

## **Retain or Override – The Question is Logical**

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### **Abstract**

Retained logic or Progress Override, one of the most emotive subjects when it comes to discussing how to update a schedule, all driven by one issue, performance out-of-sequence work. The author reviews the three schedule calculation options offered by Oracle's Primavera P6, 'Actual Dates', 'Retained Logic' and 'Progress Override' and their effect on the earned value calculations. Six scenarios have been developed and tested on an activity within two identical schedules, one with an out-of-sequence activity and one without an out-of-sequence activity. The results of the effects on the earned value cost profile for each individual scenario are presented along with summarization of the results in a clear and concise manner. Using SWOT analysis as a basis, the paper concludes with a recommendation for a 'best tested and proven' practice for fellow practitioners, project management, to adopt when performing schedule updates, and for software solution providers to consider for their future releases of their products.

**Keywords:** Cost Profiles, Earned value calculations, Actual Dates, Retained Logic, Progress Override, P6, Primavera, Schedule calculations, Scheduling, SWOT analysis

### **Introduction**

Having been classed as being from the Jurassic period by my juniors when scheduling is discussed, remember the days prior to the software era when networks was performed using 'Activity-on-Arrow' (AoA) or 'Activity-on-Node' (AoN) techniques, while embracing the new software era it's not without its pitfalls. It may be the case these were there in the past but because planners and schedulers provided better detailed schedules based on numerous meeting between discipline engineers and managers to get buy-in to a final product. Running through the software package developments saw the use of Artemis<sup>1</sup> (mainframe then PC), Primavera<sup>2</sup> (Dos then Windows), eventually all the way through to Oracle's Primavera P6<sup>3</sup> as we know it nowadays.

Potentially one if not the most contentious item when calculating the schedule during an update, especially when out-of-sequence activities are contained within the network, is what calculation method should be used. The Oracle P6 User Guide mentions very little about the subject, while within the industry there are differing opinions as to which method is better.

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<sup>1</sup> Artemis 9000 [Computer program] v 9.4.0, Debach, Suffolk, UK: Metier; (1990).

<sup>2</sup> Primavera P6 [Computer program] v8.1, Philadelphia, PA, USA: Primavera Systems Inc. (2008).

<sup>3</sup> Primavera P6 Enterprise Project Portfolio Management [Computer program] 16.2. Redwood shores, CA, USA: ORACLE (2016).

The Problem statement to be reviewed in this paper is “What is the impact of each method on the calculations of earned value?”

Specifically, this paper wants to conclude with a set of guidelines or “best tested and proven” practices as well as some recommendations for software solution providers regarding the use of Retained Logic and Progress Override.

## **The Methods Available**

The use of retained logic or progress override methods is normally associated with the discovery of ‘out-of-sequence’ work in the network. This is not an uncommon occurrence in construction industry as these tend to crop up when an activity has been identified that can be commenced ahead of the original planned sequence in the schedule network.

For example; two activities ‘A’ & ‘B’, based on the schedules original network, activity ‘A’ (the predecessor) was required to complete before activity ‘B’ could commence. However, after some analysis it was determined by the construction team that since activity ‘A’ had progressed past a certain point, that activity ‘B’ could commence before activity ‘A’ finished, so the decision is made to commence activity ‘B’. When the P6 schedule update is performed, it recognizes that the network logic has not been honored and flags an ‘out-of-sequence’ activity as an error on the schedule log it produces. Chances are that the logic in the original schedule was defective when it was developed.

When activities are in progress, Oracle P6 provides three calculation methods when performing the schedule update process, refer to figure 1.

These choices are:

1. Actual Dates

Forward and Backward passes are scheduled using the actual dates. Uses the network logic and same rules as retained logic.

2. Retained Logic

Uses the network logic for the activity and it will not schedule the activity until all the predecessor(s) are completed.

3. Progress Override

Network logic ignored allowing the activity to progress without delay.

By offering these three options, updating schedules can have differing results when using them.

As the author mentioned above the Oracle P6 v15.1 user guide<sup>4</sup> is not very forthcoming with the calculation methods. The P6 online guide which appears when the ‘Help’ icon is pressed

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<sup>4</sup> Primavera P6 Enterprise Project Portfolio Management [Computer program] 15.1. Redwood shores, CA, USA: ORACLE (2016). – User Guide

provides the following; “Schedule calculations provides three methods to choose. Specify the option to be used to schedule the activities in progress. Choosing Retained Logic, the remaining duration of an in-progress activity will not be scheduled until all predecessors are completed. Choosing Progress Override, ignores the network logic and the activity progresses without delay. Choosing Actual Dates, forward and backward passes use actual dates.”<sup>5</sup>

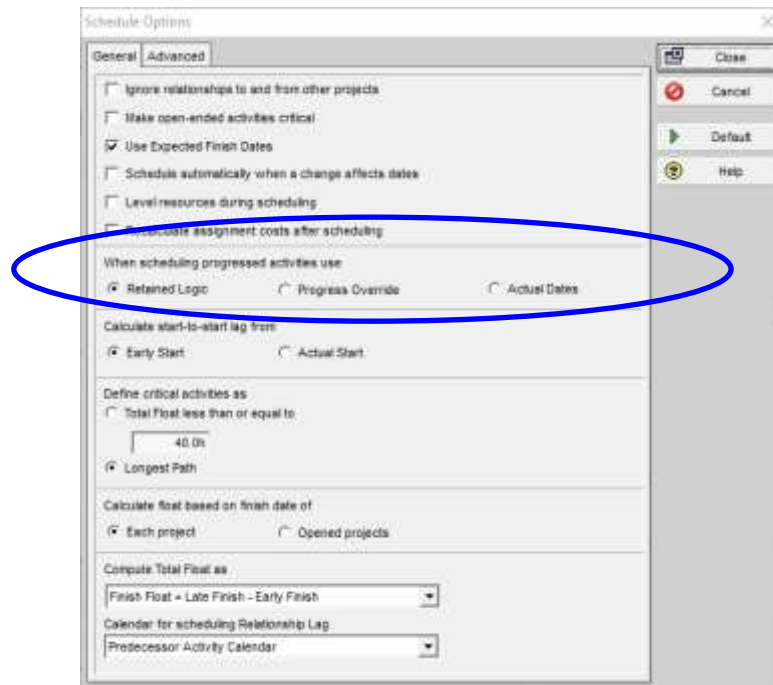


Figure 1 – P6 Schedule Update Options<sup>6</sup>

The next three sections, will provide a brief overview of each method.

