOC/defect

**b)** Adaptability = Cumulative effort spent fixing N / N
= E/N = 5+30+15/140= 50/140 = 0.36 man-days/defect

**c)** Maturity = Usage time / Number of defects C0 C1 = UT/(C0+C1) = 720/(20+100)
= 6 hours/defect

**d)** Maintainability = scrap ratio/rework ratio
Scrap ratio = $B/SLOC_T$ = Breakage/total SLOC = (500+5000+300)/15000 = 0.387
Rework ratio = Rework effort/Development_Effort
= E/Dev_effort
= (5+30+15)/300 = 50/300 = 0.167
=> Maintainability = 0.387/0.167 = 2.32

**Q3**.

**a)** Two ways to solve this problem:

1- Project velocity is the total of estimates of the user stories done during an iteration (official definition); hence, Project Velocity = 3 + 7 + 6 + 5 + 10 + 10 + 8 = **49 man-days/iteration**

2- Total number of developers = 7 persons
Total original estimated days = 3+7+6+5+10+10+8 = 49 days
Total actual days needed = 5+10+10+8+10+7+9 = 59 days

"a day's worth of estimated work" takes on average 59/49 = 1.20 actual days
each person works, on the average, 59/7 = 8.43 days/iteration (not everyone is fulltime!)

hence, Project Velocity = 7 * 8.43 / 1.20 = **49 man-days/iteration**

**b)** In the next iteration, we will have a velocity of 49 man-days per iteration, which means we can assume that we will deliver 49 man-days worth of originally-estimated work in the iteration, if the iteration was 10 working days (2 weeks). However, the iteration is 9 days, due to the long weekend; therefore we can expect to deliver:

(49/10)*9 = **44.1** days or original estimates.

We have a total of 51 man-days in the estimates table, leaving 51 – 44.1 = 6.9 ≈ 7 days of work that will not fit in iteration 2. We can move D2 and D3, for example, to iteration 3. Other tasks will make it to iteration 2.

About A2: note that A2 needs 10 days to be done which, compared to the 9 days available in the next iteration, seems not doable in the next iteration. However, the table doesn't say how A2's 10 days are scheduled. It could be that more than one developer spend time on it in parallel, in which case it will fit in the next iteration. But if A2 needs 10 days sequentially, then of course it will not fit in the next iteration. But, since the problem is explicitly saying "Ignore actual assignment of the tasks to specific developers", either of the answers will be acceptable.

**Q4.**
**a)**

- Time To Market - Product Development Cycles were long and unpredictable. Often market windows and requirements had changed since project began.
- Long integration cycle – Various development and test teams worked in silos resulting in refactoring of code during integration
- Release Tax – Testing began after code complete resulting in long test and bug fix cycles
- Lack of Feedback from Stake holders – End product often missed expectations of customer.

**b)**

The development process embraces iterative, test driven development with requirements defined as End to End use cases. This provided the following benefits

- Provided a mechanism for handling changing requirements (introduced on sprint boundaries). Requirements are prioritized according to business/customer needs and may be reprioritized based on changing customer needs and/or market conditions.
- Work is broken down into end to end use-cases that include all work items needed to deliver a product i.e. (design, coding software testing, documentation, lab set up, tool development etc.). Estimates included all of the work items needed to complete the use case (not just the coding piece.)
- Multi disciplined teams focused on building out the feature content for a release. Testing and documentation was done on each use case so that the back end release tax was reduced i.e. the time between code complete and product delivery. Backend integration between different components of the system was done as part of each work item.
- We maintain a Potentially Shippable Software load at all times by resolving, testing and closing bugs, running continuous regression testing, and adhering to our doneness criteria for tasks, Product Backlog Items and Releases.