Homework #6 Answer Key

Part 1 (20 Points)

1. (5 points)

Changes:

- Switch for Uncertain Customer Requirements =0
- Normal Quality = 0.8
- Willingness to Hire = 0

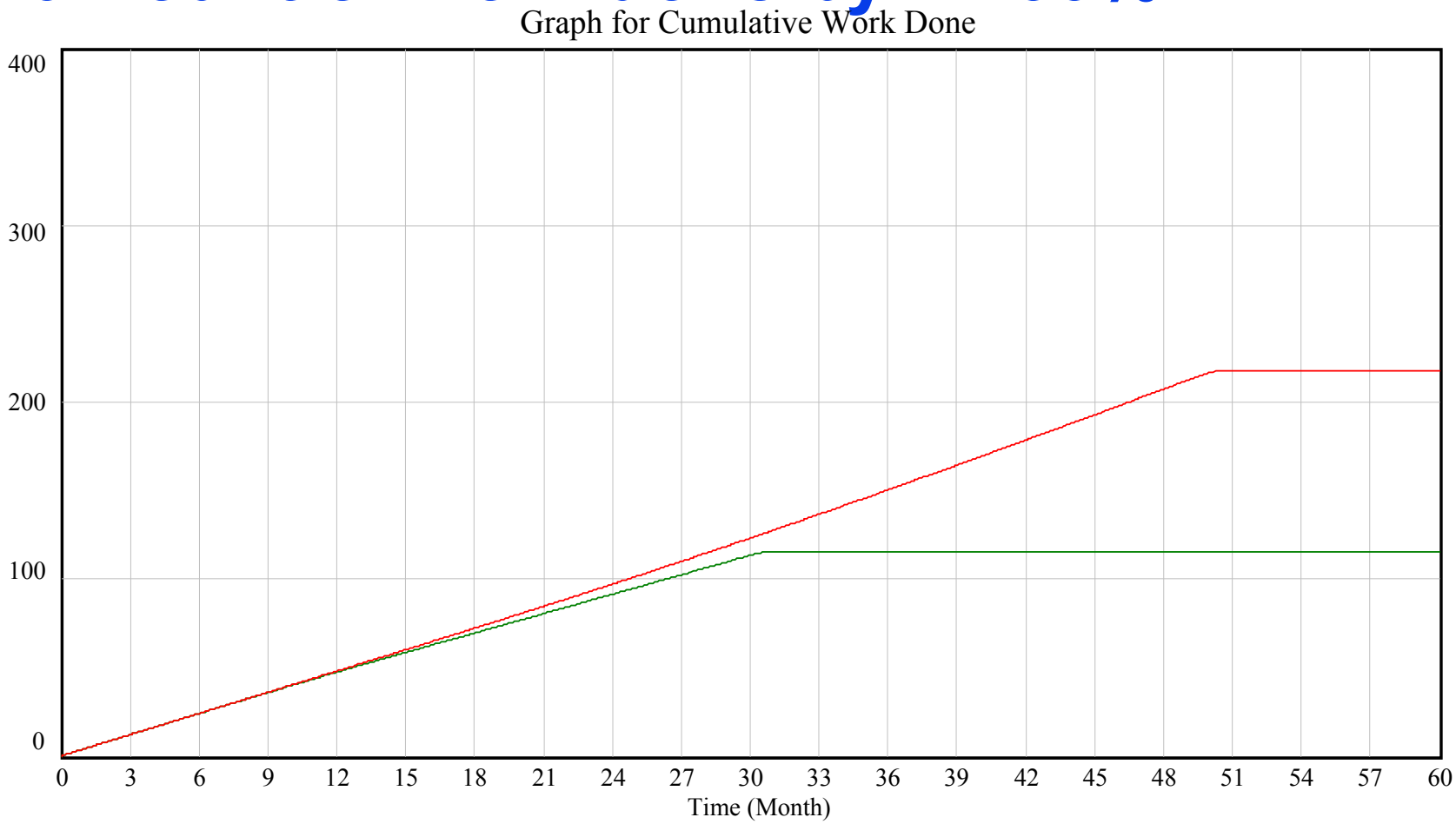
2. (5 Points)

Best estimate has project finishing at month 50 and costing 201 person-months.

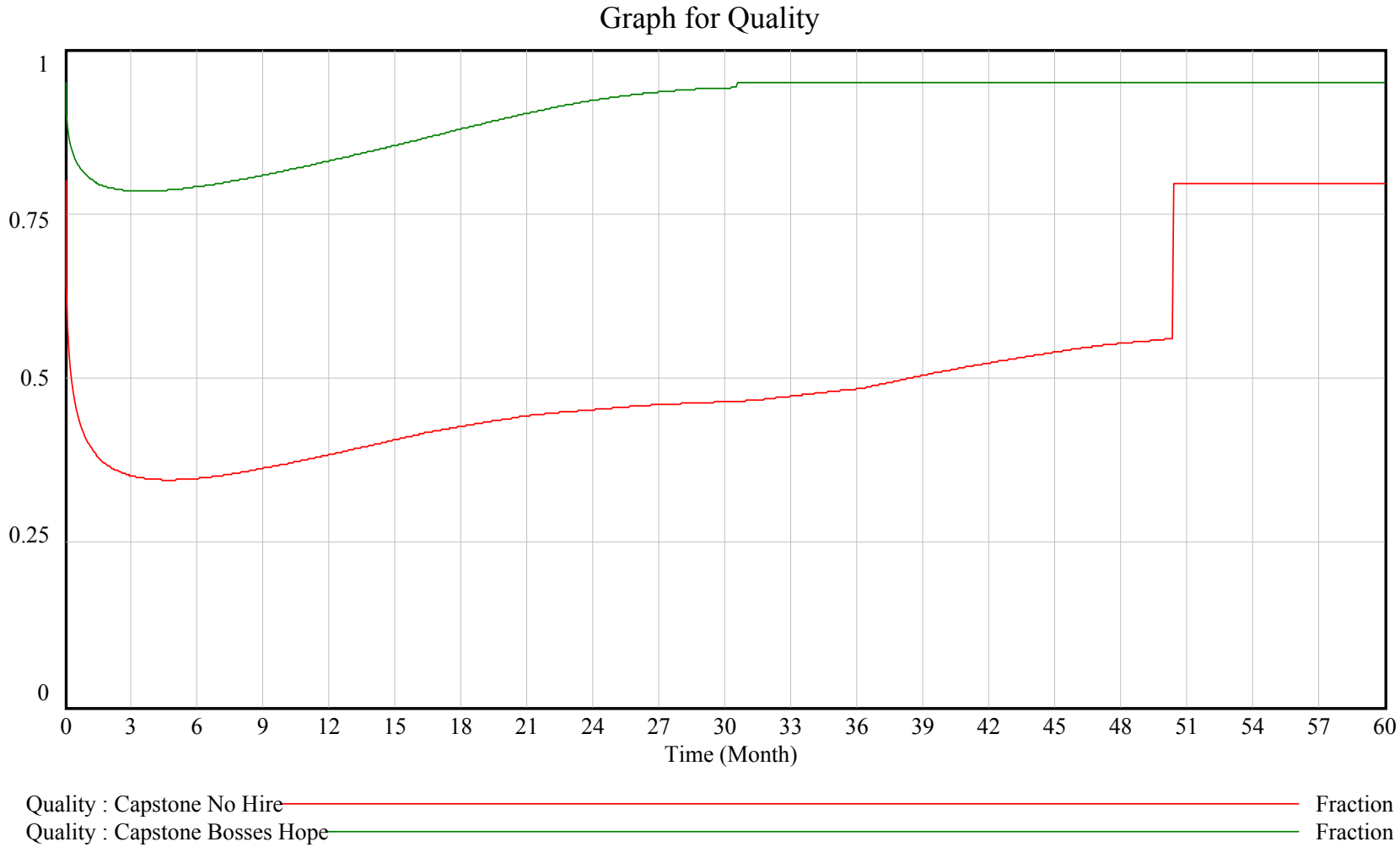
3. (10 Points) A 15 percentage point increase in errors ...

- Feedback effects amplify the 0.95 to 0.80 reduction in normal quality to create the four-fold increase in additional work (see following charts).
- And because of the additional work without additional staff, the project takes longer.

