



PROJECT MANAGEMENT SOLUTIONS THAT *SIMPLY WORK* SINCE 1989.

# Schedule Health-Killing Project Predictability

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[www.dr McNatty.com](http://www.dr McNatty.com)

# Products and Services

- Project Controls System Implementation
- Cloud Based, Global Managed Hosting Services
- Software Training Services
- Integration, Analytics, Dashboards, Risk and Role-based User Access Tools
- Program and Project System Support Services and Partnering
- Mentored and Supported SB/DVBE Project Staffing Resources

# Tool Matrix

Business Process	 ORACLE PRIMAVERA	 Asta Powerproject	 ABES PRISM	 Deltek   ACUMEN	 ProjectStatus
Portfolio Management	P6, Unifier				View
Planning & Budgeting	Unifier	Powerproject	G2		Collaborate
Estimating		BidCon	Estimating		
CPM Scheduling	P6	Powerproject	Scheduling	Fuse	Status
Cost Management & Reporting	P6, Unifier	Powerproject	G2	Fuse	Collaborate
Document Management	Unifier		Prism Docs		
Change Management	Unifier		G2		
Engineering Forms	Unifier		G2		
BIM/Schedule Integration		Asta BIM			
Risk Analysis	P6 Risk	Asta Risk		Risk	Collaborate
Risk Management & Mitigation	P6			Risk	Collaborate
Role Based Cloud Dashboard	Dashboard		Dashboard		View
Earned Value	P6		Earned Value		
Claims Support & Analysis	P6	Powerproject		Fuse	
Facility Management/Work Orders	Unifier				
Mobile online/offline support	Mobile	Mobile			browser
Integration with Finance/ERP	Gateway		Integrator		Gateway

DRMcNatty supports these project controls tools as an authorized partner, trainer and implementer as well as providing trained and supported project staffing resources.

# Abstract

## Scheduling Analytics

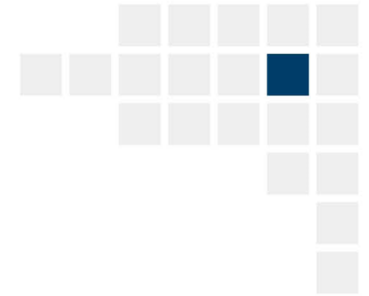
Recently, more and more schedules are poorly built, neglecting “best practices” and causing reduced confidence in meeting schedule dates. Some key elements are defeating or overriding the intelligence our current software produces, turning the CPM schedule into nothing more than a cartoon on a sheet of paper and into nothing resembling CPM at all. To let our scheduling tools work properly, we must get back to basics and build good, logically driven schedules for project teams to have confidence that the CPM schedule is accurate and predictable.

# Agenda

## Schedule Analytics

- What do we have currently?
- How'd we get here?
- Where are we headed without redirection?
- Organizations pressing the issues
- Tools to help improve the schedules
- What the tools are looking at
- What the tools can't process

# Schedule Analytics



## What do we have currently?

- Poor Schedule Health
  - Poorly built schedule, with little to no logic
  - Logic between activities makes no sense
    - Made just to check a box
- Those without logic contain many constraints, paralyzing schedule software
- Lags being used because of incomplete activity detail
- Lack of appropriate logic detail is defeating/masking/hiding/changing in some combination the actual critical path

# Schedule Analytics

## What do we have currently?

- Management questioning why they even have a project controls team
  - Drives management to maintain ‘top drawer’ schedule to manage project with
- Large Capital Projects are blowing past completion dates and budgets consistently, some by wide margins, with little to no early warning
- BCBF – Bright colors bold fonts, pretty picture
  - Looks pleasing but to the untrained eye, disaster
  - Little to no intelligence giving an educated completion date

# Schedule Analytics

## How'd we get here??

- Poorly defined expectations
- Management has placed non-schedulers into scheduling roles to “save” money
- Management expectations not defined – schedule intended to represent entire life cycle (all scope)
- No risk assessment done on project until catastrophic event causes reaction (Failure or regulation requirement usually)
  - This effort could have created a more realistic schedule, or pointed out the areas to focus attention
- Much of the schedule is dependent on user interaction, other team members, accurate activity relationship links (can't be developed/updated in a vacuum)