## Method 1 – Actual Dates

Using this method, the update method uses the actual dates and the existing logic, so in effect there appears to be no difference to using the retained logic method (refer to figure 2). Further online research confirmed this from an article called “Retained Logic and Progress Override in Primavera P6” where it stated “*The remainder of the activity is still treated the same as when we use Retained Logic. P6 will not allow the remainder of the activity to continue until its predecessor is complete.*”<sup>7</sup>

<sup>5</sup> Oracle Primavera General tab - Schedule Options dialog box. (2016). Retrieved July 22, 2017, from [https://docs.oracle.com/cd/E54700\\_01/client\\_help/en-us/general\\_tab\\_-\\_schedule\\_options\\_dialog\\_box.htm](https://docs.oracle.com/cd/E54700_01/client_help/en-us/general_tab_-_schedule_options_dialog_box.htm)

<sup>6</sup> Primavera P6 Enterprise Project Portfolio Management [Computer program] 16.2. Redwood shores, CA, USA: Oracle – Schedule Update Advanced Options

<sup>7</sup> According to R.Hendricks, “*The remainder of the activity is still treated the same as when we use Retained Logic. P6 will not allow the remainder of the activity to continue until its predecessor is complete.*”, retrieved from [www.tepeco.us](http://www.tepeco.us) website (August 2015, page 5 figure 1 lower comment note)

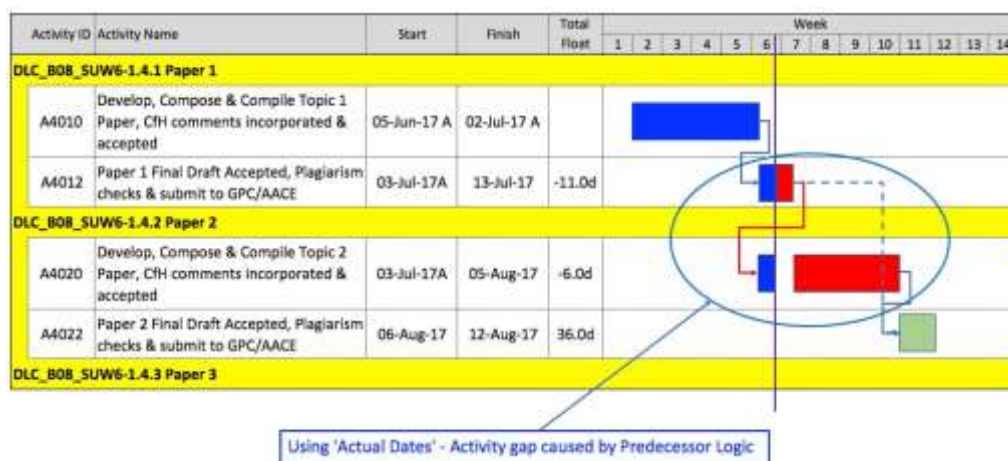


Figure 2 – Schedule Update using Actual Dates<sup>8</sup>

## Method 2 – Retained Logic

As the title suggests, this method retains the existing network logic, so an out-of-sequence activity which has a Finish to Start logic tie, the successor will have a gap in the bar until the predecessor finishes (refer to figure 3).

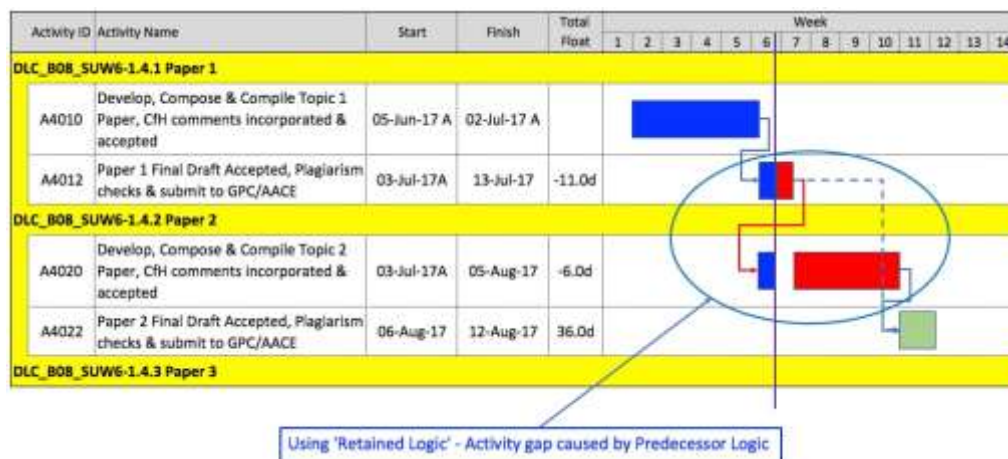


Figure 3 – Schedule Update using Retained Logic<sup>9</sup>

## Observation regarding Method 1 and 2

Looking at activity A4020, it is noted that both method 1 ‘Actual Dates’ and method 2 ‘Retained Logic’ provide the same dates with a gap in the bar due to the predecessor logic. They both use the network logic to determine the commencement of the activity (predecessor finish date) and use the remaining duration of the activity to determine the completion date.

<sup>8</sup> By Author

<sup>9</sup> By Author

Under both scenario's, any legitimate progress on activity A4020 will not recognize any earned value, which means that the contractor will not get credit for work legitimately done until the defective logic is fixed.

### Method 3 – Progress Override

Progress override ignores the network logic and treats in-progresses activities as if the Finish to Start logic tie did not exist. It does not change any network logic just ignores the any logic ties while scheduling the activities. This results in a lower float calculation than retained logic method as the activity does not have to wait for the completion of its predecessor, so there are no gaps in the activity bar (refer to figure 4). Please note that the predecessor which was critical in methods 1 and 2, is no longer critical due to ignoring of the network logic.

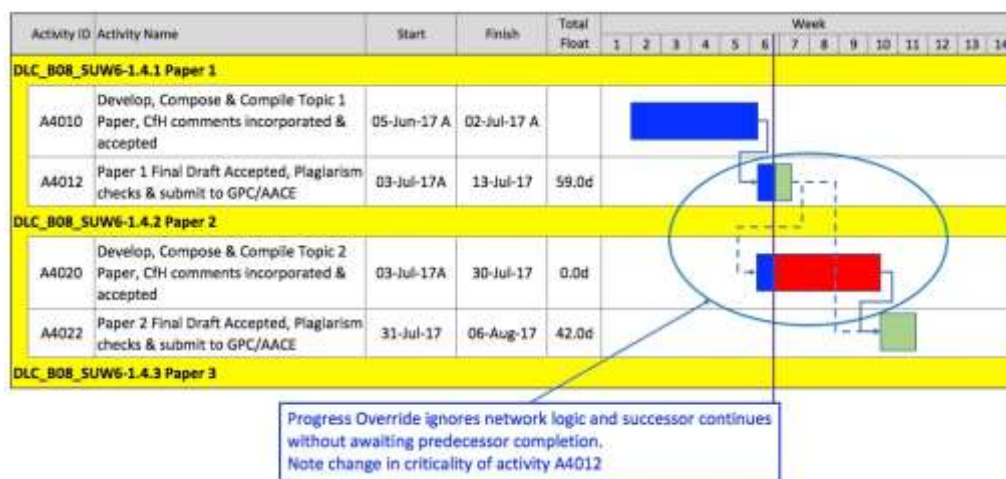


Figure 4 – Schedule Update using Progress Override<sup>10</sup>

### Model for use in Evaluations

To evaluate the effect Retained Logic and Progress Override has on the EV calculation, a small resource loaded schedule was developed. The schedule has 25 activities, 7 have been completed with 18 remaining. There are no constraints and the schedule log is clean apart from one missing predecessor (first activity) and one missing successor activity (last activity).