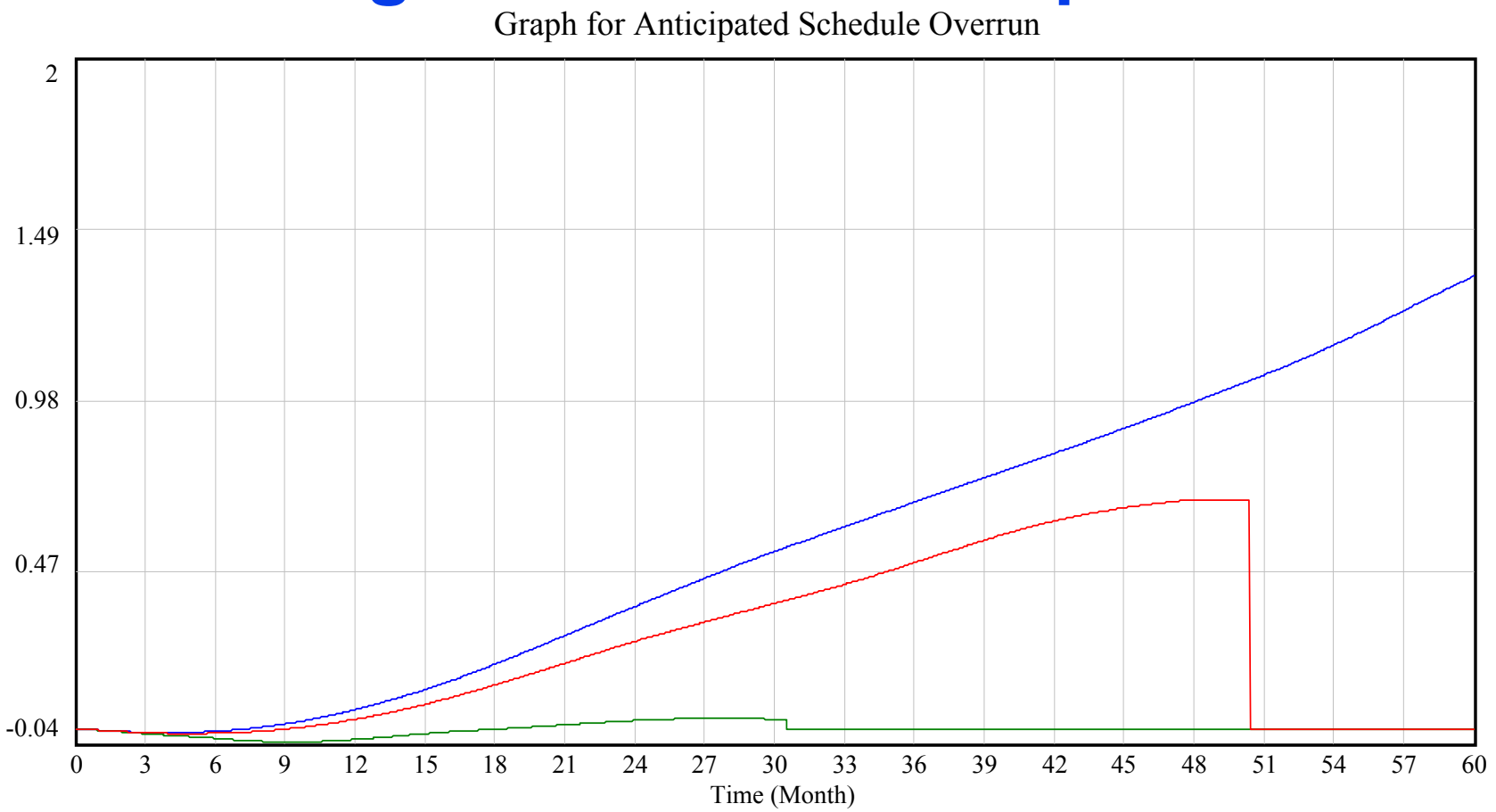
Lower quality increases the total amount of work done by ~ 100%



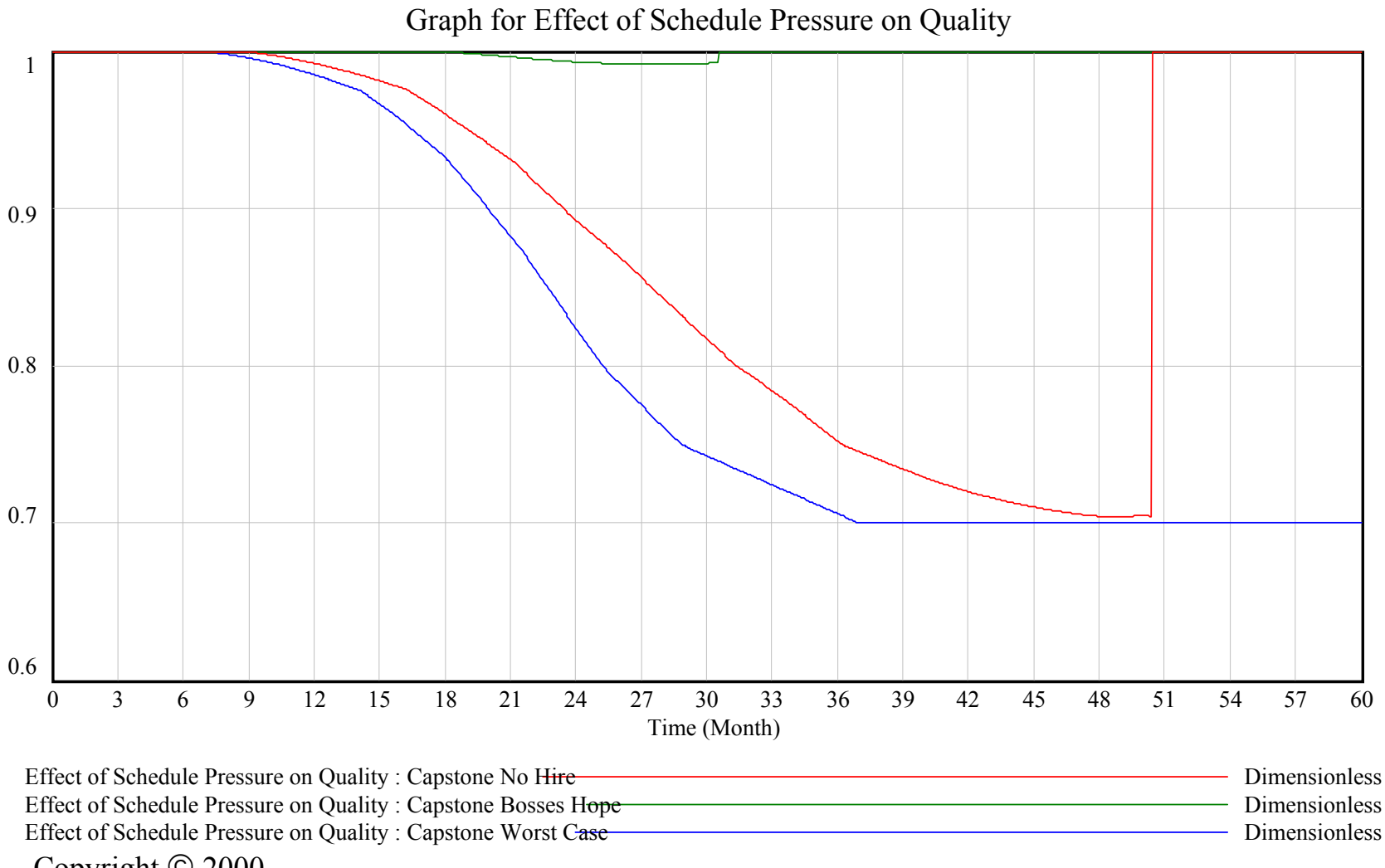
While normal quality is 0.8 (vs. 0.95 in bosses hope), actual quality is far lower because of feedback effects ...



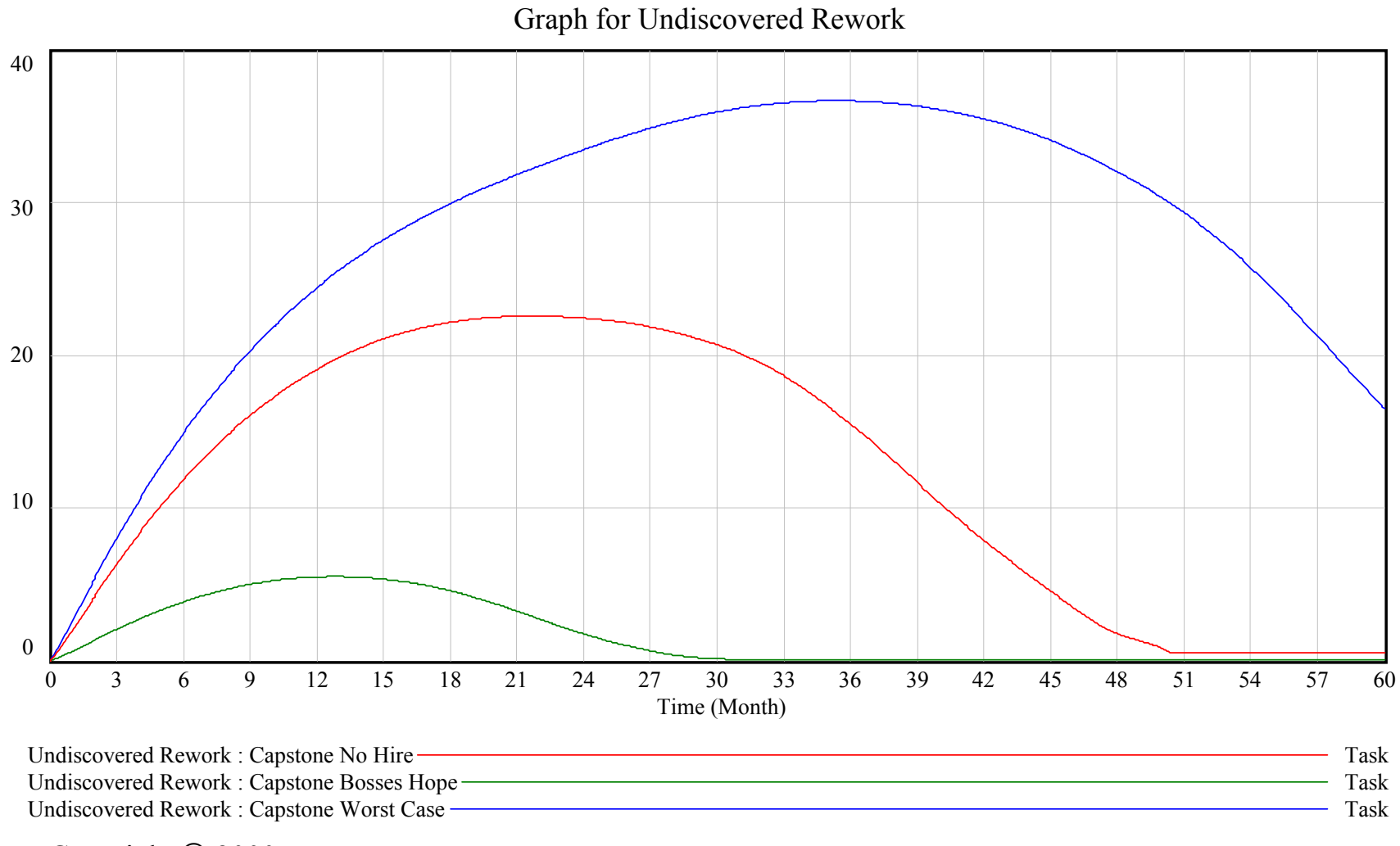
Trying to meet an unrealistic plan creates significant schedule pressure ...