# Schedule Analytics

## How'd we get here??

- Various reasons for why
  - Poor mechanics, inexperience, lack of training/mentoring
  - Misdirected focus, lost in details - proud in number of activities (more is better?)
  - Early area of cost-cutting – cutback on project controls, oversight of contractor, do more with less, sometimes seen as less important discipline, maybe even considered overhead
  - Overwhelmed staff, reporting expectations
    - Detailed schedules require lots of maintenance
    - Comparing contractor schedule updates takes time
    - With software today, expectations these high quality reports are “automagic”, in fact are very time consuming

# Schedule Analytics

## How'd we get here??

- Various reasons for why (continued)
  - Software functionality trumps “best practice” – if software can do it, must be a good thing
  - Scheduling tools don't provide all the guidelines and checklists to develop a plan
  - External risks often don't enter into conversation around building a project schedule – Heard called Systemic
  - Schedule built backwards with completion date already decided, make it fit, squeeze it into a tighter time-frame than it can be executed in

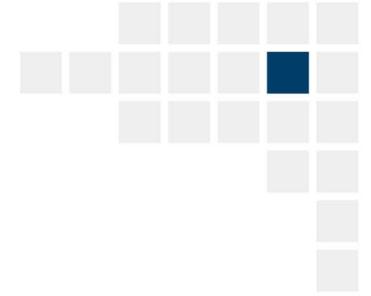
# Schedule Analytics

## How'd we get here??

- Various reasons for why (continued)
  - Management cutting back on time required to complete tasks (say the durations are too long-based on what?)
  - Sales team of Software sold great-looking tool using sanitized data, management expects same quality
  - Schedulers have lost the “in the field” exposure – many have never been on-site, sometimes due to budget constraints, software improvements have also driven some remote trends
  - Pretty picture with no backbone to support, BCBF

With all the reasons, likely the Project Manager could have a “top drawer” schedule he is actually using to manage the project and estimate his percent complete

# Schedule Analytics



## Where are we headed?

- Hopefully not down a dark dirt road to Area 51
- We as leaders, must step up, mentor the new ones on the scene – training included
- Recent software creation demonstrates recognized needed improvements-find problems quickly and report on it
- • Keeping consulting firms busy offering services, training, software, solutions
- Look around room, see the gray hair (or no hair-don't look at me)? We have to figure this out before this group walks off the stage and enjoys the Caymans

# Schedule Analytics

## Where are we headed?

- Mature organizations recognize the importance of complete project controls, cost, schedule, risk assessments, regular reviews, project health – even for small projects
- Revised Agency requirements point to the need for more robust standards and guidelines



# Schedule Analytics

## Organizations pressing the issues

### Checklists/Organizations

- Checklists
  - DCMA 14 pt. assessment (now growing to 100+)
  - GAO
  - AACE-Recommended Practices
  - PMI-Best Practices

All above are efforts to focus on eliminate limiters not allowing scheduling tools to work as designed. The tools of today are very good, but only if schedules are built correctly, avoiding the trouble spots. Many organizations have adopted recommended practices to develop their own specific detailed procedures. Grandfather' d projects avoiding the procedures are not helping the environment to improve.

# Schedule Analytics

## Tools to help with Improvement

- Software
  - Acumen Fuse
  - Schedule Analyzer Pro
  - Claim Digger
  - Schedule Detective
  - Schedule Checker (F9 log file)
  - PRA (Schedule Check)
  - Safran – Risk-readiness schedule check
  - Others??

Updates of these tools along with the introduction of new tools indicates the market is ripe for areas of improvement

# Schedule Analytics

## Schedule Software

- Software can allow for some poor practices, not realized sometimes, till a fire drill
- Communication can be minimized if not focusing on it
  - Tools making it easier for planner to update activities never talking to a person, could be updated via mobile device/vacuum
- Tools are designed to build logic - which require team input/buy-in



# Schedule Analytics

## Schedule Software

- Building the schedule can be a large task, but more important is the upkeep and maintaining of schedule that can assume large amounts of time, depending on complexity and amount of stakeholders
  - Many times the maintenance is not thought about during the creation of the schedule until that first update is needed, potential Panic sets in
- Lets be honest, many times the reasons a project goes off the rail is not poor execution, its more omitting or adding a major piece of scope after the project has started. Poor documentation of these scope changes have great impact

Tools used today have the ability to produce the most functional project plan ever conceived, but we haven't used that functionality to its full potential yet. Is Technology a solution or a problem in and of itself?