<sup>10</sup> By Author



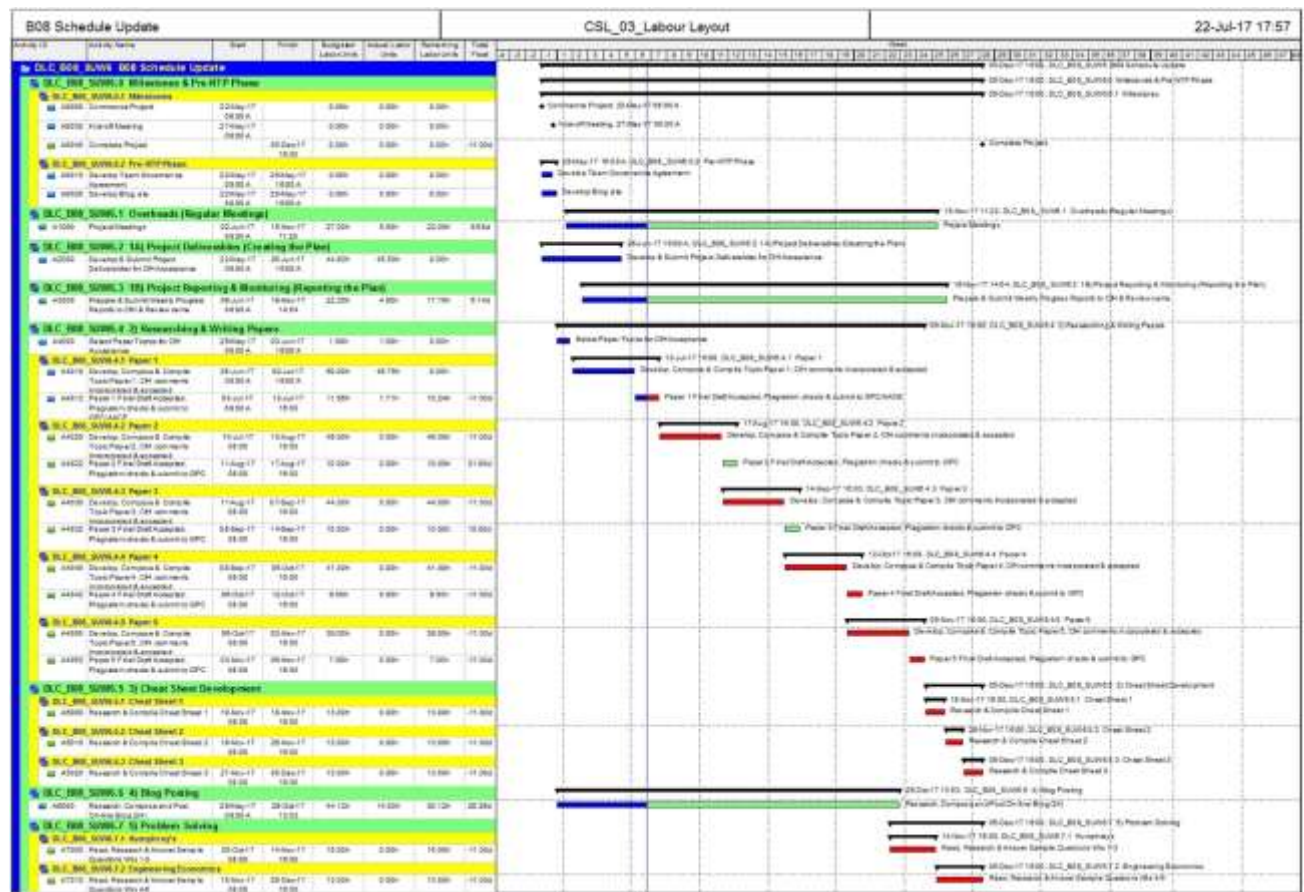


Figure 5 – Schedule used in evaluation

This project is a 25-activity schedule used to provide a road-map for progression in a Certification Mentoring program, part of which is to write a series of 5 papers on the way to achieving the professional certification, this paper being the second of these five.

Each paper has three drafts then a final issue, this schedule has one activity to cover the four steps “Develop, Compose & Compile Topic Paper 1, CfH comments incorporated & submit to GPC”, this in turn has two successors both Finish to Start relationships to a) the same activity on the next paper, and b) the acceptance of the final draft, plagiarism checks and onward submission “Paper 1 Final Draft Accepted, Plagiarism checks & submit to GPC”.

On the first paper progress was good up until the final draft and it delayed commencement of the second paper. The scenarios about to be run show the schedule as is without any out-of-sequence events, then introduce the out-of-sequence event as if the second paper commenced as planned. Activity A4020 will be that event.

Figure 6 provides the statistics and error messages from the log for the schedule without any out-of-sequence' activities.

```
Scheduling/Leveling Report - 2017-07-15 10:14:03 - PM.exe
=====

Default Project.....DLC_B08_SUW6

Projects:
    DLC_B08_SUW6.....B08 Schedule Update

Statistics:
-----
# Projects.....1
# Activities.....25
# Not Started.....14
# In Progress.....4
# Completed.....7
# Relationships.....34
# Activities with Constraint.....0

Errors:
-----
Warnings:
-----
Activities without predecessors.....1
    Project:      DLC_B08_SUW6    Activity:      A0000    Commence Project

Activities without successors.....1
    Project:      DLC_B08_SUW6    Activity:      A0040    Complete Project

Out-of-sequence activities.....0

Activities with Actual Dates > Data Date.....0

Milestone Activities with invalid relationships.....0

Finish milestone and predecessors have different calendars.....0
```

Figure 6 – Schedule without out-of-sequence activity schedule log details<sup>11</sup>

A second small schedule was developed using the first, and an ‘out-of-sequence’ activity introduced to evaluate the effects of ‘retained logic’ and ‘progress override’ in this environment. Figure 7 provides the statistics and error messages from the log.

```
Scheduling/Leveling Report - 2017-07-15 09:06:00 - PM.exe
=====

Default Project.....DLC_B08_SUW6-1

Projects:
    DLC_B08_SUW6-1.....B08 Schedule Update

Statistics:
-----
# Projects.....1
# Activities.....25
# Not Started.....13
# In Progress.....5
# Completed.....7
# Relationships.....34
# Activities with Constraint.....0

Errors:
-----
Warnings:
-----
Activities without predecessors.....1
    Project:      DLC_B08_SUW6-1    Activity:      A0000    Commence Project

Activities without successors.....1
    Project:      DLC_B08_SUW6-1    Activity:      A0040    Complete Project

Out-of-sequence activities.....1
    Project:      DLC_B08_SUW6-1    Activity:      A4020    Develop, Compose & Compile Topic Paper 2,
                                CfH comments incorporated & submit to GPC

Activities with Actual Dates > Data Date.....0

Milestone Activities with invalid relationships.....0

Finish milestone and predecessors have different calendars.....0
```

Figure 7 – Schedule with out-of-sequence activity schedule log details<sup>12</sup>

<sup>11</sup> By Author

<sup>12</sup> By Author

## Analysis

The following scenarios will be performed to demonstrate the effects of “Actual Dates”, ‘Retained logic’ and ‘Progress override on the earned value calculations.