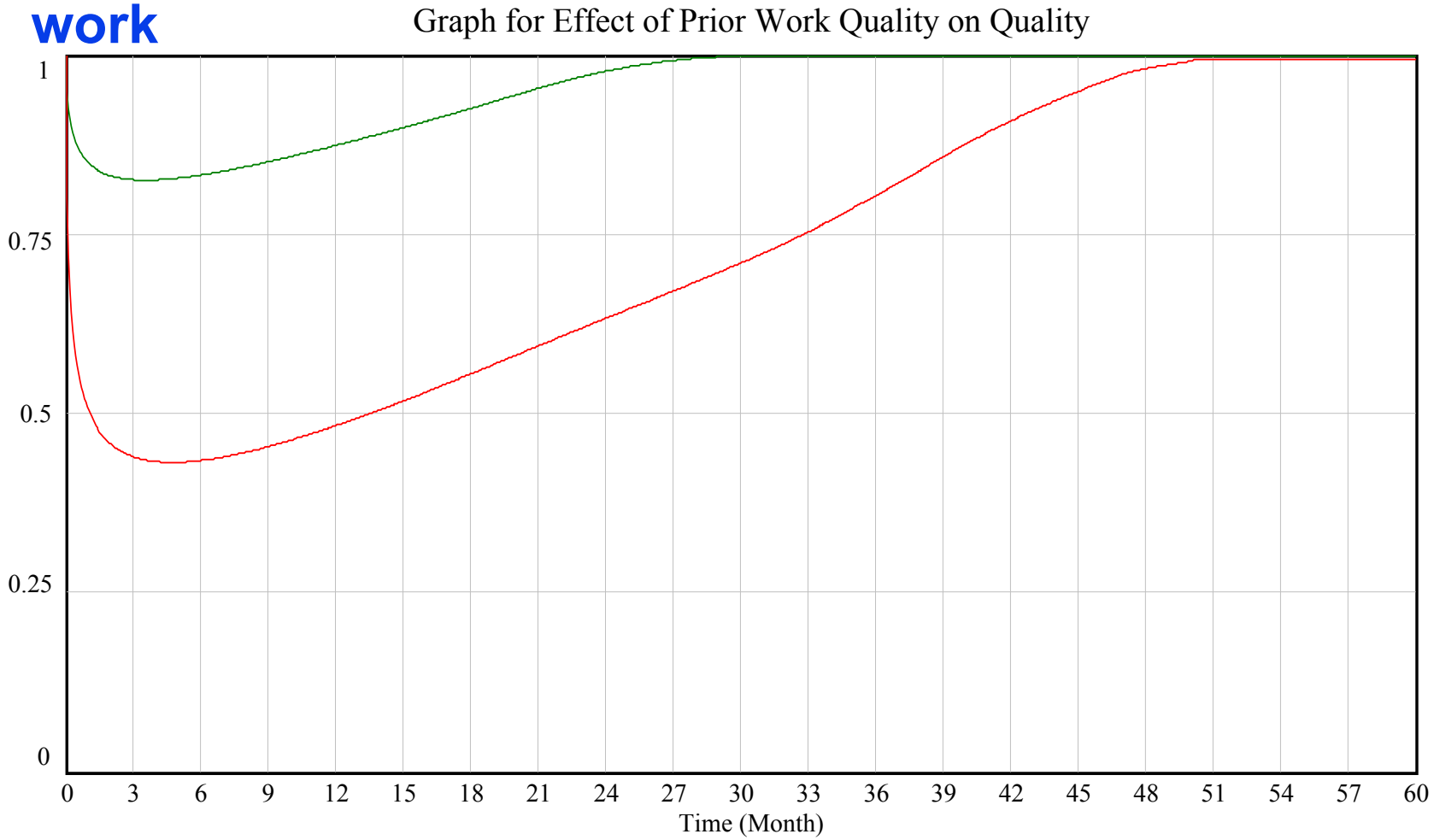
… which causes quality to fall ...



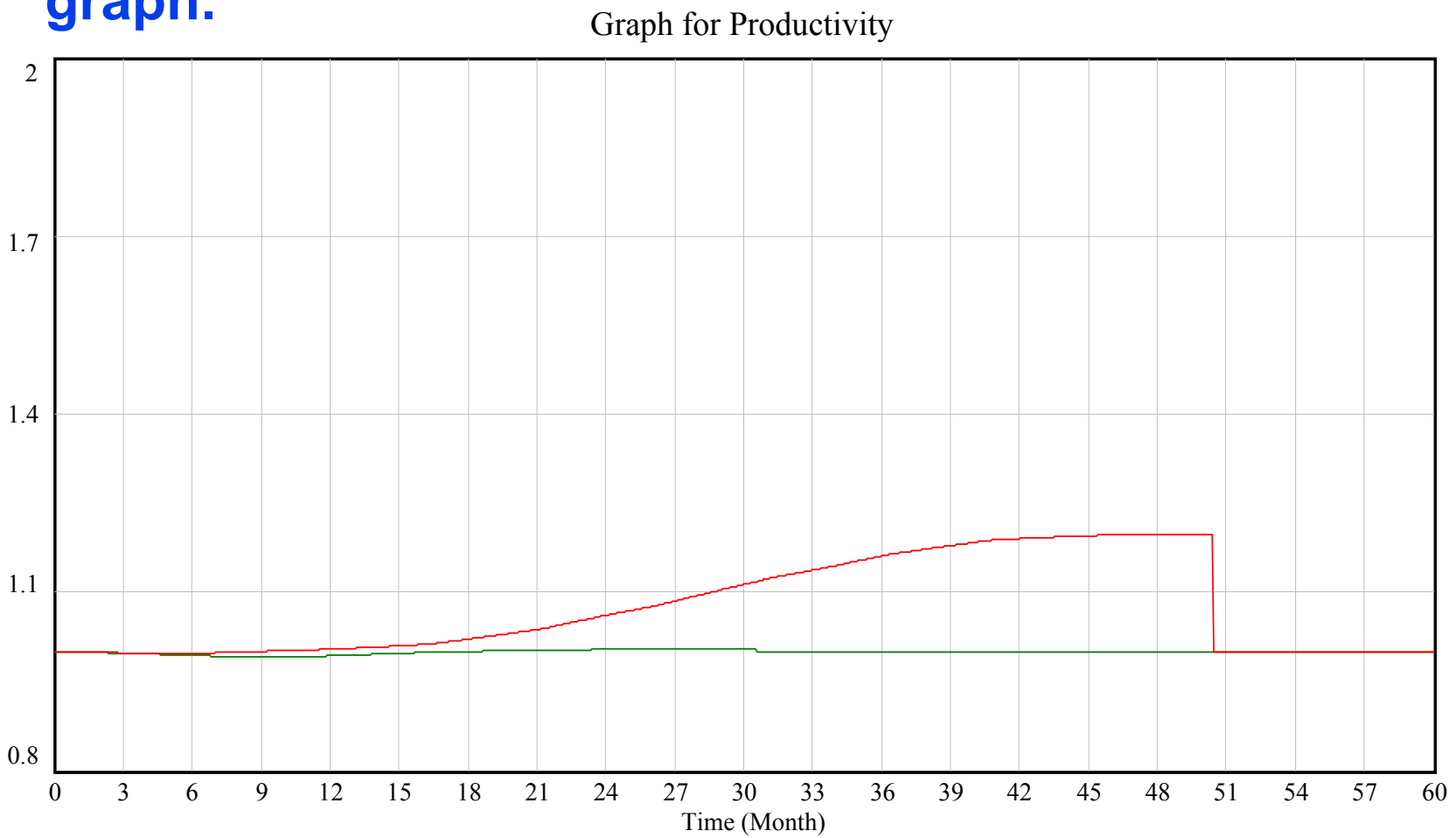
… increasing rework and making the project perform worse