# Schedule Analytics

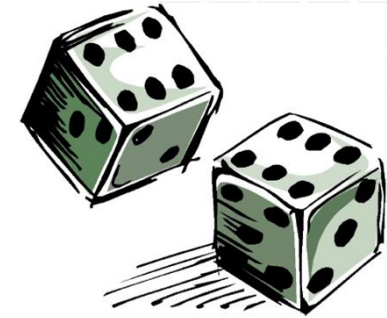
## What the tools are looking at

### Schedule Quality – Problem areas

- Logic (missing predecessors/successors)
- Lags (Negative/Positive)
- Relationship types
- Hard constraints
- High float
- Negative float
- High duration
- Out of sequence updates (broken logic)
- Resources
- Missed Tasks
- Critical Path

# Schedule Analytics

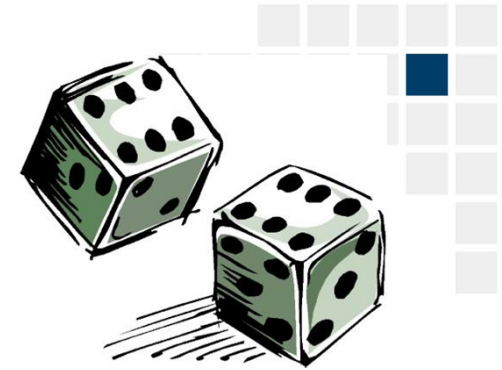
## What the tools can't process



### Activity Duration

- The estimate for a given duration can only be justified based on historical info from people that know the best, past work data
- No way to know exactly how long it takes to complete a task until it is complete – uncertainty exists in every activity, be sure to account for it
- All teams are full of optimists, always willing to say it could be done faster than last project
- If you knew ahead of time, you'd live in Vegas and do very well and probably not be in the room here with me

# Schedule Analytics



## What the tools can't process

### Activity Duration

- Factors to consider for duration
  - Incomplete Design
  - Inadequate site investigation
  - Unrealistic schedule/budget
  - Permit requirements
  - Weather
  - Public relations
  - Owner/Partner/Agency approvals

For more realistic durations, apply duration uncertainty using a Risk tool, then use the output as the new deterministic project schedule (trying to estimate reality). Without schedule and risk optimization, successful execution is unlikely. When's the best time to adjust the schedule? As early as possible to assure the most accurate, realistic plan with the best chance of completing on time.

# Schedule Analytics

## What the tools can't process (human aspect)

### Logic

- The tools can look holistically at logic and open ends but cannot with certainty decide whether activities tied together should be related
- Only project scheduler and project team can determine the proper activity relationships
- Sequence of work varies greatly, depending on site layout, material deliveries, partner approvals, agency's permits, etc.
- This is where experience and knowledge is imperative

# Schedule Analytics

## What the tools can't process (human aspect)

### Logic (Con't)

- Is the critical path realistic and reasonable per the team's expectations?
- Too much logic, more than needed to tell story - Overkill
- Owner/Agency's approval cycles driving activities?

Projects will not follow their plan to their original intentions no matter how well you think it was built. We must allow for that uncertainty in logic. Refresh that logic periodically to more accurately portray reality

# Schedule Analytics

## What the tools can't process (human aspect)

### Constraints

- Freezing/paralyzing logic from reacting as software is designed
- Could be scheduler cheating to force activity time placement
- Some constraints applied because of external stakeholder-legitimate reasons why, permitting, weather window, noise restrictions

Could be some good reasons for constraints and those need to be recognized/documented. Be ready to explain those reasons, use Notes tab in Activity Details

# Schedule Analytics

## Schedule Quality

- Logic
  - Ideal to have only finish to start relationships
  - Open ends – best if there are none
  - Open ended activities could be critical or near critical and impacting project completion but not impactful when left open
  - Ideally, one start and one finish for Project. If not, possible to have multiple ends, Train startups for example
  - Start-to-finish links (reverse logic)
  - External links (to other projects not in model)
  - Redundant logic is prevalent – started as a high level schedule that was elaborated but summary logic remains



# Schedule Analytics

## Schedule Quality

- Minimal lags/leads (+/-)
  - Best if there are none
  - Lags are fixed duration (hidden activities)
  - When applying duration uncertainty (min/ml/max) ranges, risk tool cannot apply uncertainty to lags
  - If no way around a lag, best to convert a lag duration to an activity
  - Lags on critical path cause additional issues