- ‘Actual Dates’ without any out-of-sequence activities
- ‘Actual Dates’ with an out-of-sequence activity
- ‘Retained logic’ without any out-of-sequence activities
- ‘Retained logic’ with an out-of-sequence activity
- ‘Progress override’ without any out-of-sequence activities
- ‘Progress override’ with an out-of-sequence activity

In all scenarios, activity A4020 is the item that is being used to demonstrate the effects, for information purposes the budget and baseline cost phasing plan are shown in table 1.

Activity	A4020			
	W06	W07	W08	W09
Dates	Start		Finish	
	03-Jul-17		09-Jul-17	
Budget	\$4,600			
Cost Phasing				
Planned	\$1,150	\$1,150	\$1,150	\$1,150
Total in Period	\$1,150	\$1,150	\$1,150	\$1,150
Cuml't	\$1,150	\$2,300	\$3,450	\$4,600

Table 1 – Activity A4020 Baseline Information<sup>13</sup>

A4010 has two successor ties A4012 (Paper 1 Final Draft Accepted, Plagiarism checks & submit to GPC/AACE) and A4020 (Develop, Compose & Compile Topic Paper 2, CfH comments incorporated & accepted). Activity A4020 has only one predecessor (A4010 FS+0) so can start when A4010 is complete. Both A4012 and A4020 are scheduled to commence on 03-Jul-17.

### **‘Schedule A’ No Out-of-Sequence Activities – Week 6 Progress Update**

Progress update implemented to update the schedule based on activity through end of week 6.

- Data date for cut-off is Saturday 8<sup>th</sup> July at 8:00am
- Activity 4010 completed as scheduled on 2<sup>nd</sup> July
- Activity 4012 commenced as scheduled on 3<sup>rd</sup> July
- Activity 4020 did not commence on 3<sup>rd</sup> July as the work-scope of A4012 is more onerous than planned/anticipated during the baseline development. Discussions held with management determined that this should commence after the A4012 completes.
- Predecessor logic tie added from A4012 to A4020 FS+0.

Based on the above, the following retained logic and progress override analysis was performed.

<sup>13</sup> By Author



### ‘Actual Dates’ without any out-of-sequence activities

Activity A4020 has moved to a forecasted start of 14-Jul-17, and P6 uses this information to re-profile the costs between 14-Jul-17 and 10-Aug-17. The budget of \$4,600 is divided by 28 days to give a daily rate of \$164.286 (Equation 1 – “Activity A4020 Rate per day” - Activity budget in \$US divided by number of days) and uses the days in each week to provide weekly totals.

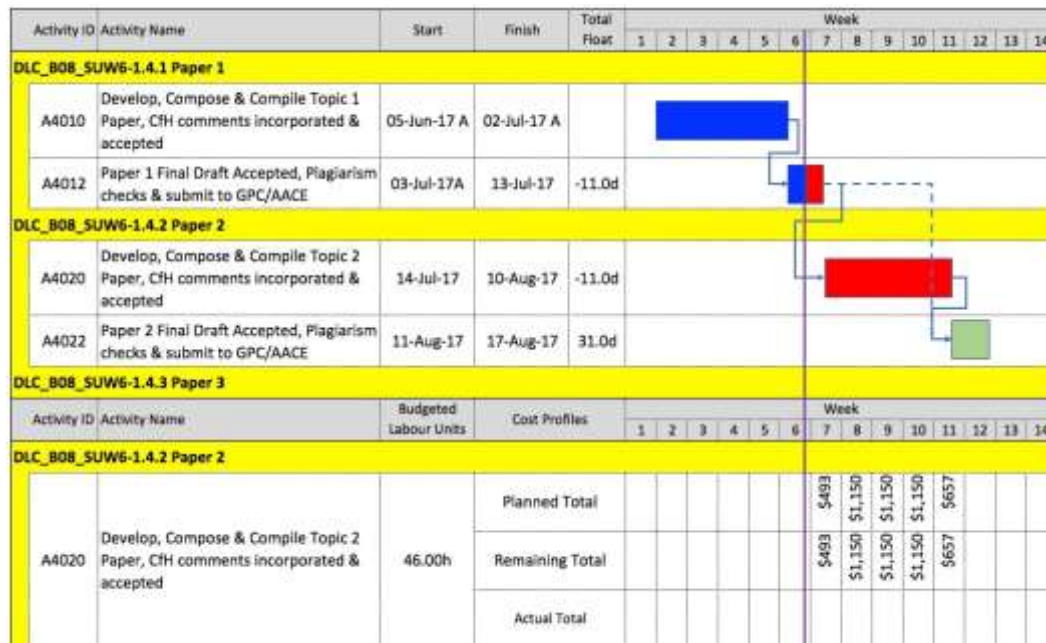


Figure 8 – Schedule ‘A’ Activity A4020 Cost Phasing using Actual Dates<sup>14</sup>

Table 2 shows how the figures compared vs the baseline.

Activity Cost Phasing	A4020					
	W06	W07	W08	W09	W10	W11
<b>Baseline</b>						
Period	\$1,150	\$1,150	\$1,150	\$1,150		
Cum'l't	\$1,150	\$2,300	\$3,450	\$4,600		
<b>Actual Dates</b>						
Period		\$493	\$1,150	\$1,150	\$1,150	\$657
Cum'l't		\$493	\$1,643	\$2,793	\$3,943	\$4,600

Table 2 – Schedule ‘A’ Cost Phasing Comparison Baseline vs Retained Logic<sup>15</sup>

From table 2 above, it is apparent that due to the start of activity A4020 slipping 11 days that the cost profile has shifted the same to the right.

<sup>14</sup> By Author

<sup>15</sup> By Author

### **Retained Logic without any out-of-sequence activities**

Taking ‘Schedule A’ and selecting schedule option ‘Retained Logic’ the calculations are re-run for the schedule. Figure 9 shows the results.