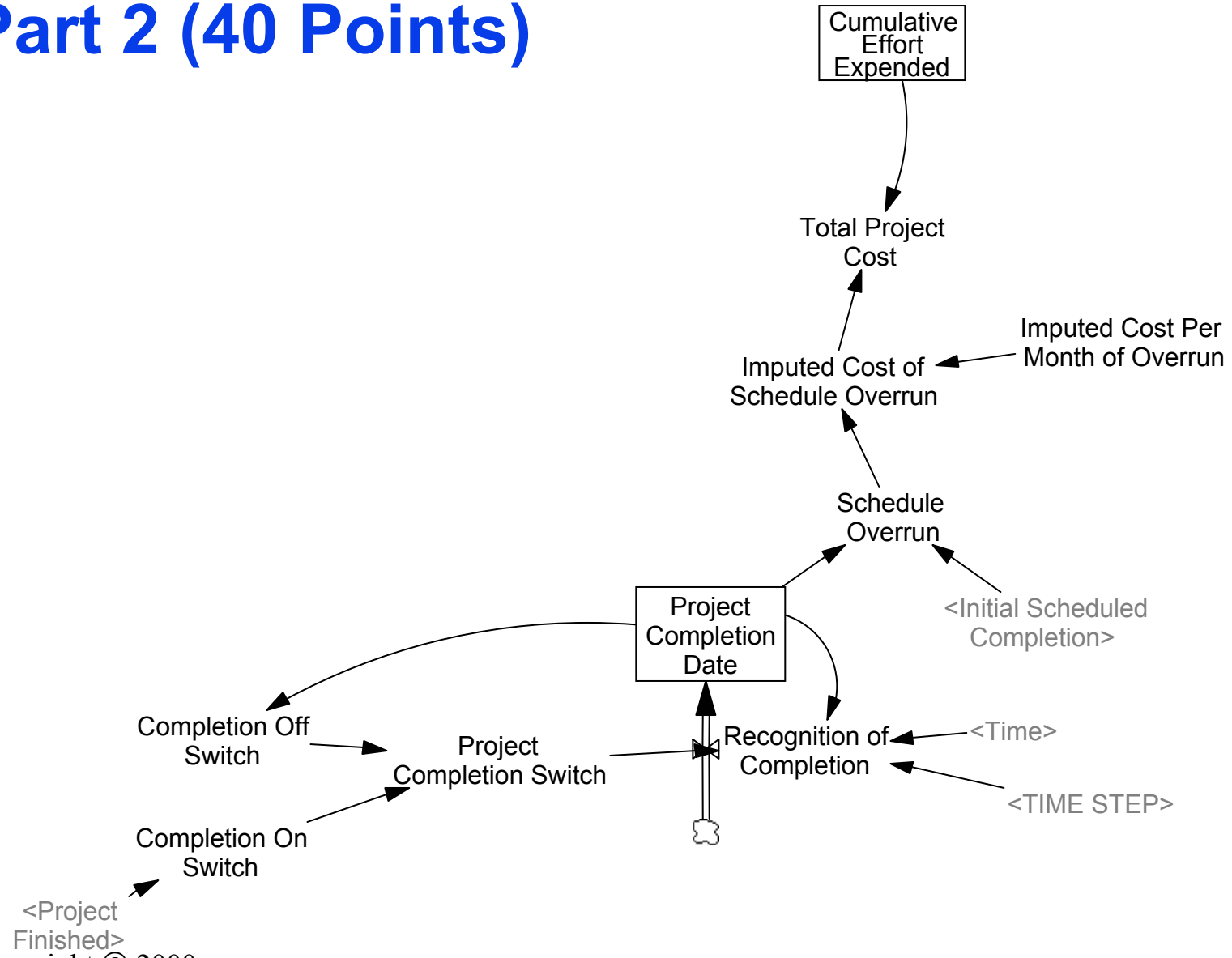
"Quality on quality" is the key driver -- undiscovered errors causes errors in downstream work



While schedule pressure also increase productivity, the net effect is more total work as shown in first graph.



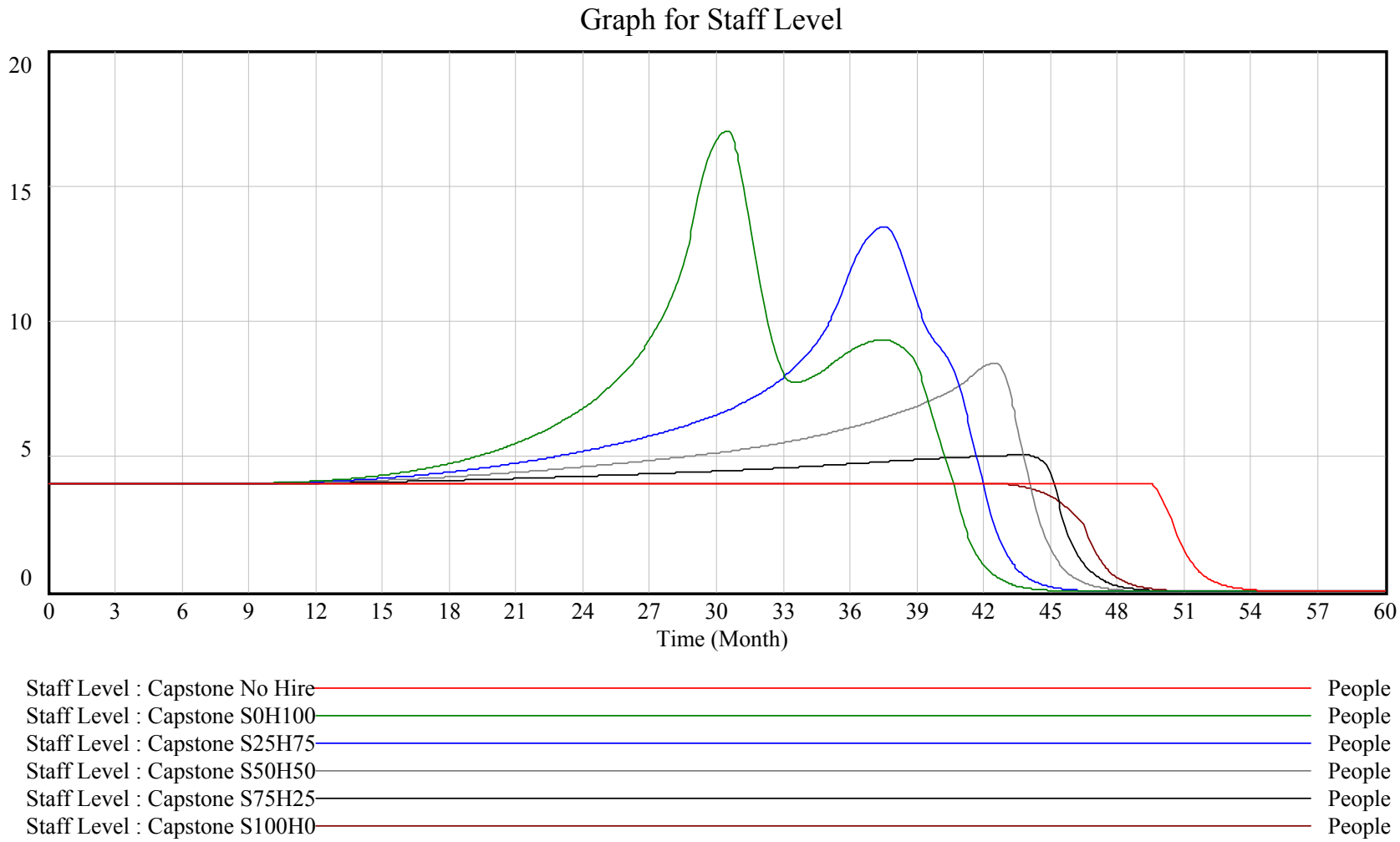
Part 2 (40 Points)



1. (15 Points) Hiring/Schedule Slip Analyses

Test	Finish	Dir. Cost	Total Cost
No Hire	50.43	201.2	405.6
S0H100	40.68	271	377.9
S25H75	41.93	248	367.4
S50H50	44.0	218	358
S75H25	45.25	196.4	348.9
S100H0	46.5	184.2	349.2

