



Next Level Schedule Analytics & Automation

Speaker Name

- Speaker bio:
 - SmartPM Technologies, Inc
 - Industrial Engineer
 - 20 yrs experience in construction schedule analysis
 - PSP, CCE Certified
 - Fun fact: I Love Soup!



Topic Outline

- Announcement
- History of Scheduling
- Current State of Construction Scheduling
- The Future of Scheduling
- How will we need to Evolve as Schedulers
- Man vs. Machine - Who will be better at what?
- Questions & Comments

Announcement – Schedule Quality Contest

Sign up today!

*- \$250 for the best overall base
line schedule score*

*- \$250 for the best cumulative
schedule score with 10 updates*

***Schedules graded using SmartPM's default DCMA based grading structure*

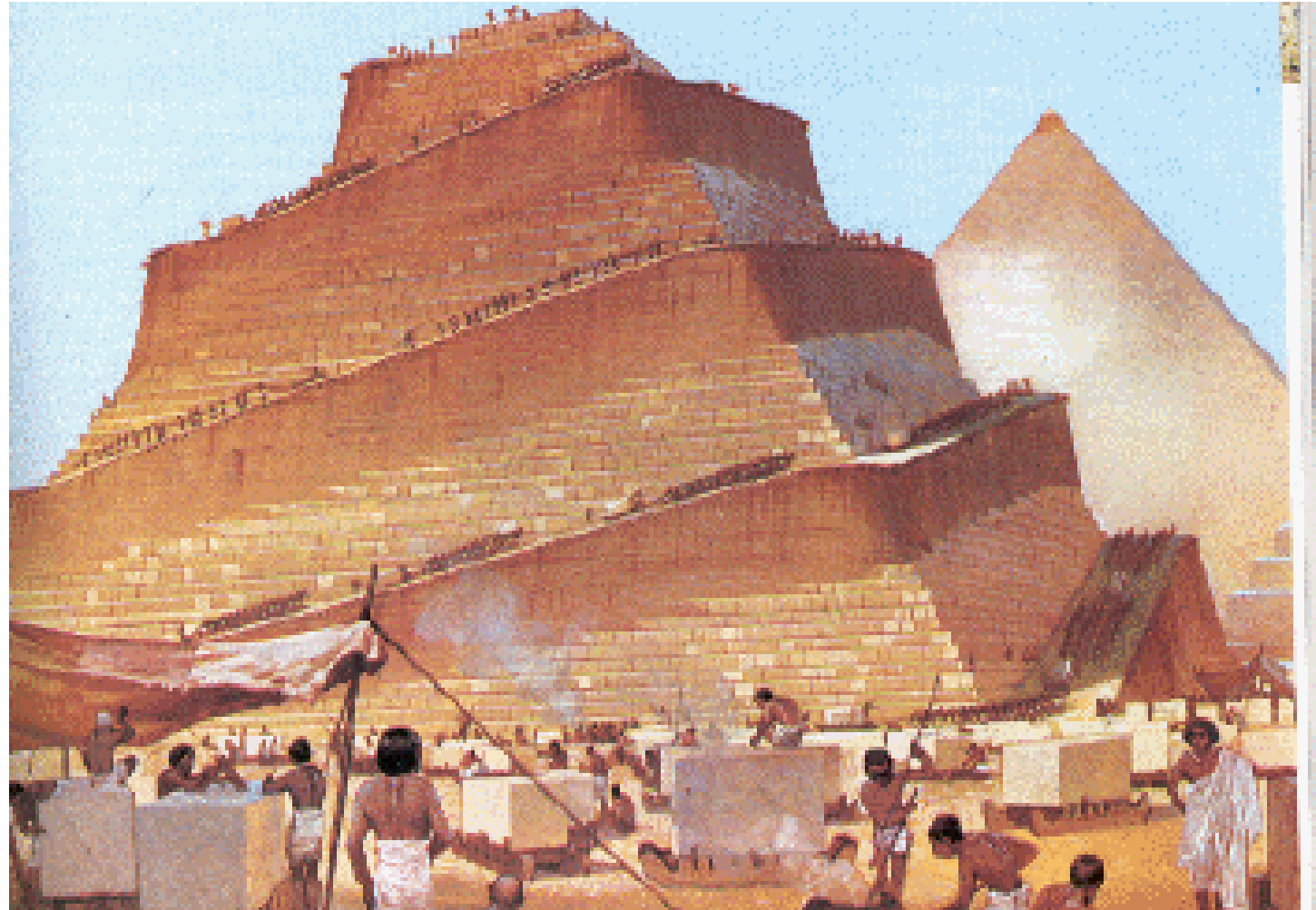
HINT – SmartPM’s Quality Grading Criteria