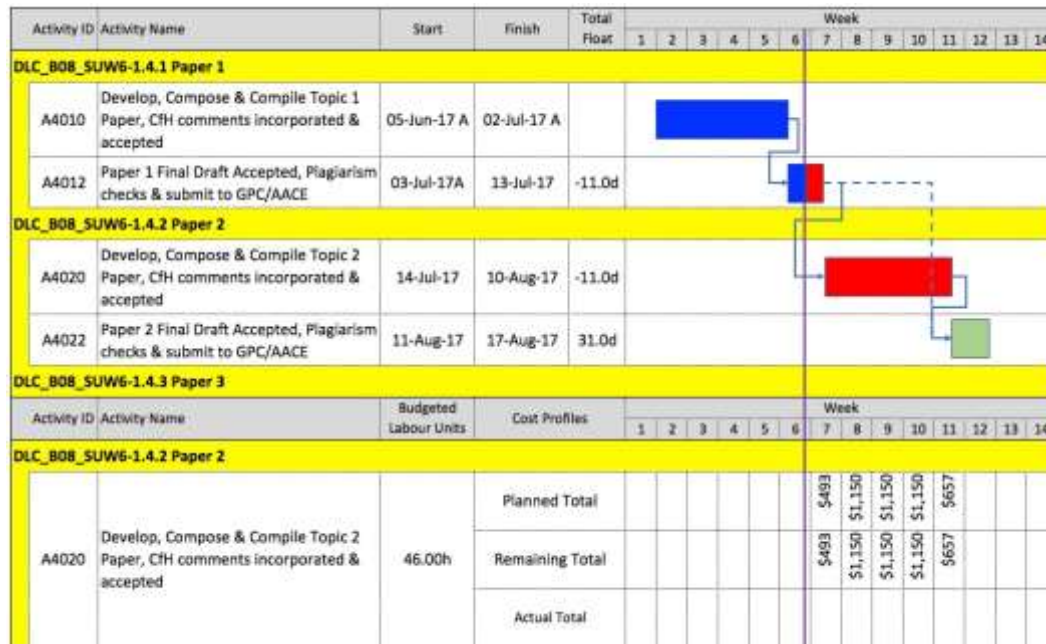


Figure 9 – Schedule ‘A’ Activity A4020 Cost Phasing using Retained Logic<sup>16</sup>

Table 3 shows how the figures compared vs the baseline.

Activity Cost Phasing	A4020					
	W06	W07	W08	W09	W10	W11
<b>Baseline</b>						
Period	\$1,150	\$1,150	\$1,150	\$1,150		
Cuml't	\$1,150	\$2,300	\$3,450	\$4,600		
<b>Retained Logic</b>						
Period		\$493	\$1,150	\$1,150	\$1,150	\$657
Cuml't		\$493	\$1,643	\$2,793	\$3,943	\$4,600

Table 3 – Schedule ‘A’ Cost Phasing Comparison Baseline vs Retained Logic<sup>17</sup>

Like that on table 2, table 3 shows the cost profile has shifted to the right due to the start of activity A4020 slipping 11 days.

### **Progress Override without any out-of-sequence activities**

Taking ‘Schedule A’ and selecting schedule option ‘Progress Override’ the calculations are re-run for the schedule. Figure 10 shows the results.

<sup>16</sup> By Author

<sup>17</sup> By Author

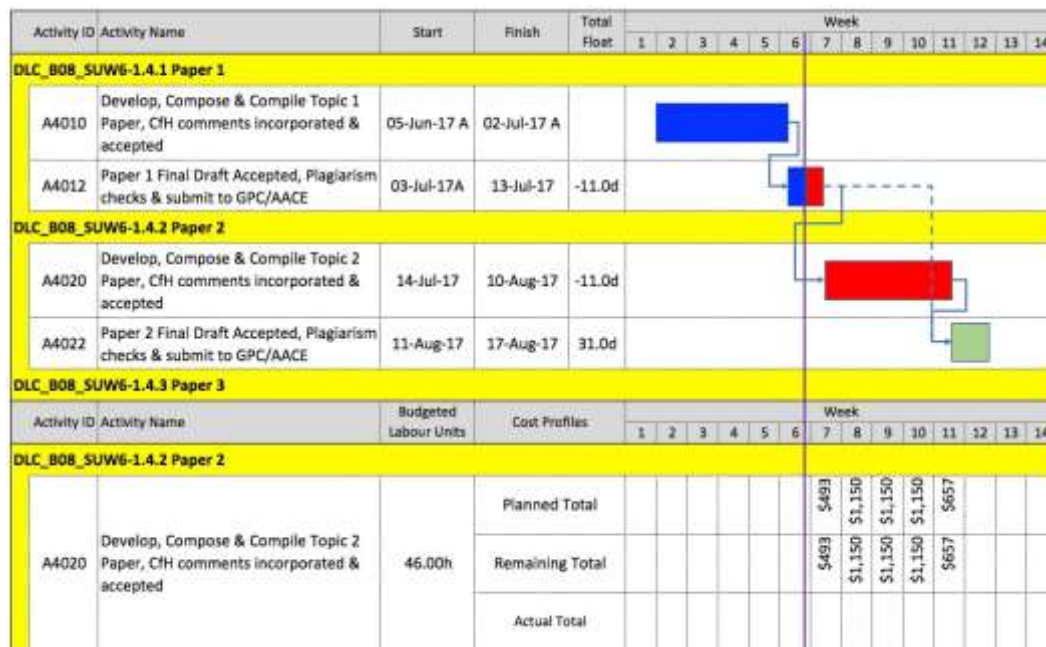


Figure 10 – Schedule ‘A’ Activity A4020 Cost Phasing using Progress Override<sup>18</sup>

Table 4 shows how the figures compared vs the baseline.

Activity Cost Phasing	A4020					
	W06	W07	W08	W09	W10	W11
<b>Baseline</b>						
Period	\$1,150	\$1,150	\$1,150	\$1,150		
Cuml't	\$1,150	\$2,300	\$3,450	\$4,600		
<b>Progress Override</b>						
Period		\$493	\$1,150	\$1,150	\$1,150	\$657
Cuml't		\$493	\$1,643	\$2,793	\$3,943	\$4,600

Table 4 – Schedule ‘A’ Cost Phasing Comparison Baseline vs Progress Override<sup>19</sup>

Like tables 2 and 3, table 4 shows a delayed cost profile due to the start of activity A4020 slipping 11 days.

Interesting enough, when there are no out-of-sequence activities in the network the results from ‘Actual Dates’, ‘Retained logic’ and ‘Progress Override’ are identical.

### **‘Schedule B’ Out-of-Sequence Activity inserted – Week 6 Progress Update**

Progress update implemented to update the schedule based on activity through end of week 6.

- Data date for cut-off is Saturday 8<sup>th</sup> July at 8:00am
- Activity 4010 completed as scheduled on 2<sup>nd</sup> July

<sup>18</sup> By Author

<sup>19</sup> By Author

- Activity 4012 commenced as scheduled on 3<sup>rd</sup> July
- Predecessor logic tie added from A4012 to A4020 FS+0.
- Activity 4020 commenced on 3<sup>rd</sup> July as planned, thus introducing an out-of-sequence activity to the schedule.

Based on the above, the following retained logic and progress override analysis was performed.

### **Actual Dates with an out-of-sequence activity**

As activity A4020 started as planned on 03-Jul-17 the network rules kick in and gaps the activity bar to show where the uncomplete predecessor is forecasted to finish. It also uses the remaining duration to re-calculate the completion date of the activity. Cost phasing wise the activity shows actuals to the data-date, then re-profiles the remaining cost from when the predecessor completion date is to the completion of the activity. As there are actuals the equation used to calculate the remaining profile is adjusted to suit. (Equation 2 – “Activity A4020 Revised Rate per day” – [Activity budget – Actual Expended] in \$US divided by number of days)

Figure 11 provides the cost profile for the ‘Actual Dates’ method.