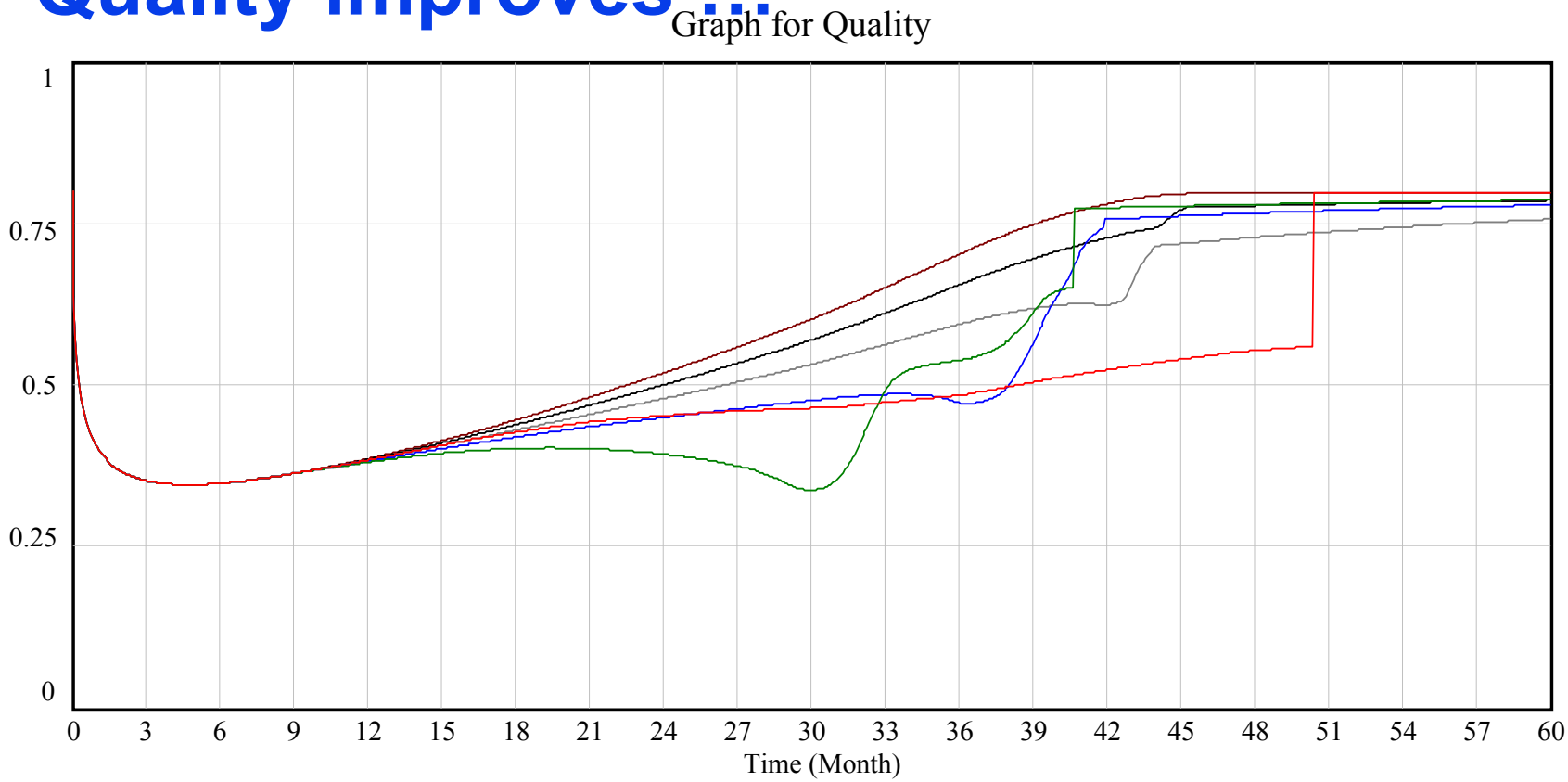
2. (5 Points)



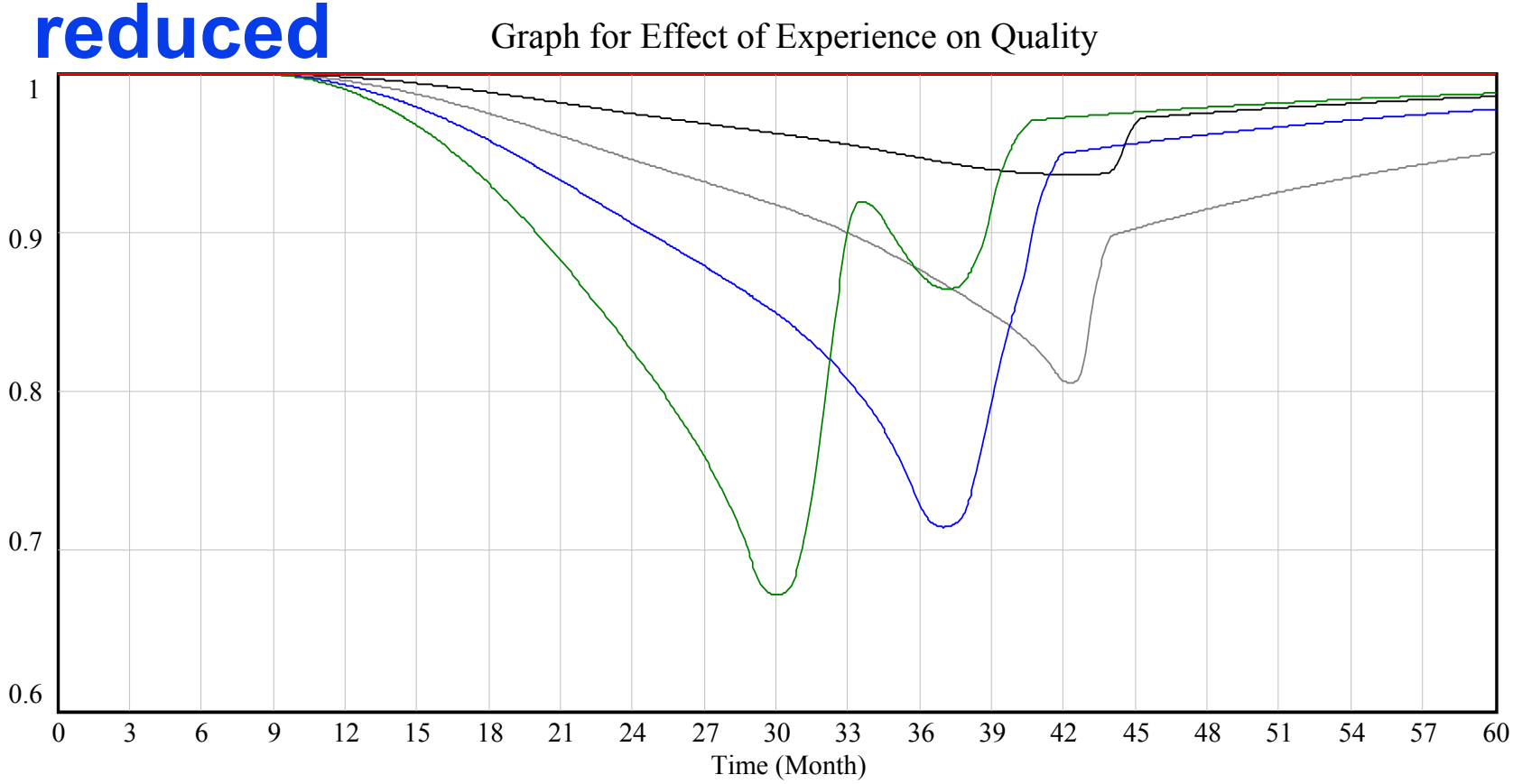
3. (15 Points) Tradeoffs

- Direct cost falls as hiring is constrained and the schedule slipped, because (see graphs below) experience dilution is reduced and schedule pressure effects on quality reduced.
- Imputed cost increases with delay on the project. Given the numbers, schedule slip improves performance.

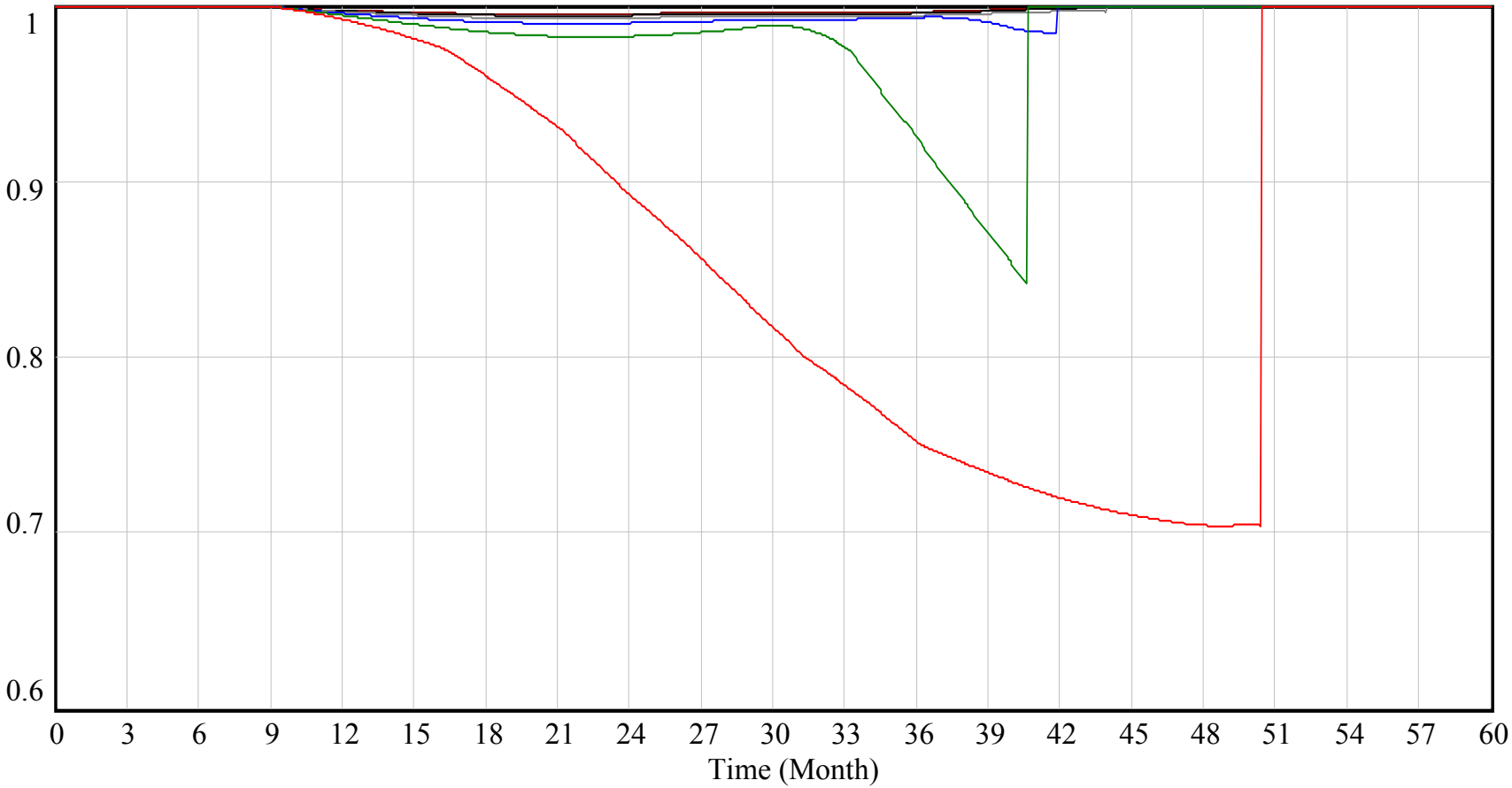
Quality improves....