Metric	Criteria		
	Good Threshold	Acceptable	Unacceptable
Total Relationships	> = 1.5	> = 1.25	< 1.25
FS	> 90%	80% - 90%	< = 80%
SS	< = 5%	5% - 10%	> = 10%
FF	< = 5%	5% - 10%	> = 10%
SF	< = 0%	0% - 0.2%	> = 0.2%
Missing Logic	< = 2.5%	2.5% - 5%	> 5%
Negative Lag	< = 2.5%	2.5% - 5%	> 5%
Positive Lag	< = 2.5%	2.5% - 5%	> 5%
Constraints	< = 2.5%	2.5% - 5%	> 5%
High Float Activities (> 44 days)	< = 20%	20% - 33%	> 33%
High Duration Activities (> 44 days)	< = 2.5%	2.5% - 5%	> 5%
Critical Path %	10% - 20%	5% - 10% or 20% - 30%	< 5% or > 30%
Average Total Float	15 - 44 days	7.5 - 15 days	< 7.5 days or > = 44 days



THE HISTORY OF SCHEDULING

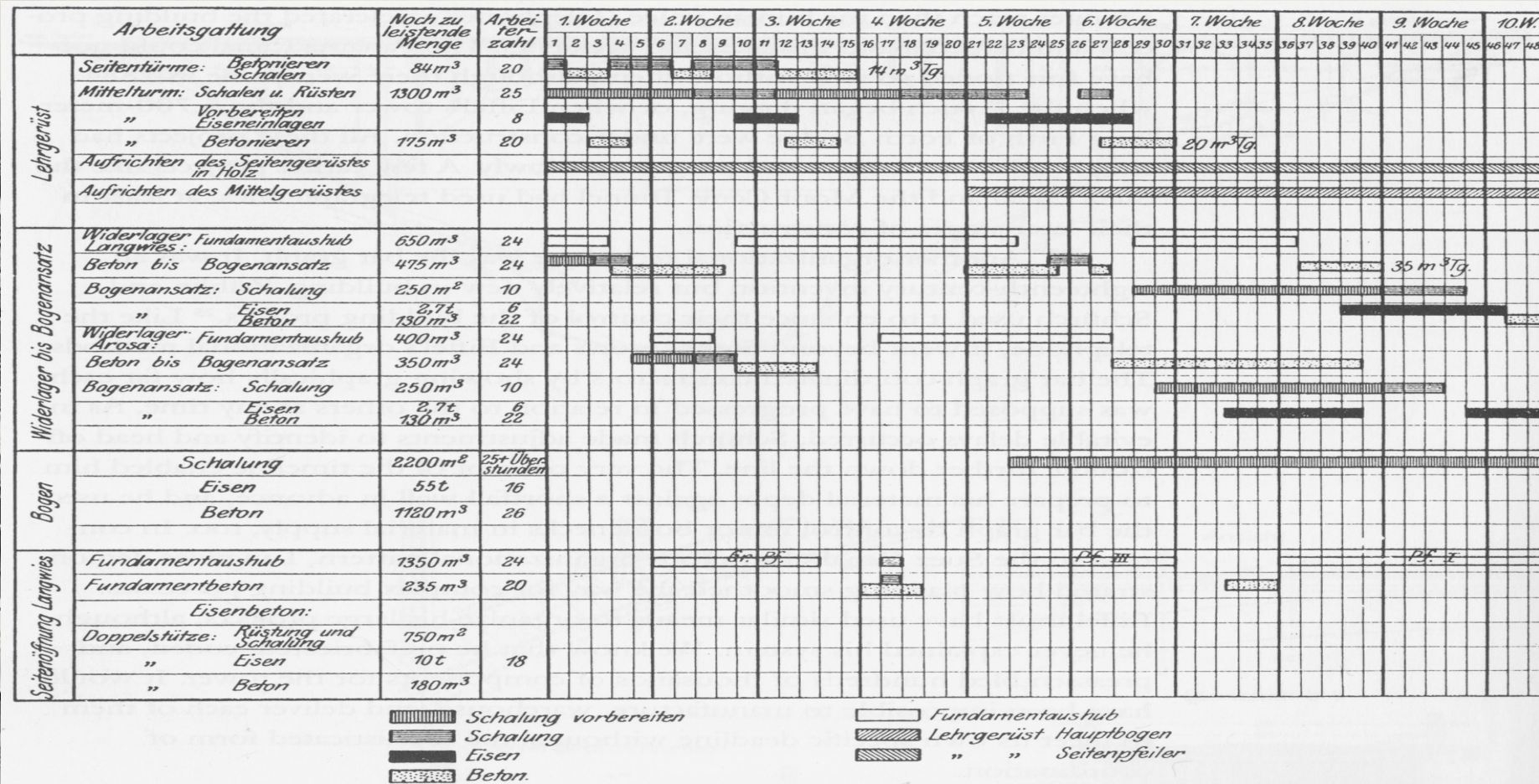
In the Beginning



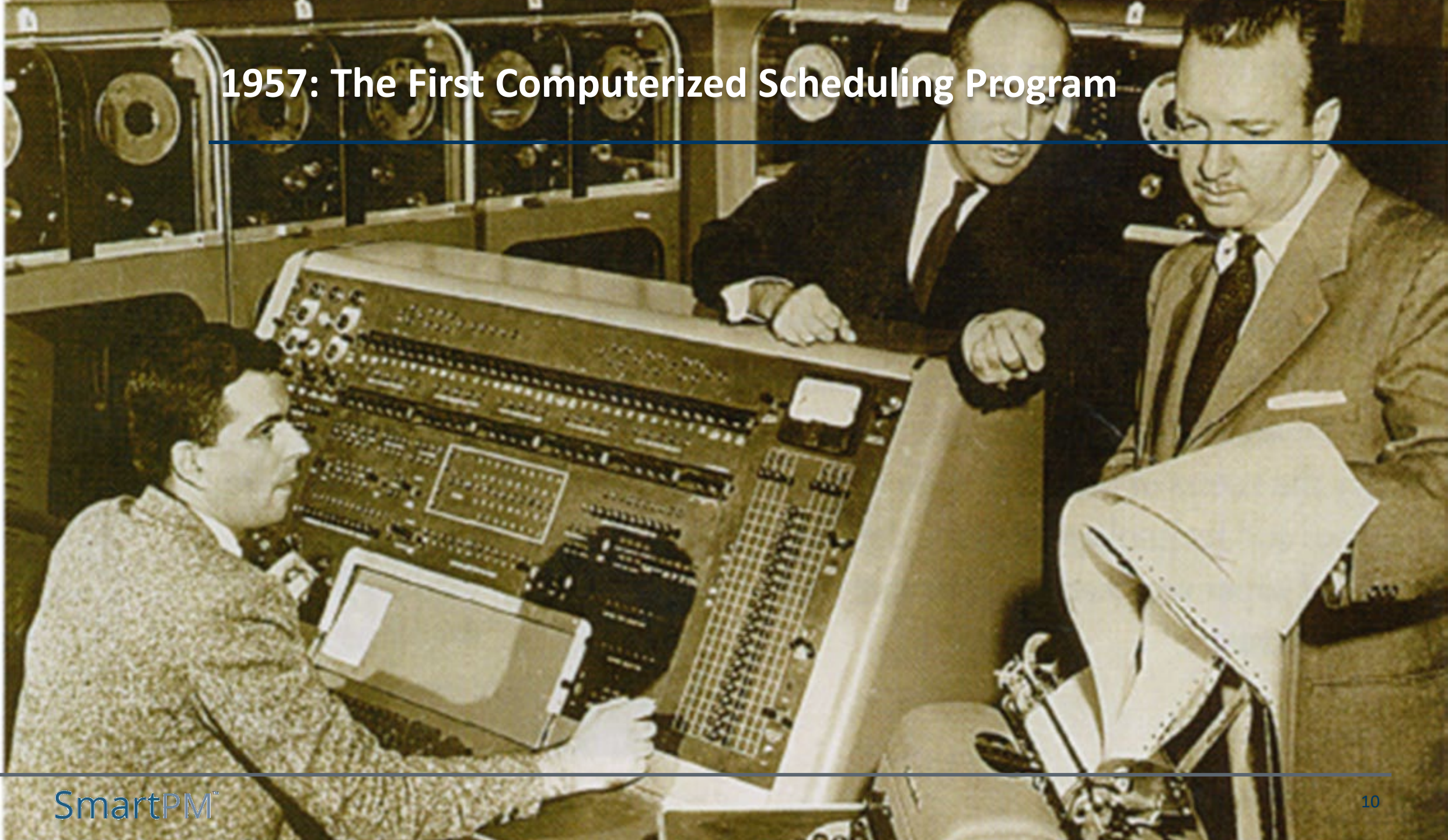
1896: The Workers Harmony Graph

time	From	—	—	—	A-1	B-1	...
	To	A-2	B-2,C	D-2	A-3	E-1	...
	activity	A-1<4>	B-1<4>	D-1<2>	A-2<4>	B-2<3>	...