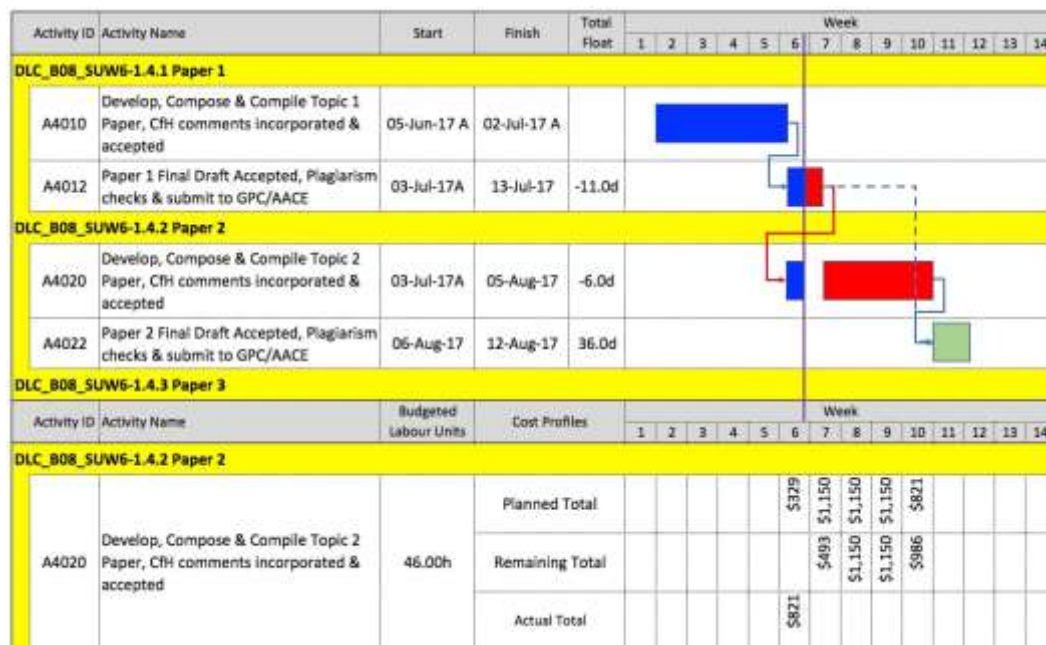


Figure 11 – Schedule ‘B’ Activity A4020 Cost Phasing using Actual Dates<sup>20</sup>

Table 5 shows how the figures compared vs the baseline.

<sup>20</sup> By Author



Activity Cost Phasing	A4020				
	W06	W07	W08	W09	W10
<b>Baseline</b>					
Period	\$1,150	\$1,150	\$1,150	\$1,150	
Cuml't	\$1,150	\$2,300	\$3,450	\$4,600	
<b>Actual Dates</b>					
Actual	\$821				
Period		\$493	\$1,150	\$1,150	\$986
Cuml't	\$821	\$1,314	\$2,464	\$3,614	\$4,600

Table 5 – Schedule ‘B’ Cost Phasing Comparison Baseline vs Actual Dates<sup>21</sup>

It should also be noted that the gapping in the bar also stops resource allocation for the period of the predecessors remaining duration. In effect, while the contractor may have resources on site, the schedule does not recognize them.

### Retained Logic with an out-of-sequence activity

Taking ‘Schedule B’ and selecting schedule option ‘Retained Logic’ the calculations are re-run for the schedule. Figure 12 shows the results.

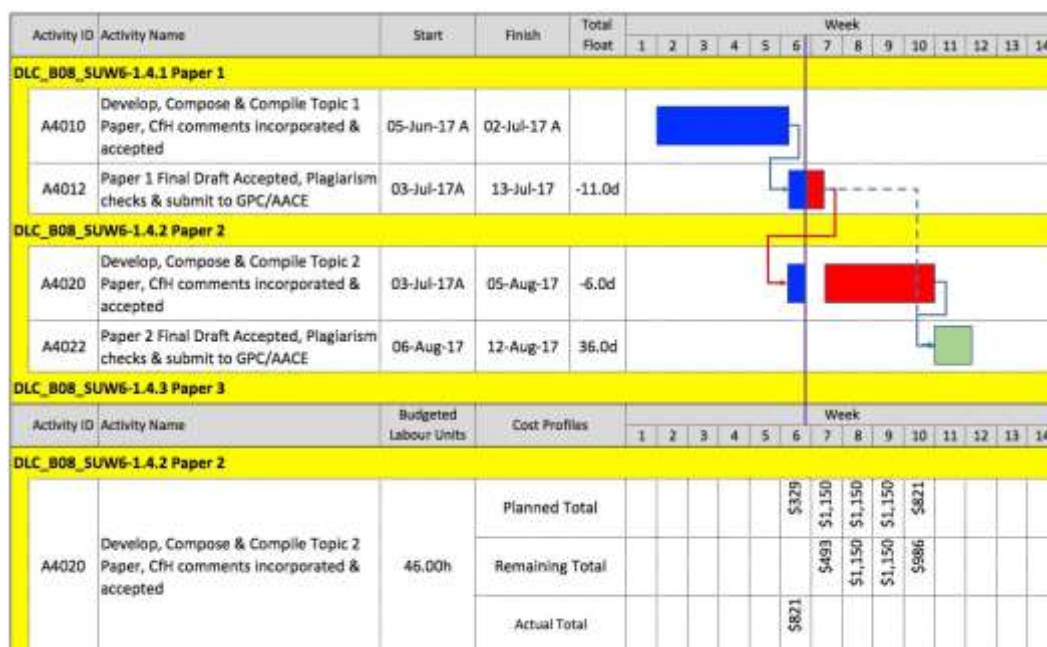


Figure 12 – Schedule ‘B’ Activity A4020 Cost Phasing using Retained Logic<sup>22</sup>

<sup>21</sup> By Author

<sup>22</sup> By Author



Table 6 shows how the figures compared vs the baseline.

Activity Cost Phasing	A4020				
	W06	W07	W08	W09	W10
<b>Baseline</b>					
Period	\$1,150	\$1,150	\$1,150	\$1,150	
Cuml't	\$1,150	\$2,300	\$3,450	\$4,600	
<b>Retained Logic</b>					
Actual	\$821				
Period		\$493	\$1,150	\$1,150	\$986
Cuml't	\$821	\$1,314	\$2,464	\$3,614	\$4,600

Table 6 – Schedule 'B' Cost Phasing Comparison Baseline vs Retained Logic<sup>23</sup>

Retained logic also treats resource allocation the same way as 'actual dates' for the period of the predecessors remaining duration. Again the contractor may have the resources on site, but there is no plan for them to perform any work until the predecessor is completed.

### Progress Override with an out-of-sequence activity

Taking 'Schedule B' and selecting schedule option 'Progress Override' the calculations are re-run for the schedule. Figure 13 shows the results.