… because experience dilution is reduced

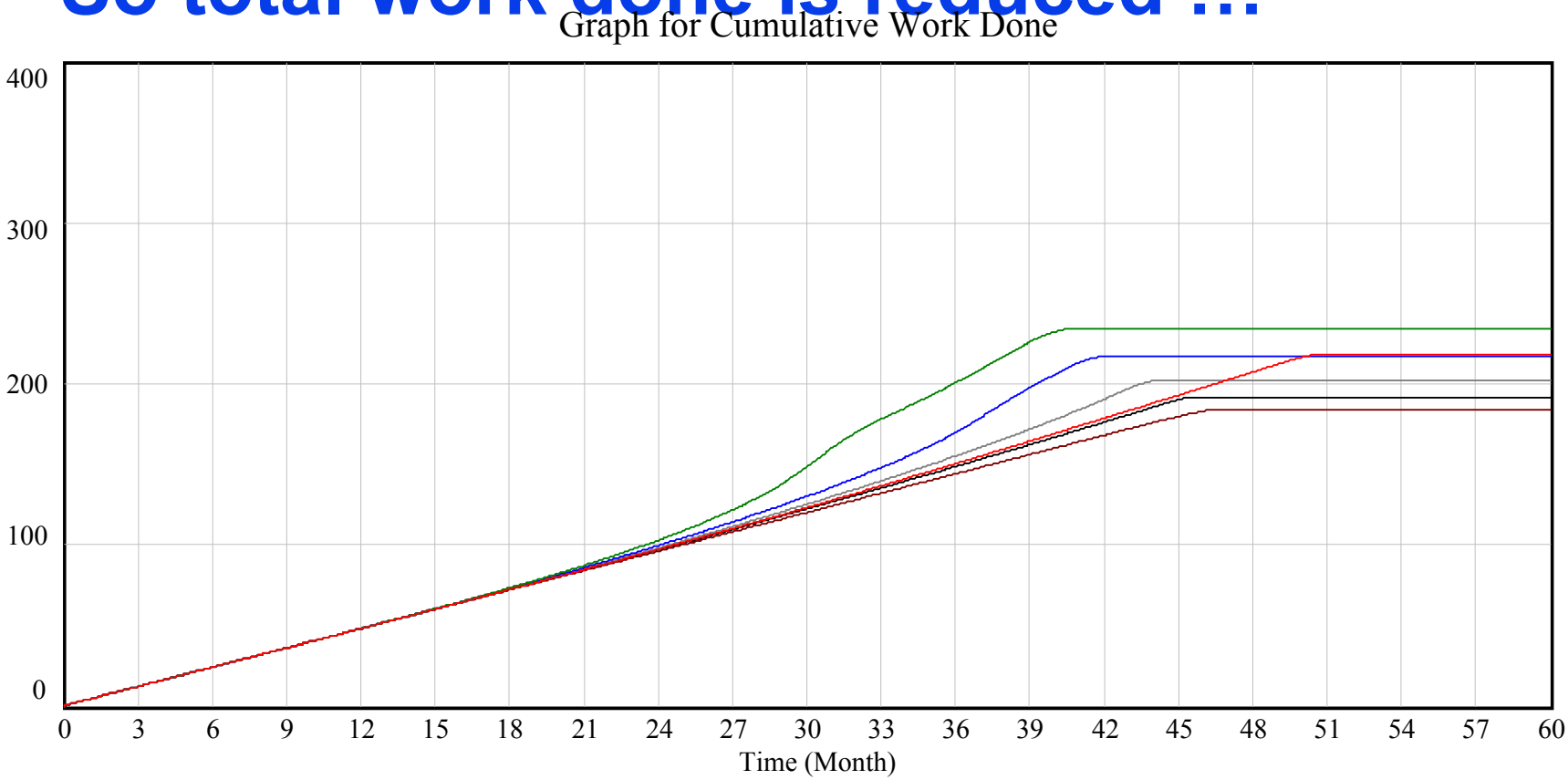


Graph for Effect of Schedule Pressure on Quality



Effect of Schedule Pressure on Quality : Capstone No Hire — Dimensionless
Effect of Schedule Pressure on Quality : Capstone S0H100 — Dimensionless
Effect of Schedule Pressure on Quality : Capstone S25H75 — Dimensionless
Effect of Schedule Pressure on Quality : Capstone S50H50 — Dimensionless
Effect of Schedule Pressure on Quality : Capstone S75H25 — Dimensionless
Effect of Schedule Pressure on Quality : Capstone S100H0 — Dimensionless

So total work done is reduced …



4. (5 Points)

- Best is WTS=.75, WTH =.25, as it provides the lowest total cost.
- To be thorough, they might want to test this with a quality of .7 and also .95. This was not specifically requested, so perhaps we should give extra credit if they did some sensitivity tests.

Part 3 (40 points)