# Schedule Analytics

## Schedule Quality

- Constraints
  - Hard constraints defeat logic purpose and may drive more critical than realistic
  - Comment in Notes tab for those legitimate critical dates
    - Option – add a duplicate activity into same logic string to compare changes of removing constraint
  - Change constraint to soft for risk purposes

# Schedule Analytics

## Schedule Quality

- Float
  - Watch for excessive float, large number – sometimes is trigger for lack of logic
  - Large float activities typically pose low risk exposure to project
  - Low float activities could become critical with little warning
  - Real float paths are good candidates for adding concurrent work for acceleration

# Schedule Analytics

## Schedule Quality

- Critical
  - Watch for critical ratio (critical to non-critical count)
    - Too many critical could be indicator of redundant logic
    - Too few could indicate high # of open ends
  - Don't ignore the non-critical, could be near and be a swing factor with little effort
  - Does the critical path make sense?
    - Project where the rain gutters were on critical path for a compressor shelter – probably not critical to start-up
    - Are there gaps in the path from data date to completion?
    - Close-out documents

# Schedule Analytics

## Schedule Quality

- Schedule Comparison – Forensics
  - Modified schedule characteristics between updates
    - Logic changes – FS to SS w lag, decreases in lag duration between updates
    - Actual date changes – activities in the past with actuals have changed dates affecting those successors tied
    - Calendar changes – adding additional workhours to the day different than the original

Heads up - Contractor knowing the owner has a forensics tool changes behavior

# Schedule Analytics

## Schedule Quality

- Schedule Cleanse (Acumen) – eliminate the below characteristics in one motion quickly
  - Redundant Logic
  - Hard Constraints
  - Soft Constraints
  - Remaining Leads/Lags
  - Links on Summaries
- Identifies each and lets you modify all or individually

# Schedule Analytics

## Schedule Quality – Cleanse (Acumen tool)

List of hard constraints

Available categories to modify

The screenshot shows the 'Cleanse Schedule - Current Schedule' window. On the left, there are several categories of constraints to be modified, each with a checkbox and a description:

- Redundant Logic - (0/2)**: Lower Redundancy Index™ to zero by removing unnecessary (redundant) links.
- Hard Constraints - (0/4)**: Removes all hard constraints (Mandatory Start, Mandatory Finish, Must Start On and Must Finish On constraints) from the schedule.
- Soft Constraints - (0/3)**: Remove all soft constraints (Finish On or After, Finish On or Before, Start On or After, Start On or Before, As Late As Possible constraints) from the schedule.
- Remaining Leads - (0/2)**: Removal of negative lags (leads) from the schedule. Results in a more realistic forecast.
- Remaining Lags - (0/20)**: Elimination of positive durations on relationships. Achieve this either by removing the lags or converting the lags to activities.
- Links on Summaries - (0/0)**: Elimination of links on summaries. Achieve this by converting the links on summaries to links on normal activities.

On the right, a table titled 'Primary Constraint' displays a list of constraints. An arrow points from the text 'List of hard constraints' to this table. The table has columns for 'Remove', 'Excluded', 'Id', 'Description', 'Project', 'Original Duration', and 'Remainin'. It shows two groups of constraints:

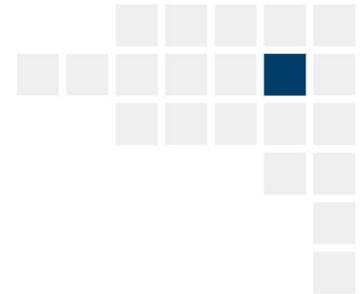
- Primary Constraint: MandatoryStart (3 items)**

Remove	Excluded	Id	Description	Project	Original Duration	Remainin
<input type="checkbox"/>	<input type="checkbox"/>	0160	Bid B review	Current Schedule	50	
<input type="checkbox"/>	<input type="checkbox"/>	0320	Electrical	Current Schedule	45	
<input type="checkbox"/>	<input type="checkbox"/>	0380	Vendor A	Current Schedule	25	
- Primary Constraint: MandatoryFinish (1 item)**

Remove	Excluded	Id	Description	Project	Original Duration	Remainin
<input type="checkbox"/>	<input type="checkbox"/>	0300	Communications	Current Schedule	5	