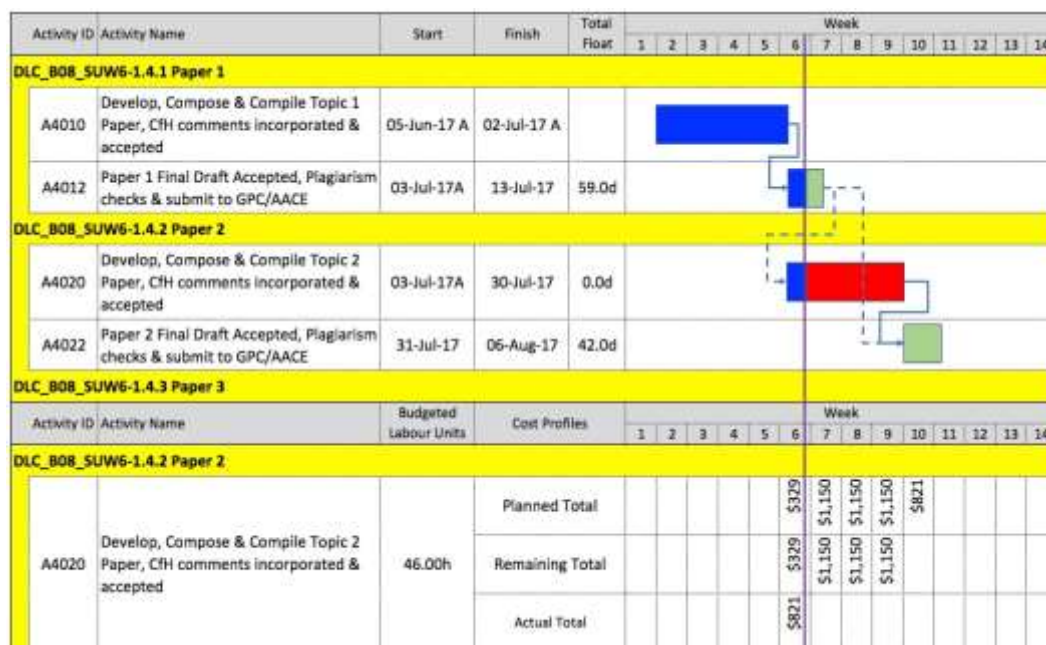


Figure 13 – Schedule 'B' Activity A4020 Cost Phasing using Progress Override<sup>24</sup>

<sup>23</sup> By Author

<sup>24</sup> By Author

Table 7 shows how the figures compared vs the baseline.

Activity Cost Phasing	A4020				
	W06	W07	W08	W09	W10
<b>Baseline</b>					
Period	\$1,150	\$1,150	\$1,150	\$1,150	
Cuml't	\$1,150	\$2,300	\$3,450	\$4,600	
<b>Progress Override</b>					
Actual	\$821				
Period	\$329	\$1,150	\$1,150	\$1,150	
Cuml't	\$1,150	\$2,300	\$3,450	\$4,600	

Table 7 – Schedule ‘B’ Cost Phasing Comparison Baseline vs Progress Override<sup>25</sup>

Unlike ‘actual dates’ and ‘retained logic’, ‘progress override’ reflects that resources are required to perform the activity. However, depending on when the method was used will depend if the contractor has sufficient resources available. If the Planner/Scheduler has just run the schedule calculation then the information regarding resources required needs to be reaching the field management team immediately to ensure availability.

Unlike the scenarios in Schedule ‘A’ where all three methods produced the same result, when the schedule has out-of-sequence activities in the network both ‘actual dates’ and ‘retained logic’ provide the same result, however ‘progress override’ treats the scenario differently. In this case, probably due to the fact the scenario commenced the Out-of-Sequence’ activity on schedule, progress override generates the same cost phasing profile as the baseline, while ‘actual dates’ and ‘retained logic’ provide a cost phasing in between the baseline and results from the no out-of-sequence scenarios.

To better understand the results, a table (table 8) and graphic (figure 14) has been developed to place them together against the baseline for comparison purposes.

<sup>25</sup> By Author

Activity Cost Phasing	A4020					
	W06	W07	W08	W09	W10	W11
<b>Baseline</b>						
Period	\$1,150	\$1,150	\$1,150	\$1,150		
Cuml't	\$1,150	\$2,300	\$3,450	\$4,600		
<b>Schedule 'A' - No Out-of-Sequence Activities</b>						
<b>Actual Dates</b>						
Period Plan		\$493	\$1,150	\$1,150	\$1,150	\$657
Cuml't Plan		\$493	\$1,643	\$2,793	\$3,943	\$4,600
<b>Retained Logic</b>						
Period Plan		\$493	\$1,150	\$1,150	\$1,150	\$657
Cuml't Plan		\$493	\$1,643	\$2,793	\$3,943	\$4,600
<b>Progress Override</b>						
Period Plan		\$493	\$1,150	\$1,150	\$1,150	\$657
Cuml't Plan		\$493	\$1,643	\$2,793	\$3,943	\$4,600
<b>Schedule 'B' - With Out-of-Sequence Activities</b>						
<b>Actual Dates</b>						
Actual	\$821					
Period Plan	\$0	\$493	\$1,150	\$1,150	\$986	
Cuml't Plan	\$821	\$1,314	\$2,464	\$3,614	\$4,600	
<b>Retained Logic</b>						
Actual	\$821					
Period Plan	\$0	\$493	\$1,150	\$1,150	\$986	
Cuml't Plan	\$821	\$1,314	\$2,464	\$3,614	\$4,600	
<b>Progress Override</b>						
Actual	\$821					
Period Plan	\$329	\$1,150	\$1,150	\$1,150		
Cuml't Plan	\$1,150	\$2,300	\$3,450	\$4,600		

Table 8 – Cost Phasing Comparison Baseline vs Scenarios <sup>26</sup>

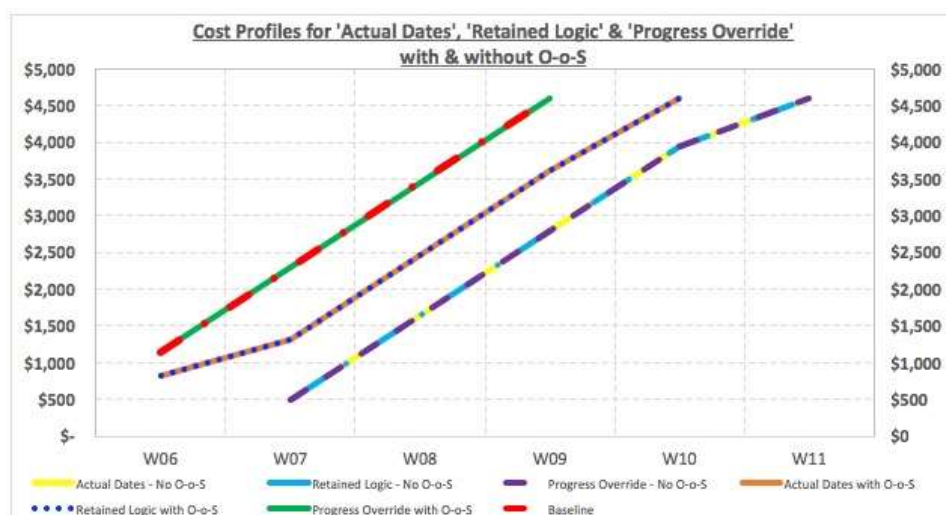


Figure 14 – Cost Phasing Comparison Chart <sup>27</sup>

<sup>26</sup> By Author

The figure 14 chart shows the baseline and the six scenarios analyzed, and while it looks busy the following is a summary of the lines:

Red/Green – Baseline & Progress Override with O-o-S activity  
Blue/Orange – Retained Logic with O-o-S activity & Actual Dates with O-o-S activity  
Purple/Cyan/Yellow – All three No O-o-S scenarios (Actual dates, Retained Logic & Progress Override)

Effectively, if there is no out-of-sequence activity all three schedule calculation methods provide the same result. When the network contains an out-of-sequence activity the ‘progress override’ method provides the profile closest to the baseline profile, while ‘actual dates’ and ‘retained logic’ provide a protracted profile. With regards to earned value calculations, the progress override provides a profile to allow contractors to claim what they have legitimately progressed, while the ‘actual dates’ and ‘retained logic’ provide an under-reporting of the physical progress. This is not good either for the contractor or for the owner. For the contractor it adversely impacts his/her cash flows and for the owner, it provides unrealistic information upon which management is using to make decisions.

Based on the above scenarios, the author developed a SWOT analysis chart to best characterize the opportunities and risks associated with the schedule calculation methods.

Schedule Calculations	
<b>Strengths</b> <ul style="list-style-type: none"> <li>● <b>AD &amp; RL:</b> Uses Network logic (Successor cannot commence until Predecessor(s) completed)</li> <li>● <b>RL:</b> Software default setting</li> <li>● <b>RL:</b> Preferred approach by GAO Schedule Assessment Guide GAO-16-89G</li> <li>● <b>PO:</b> Successor activity cost phasing profile not driven by predecessor logic, remaining duration planned from data-date outwards</li> </ul>	<b>Weakness</b> <ul style="list-style-type: none"> <li>● <b>RL:</b> Ignores legitimate progress as logic gaps activity bar</li> <li>● <b>PO:</b> Assumes resources are available to work activity</li> </ul>
<b>Opportunities</b> <ul style="list-style-type: none"> <li>● <b>AL:</b> Address defective schedule logic, removing Out-of-Sequence work</li> <li>● <b>AL:</b> Oracle P6 to make software more ‘user-friendly’ and better document the calculation methods in their user manuals.</li> <li>● <b>AL:</b> Capture as much earned value as legitimately entitled.</li> <li>● <b>AL:</b> Report as much progress as legitimately entitled.</li> </ul>	<b>Threats</b> <ul style="list-style-type: none"> <li>● <b>RL:</b> Contractor unable to claim work performed</li> <li>● <b>RL:</b> Client under-reporting progress</li> <li>● <b>PO:</b> Predecessor could slip indefinitely as logic no longer considered</li> <li>● <b>AL:</b> Software user will choose wrong ‘schedule calculation’ option because software user manual is not clear enough in explaining options available</li> </ul>

AD = Actual Dates, RL = Retained Logic, PO = Progress Override, AL = All Schedule Calculations

Figure 15 – SWOT Analysis for Schedule Calculation Methods<sup>28</sup>

<sup>27</sup> By Author

<sup>28</sup> By Author

Review of the above scenario's, figures and tables indicates that the method that provides an earned value cost profile closest to the baseline is the out-of-sequence 'progress override' method. However, the tradeoff for this is the ignoring of the network logic, which is not a recommended practice. The most effective way to eliminate any ambiguities as to which method to adopt is to resolve the out-of-sequence error by addressing the defective logic in the network.

## Current Industry Recommendations

In reviewing the following documents;

- Guild of Project Controls (GPC) Compendium and Reference (CaR) Module 09<sup>29</sup>
- GAO's Schedule Assessment Guide (Dec'15)<sup>30</sup>
- NDIA-IPMD-PASEG-v3 (Mar'16)<sup>31</sup>

The subject of out-of-sequence activities is addressed. All three, GPC, GAO and NDIA recommend that the out-of-sequence work be addressed and the logic fixed to accurately reflect current conditions of the project.

## Conclusion

This purpose of this paper was to develop guidelines for fellow practitioners to utilize, and based on the research, the author recommends the following be considered as a "best tested and proven" practice:

1. Professional Planners/Schedulers should be using 'Retained Logic' schedule calculation methods but only after running an out-of-sequence progress report and resolving any out-of-sequence progress.
2. Addressing the out-of-sequence activities, allows both Contractor and Client to capture as much as legitimately possible earned progress and report same, thus ensuring there is no progress under-reporting. This helps the contractor's cash flow situation and ensure that the owner's management team are making informed decisions based on accurate up to date information.
3. Software solution providers who offer these three options should be clearer in explaining the impact of each option.
4. Software solution providers that do not yet offer out-of-sequence reports should consider adding this feature in future releases.

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<sup>29</sup> Guild of project controls - Compendium and reference (CaR) | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet). (2015, October 3). Retrieved July 10, 2017, from <http://www.planningplanet.com/guild/gpccar/assessing-interpreting-progress-data>

<sup>30</sup> Government Accountability Office. (2015). *Schedule assessment guide : Best practices for project schedules* (GAO-16-89G). Washington, DC: Author.

<sup>31</sup> National Defense Industrial Association Integrated Program Management Division. (2016). *Planning & scheduling excellence guide* (PASEG) (Version 3). Arlington, VA: Author.



While the author concurs with the GPC, GAO and NDIA recommendations that Out of Sequence Progress be corrected to reflect as closely as possible, what actually happened on the project, the author takes it one step further by suggesting that any work that needs to be performed 'out-of-sequence' that it should go through a management of change process that demonstrates the benefits of doing this work ahead of time, and what the potential impacts are. The supporting documentation should also include a brief analysis of any logic changes required to be implemented in the schedule, as the current network logic is defective. If the change is approved, then the logic change is required to be implemented, and any changes made should be documented in the schedule changes register which the Project Controls Manager and Project Manager review and sign-off weekly/monthly depending on the reporting cycles. This requirement should be spelled out in detail in the appropriate area of the specifications.

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**Stephen Paterson** is an Oil and Gas professional with 35+ years of experience in project controls and construction management. Born in the Highlands of Scotland, he served an apprenticeship and gained a Higher National Certificate in Civil Engineering in the UK, before embarking on the adventure of expat living, working worldwide; Middle East, North & South America, Russia, Middle East, Far East, South East Asia, China and Australia. He just completed his last assignment in February of 2017, and currently, furthering his education by way of a distance learning mentoring course, under the tutorage of Dr Paul D. Giammalvo, CDT, CCE, MScPM, MRICS, GPM-m Senior Technical Advisor, PT Mitrata Citragraha, to attain Guild of Project Controls certification.

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