1. (5 Points) For Changes and some explanation --

Normal pdy =.9

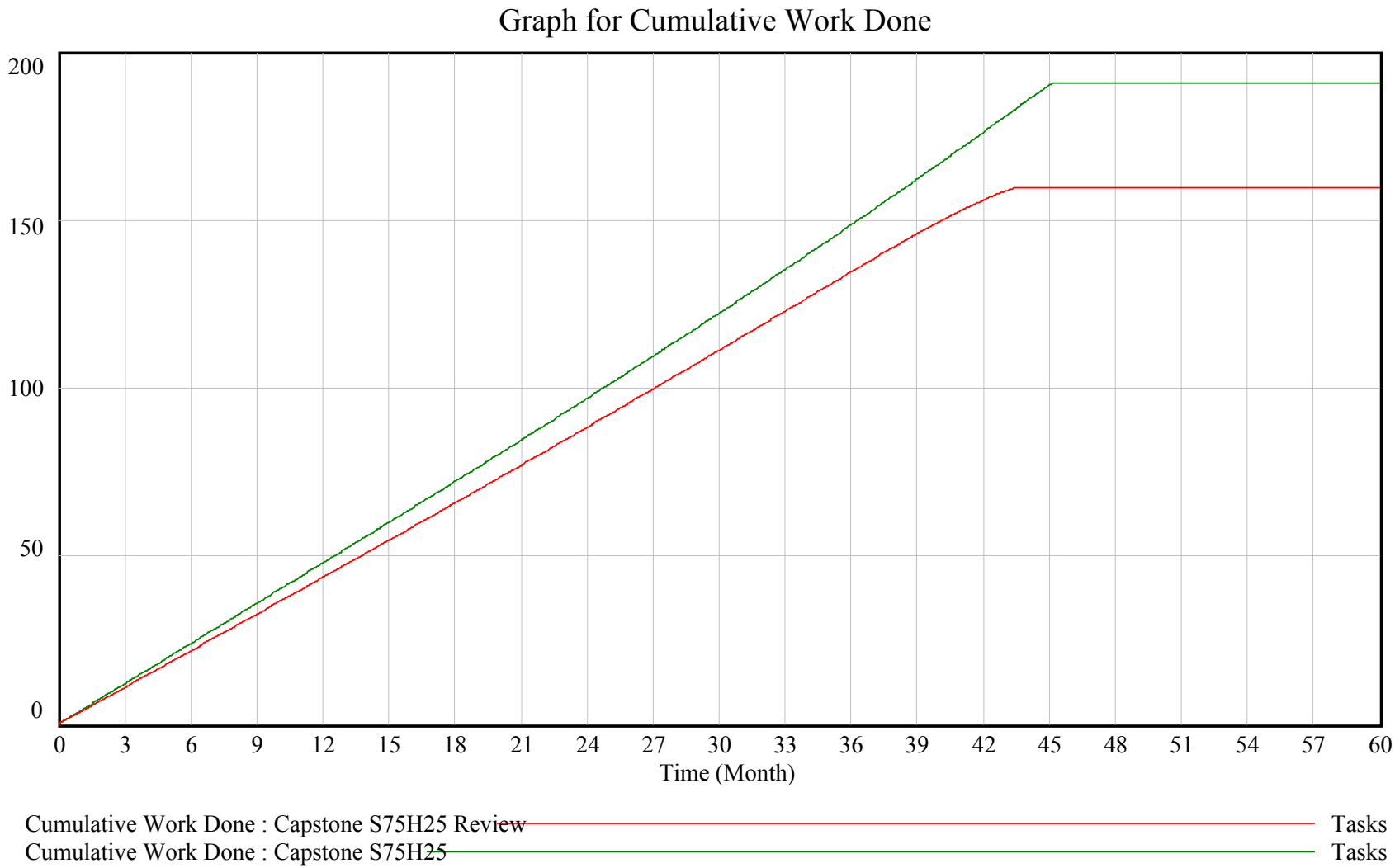
Max rwdd = 6 mos

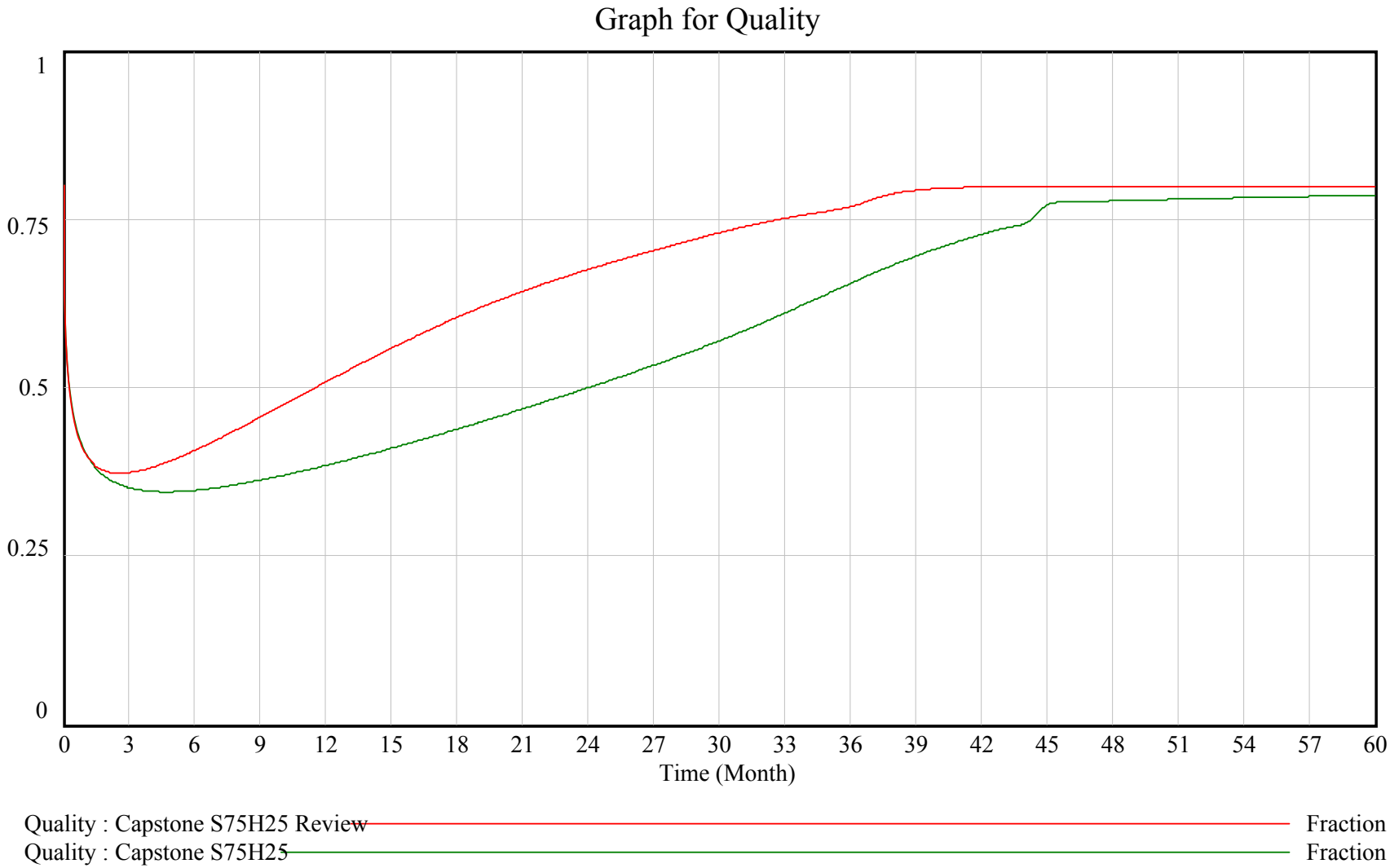
2. (10 Points) for what happened & why)

The performance of the project improves --

- completion date is 43.5 (vs. 45.25)
- direct expenditures fall to 180.11 (vs. 196.4)
- total cost improves to 313.11 (vs. 348.9)

Why -- as shown in graphs following, a shorter rework discovery time reduces the amount of undiscovered rework and thereby decreases the quality on quality effect; quality improves, and less total work is done. Doing less work offsets the productivity hit.





3. Sensitivity (15 Points)

The benefit of the proposed review process decreases as the rework discovery reduction decreases. If the rework discovery time is only cut to 8 months from 12 months (rather than to 6 months), the review process produces no net benefit -- the quality improvement and work reduction is offset by the lower productivity.

The “breakeven” point for rework discovery delay increases to 9-10 months if normal quality (technical risk) falls to 0.7.

Sensitivity

The advisability of adopting the review process would depend on your confidence in getting at least a reduction to 8 months, or less if technical uncertainty might be higher.

Sensitivity Analyses

Test	Finish	Dir. Cost	Total Cost
No Hire	50.43	201.2	405.6
S75H25	45.25	196.4	348.9
RWDD = 6	43.5	180.1	315.1
RWDD = 7	44.6	186.3	315.1
RWDD = 8	45.6	192.2	348.5
RWDD = 9	46.6	198.2	364.5

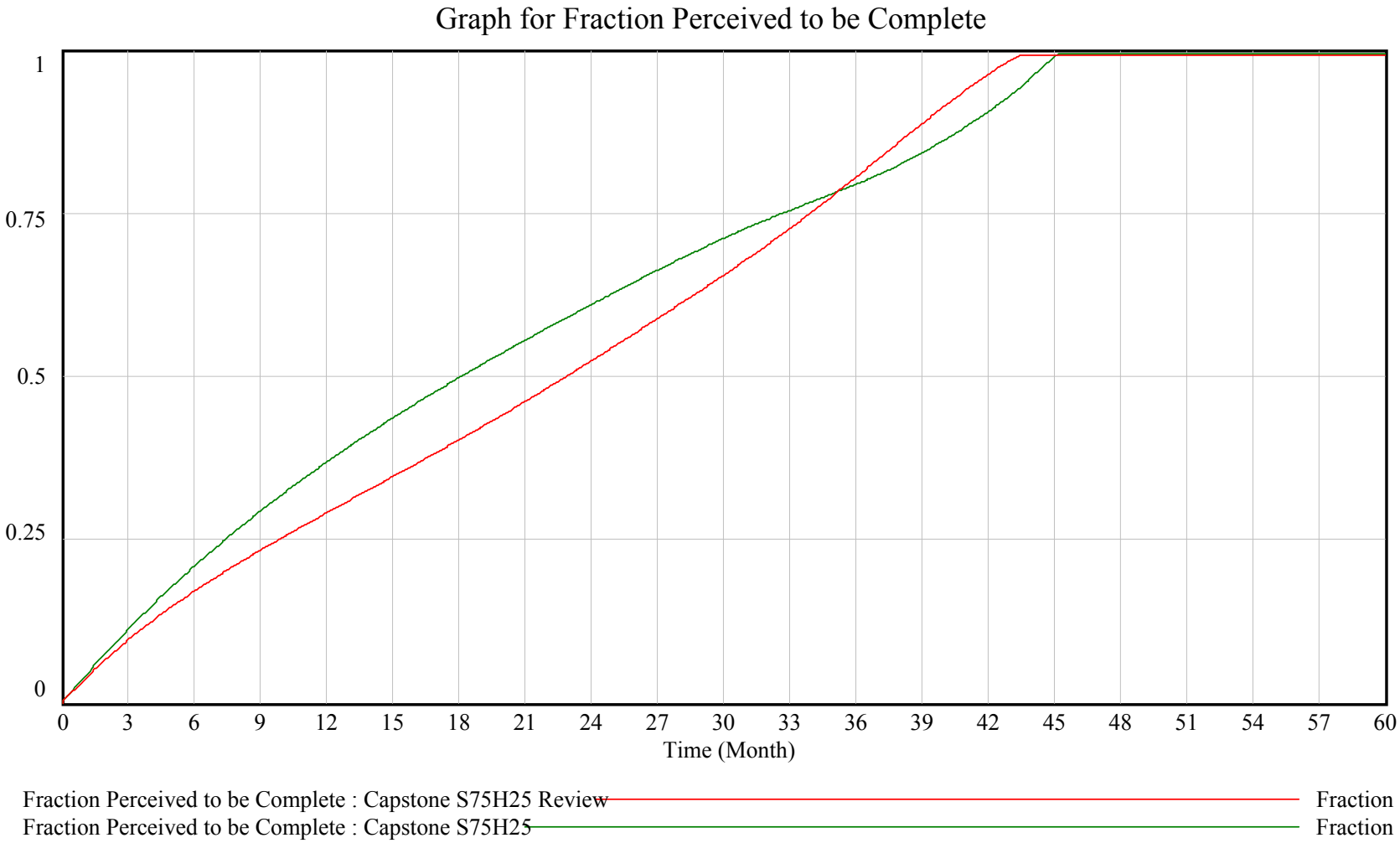
Sensitivity Analyses (Worst Case NQ=.7) [not asked Fall 2003]