# Schedule Analytics

## Schedule Quality – Acumen Fuse



### Timeline

### Metrics

Project / Snapshot	Timeline					Ribbon Analyzer																						
	2010	2011	2012	2013	2014	Normal	Milestones	Avg. Float	Critical <=20	Missing Predecessors	Missing Successors	FS Predecessors	SF Predecessors	Negative Lag	Positive Lag	Hard Constraints	Resources on No...	Resources on Su...	Invalid Dates	Critical <=0	Missing WBS	Calendar count	> 30 days float	> 30 days lag	Excessive Lag	Score		
Current Schedule						38 (68%)	3 (5%)	-42	33 (80%)	1 (2%)	4 (10%)	35 (85%)	0 (0%)	2 (5%)	21 (51%)	3 (7%)	52 (100%)	0	0 (0%)	33 (80%)	3 (5%)	1	8 (20%)	1 (2%)	2 (12%)	16%		
Phase Analyzer	Normal	6 (29%)	5 (100%)	26 (100%)	13 (87%)	0 (0%)																						
	Milestones	0 (0%)	0 (0%)	0 (0%)	2 (13%)	1 (100%)																						
	Avg. Float	0	N/A	-19	10	0																						
	Critical <=20	5 (83%)	5 (83%)	21 (81%)	12 (80%)	1 (100%)																						
	Missing Predecessors	1 (17%)	0	0 (0%)	0 (0%)	0 (0%)																						
	Missing Successors	0 (0%)	0	2 (10%)	1 (7%)	1 (100%)																						
	FS Predecessors	3 (50%)	0	18 (90%)	13 (93%)	1 (100%)																						
	SF Predecessors	0 (0%)	0	0 (0%)	0 (0%)	0 (0%)																						
	Negative Lag	0 (0%)	0	1 (5%)	1 (7%)	0 (0%)																						
	Positive Lag	5 (83%)	0	12 (60%)	4 (29%)	0 (0%)																						
	Hard Constraints	1 (17%)	N/A	2 (10%)	0 (0%)	0 (0%)																						
	Resources on No...	20 (100%)	6 (100%)	26 (100%)	13 (100%)	0																						
	Resources on Su...	0	0	0	0	0																						
	Invalid Dates	0	0	0 (0%)	0 (0%)	0 (0%)																						
	Critical <=0	0	0	20 (80%)	12 (80%)	1 (100%)																						
	Missing WBS	1 (5%)	0	0 (0%)	1 (7%)	1 (100%)																						
	Calendar count	1	1	1	1	1																						
	> 30 days float	0	0	5 (20%)	3 (20%)	0 (0%)																						
	> 30 days lag	0 (0%)	0 (0%)	0 (0%)	1 (7%)	0 (0%)																						
	Excessive Lag	0	0	2 (15%)	0 (8%)	0																						
Score	0%	0%	15%	40%	0%																							



# Schedule Analytics

## Schedule Quality – My typical Metrics (Fuse)

- Normal – count of activities (duration > 0)
- Milestones – count of milestones (looking at ratio normal/milestones)
- Average float – average float across entire schedule
- Critical $\leq$ 20 – float values to gather near critical path
- Missing Pred/Succ – Open ended activities
- FS Predecessors – should be majority of schedule
- SF Predecessors – should be none, issues when using for Risk model
- Negative/Positive Lag – hidden detail (lack of tasks)

# Schedule Analytics

## Schedule Quality – My typical Metrics (Fuse)

- Hard/Soft constraints – Must start/finish, force critical path
- Critical  $\leq 0$  – Float value less than or equal 0, making sure to capture critical activities (regardless of user definition)
- $>30d$  float – activities seemingly off critical path, missing logic?
- $>30d$  lag – long duration lag, not good practice, missing activity detail?
- Excessive lag –  $\geq$  than duration of predecessor

# Schedule Analytics

## Avoiding Disaster

Schedule health isn't the sole factor in ensuring project success, but it is a key ingredient. The ability to use the schedule to accurately forecast equipment and materials needs, resource requirements and ultimately the completion of the project are key to having a successful project schedule. Schedules don't build and maintain themselves so we must make the most of the tools available to create as accurate a plan as possible driving toward completion. Project failure is often because of a poorly planned schedule, weak execution or omitting additional scope of such schedule. Our goal is a sound plan to mitigate these potentials and produce an achievable schedule.

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