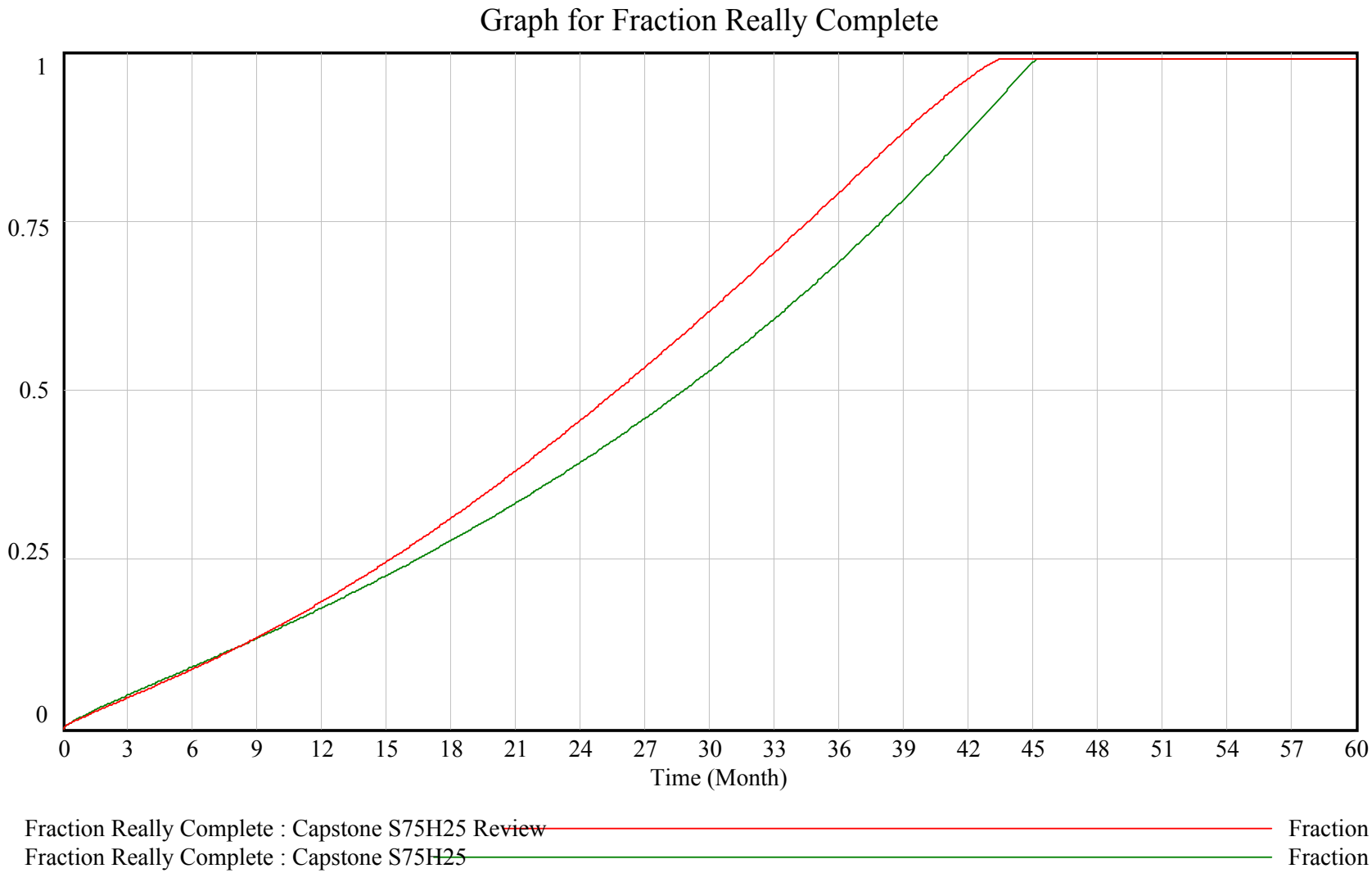
Test	Finish	Dir. Cost	Total Cost
Worst Case	74.9	299.4	748.7
S75H25	60.6	285.3	591.6
RWDD = 6	54.7	234.5	481.4
RWDD = 9	60.4	269.8	573.6
RWDD = 10	62.4	281.8	602.4

4. Delay Progress? (10 Points)

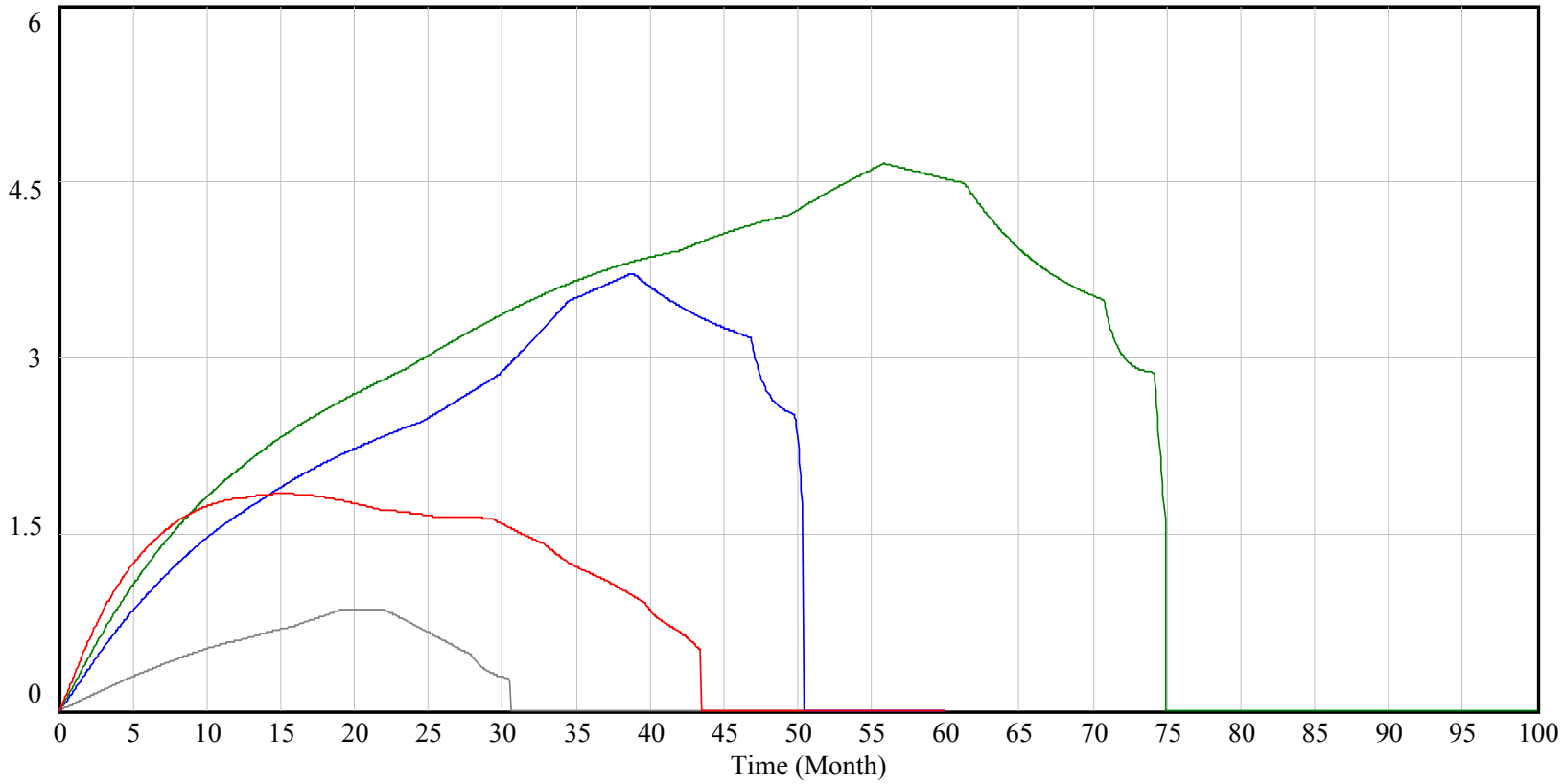
As shown in the following graphs, the review process delays perceived progress, but not real progress --

- perceived progress is lower because more total work is getting done without the review, because of the higher productivity
- However, because this work contains more errors which will need to be reworked, real progress is actually lower.





Graph for Rework Discovery



Rework Discovery : Capstone S75H25 Review Task/Month
Rework Discovery : Capstone Worst Case Task/Month
Rework Discovery : Capstone No Hire Task/Month
Rework Discovery : Capstone Bosses Hope Task/Month