1		■	■	■			
2				■			
3							
4		■	■				
5					■	■	
6							
7						■	
8					■		
9							
10							
11							
12							
13							
14							

1912: Early Versions of a Graphic Bar Chart



1957: The First Computerized Scheduling Program



1983: Primavera Developed the First CPM Scheduling Program





THE CURRENT STATE OF SCHEDULING

The Schedule Analytics Age is Upon Us



Schedule
Quality



Schedule
Delay



Schedule
Recovery



Schedule
Risk



Schedule
Feasibility



Schedule
Predictive

Schedule Analysis Techniques and Technologies

Analyzing Schedule Quality

Preferred Technique:	DCMA	
How Often:	Every Schedule	
Technologies:	SmartPM™, Acumen Fuse, Schedule Analyzer, Steel Ray, Rubix, Schedule Cracker	
Challenges:	Most tools lack intelligence & require specialized Experience	
Tips:	Enforce Best Practices; Don't accept bad schedules to avoid confrontation	

Total Activities	1192		High Float Activities	722	60.6%
Milestones	87		High Duration Activities	38	3.2%
Activities	1105		Resource Loaded Activities	0	0.0%
Total Relationships	1736	1.5:1	Critical Path %	61	5.1%
Finish to Start	1578	90.9%	Avg. Activity Total Float	31	
Start to Start	56	3.2%			
Finish to Finish	102	5.9%			
Start to Finish	0	0.0%			
Missing Logic	1	0.1%			
Negative Lag	0	0.0%			
Positive Lag	20	1.2%			
Constraints	4	0.3%			

Analyzing Recovery

Preferred Technique:	Comparison, Half Step
How Often:	Every Update
Technologies:	SmartPM™, Claimdigger, Acumen Fuse, Schedule Analyzer, Rubix
Challenges:	Manual Process is specialized & time consuming / Most tools are archaic, lack intelligence and require a specialist.
Tips:	Focus on Critical and Near Critical Changes; Perform What – If Scenarios; Don't fear the discussion about this

	DATE	CRITICAL CHANGES	NEAR CRITICAL CHANGES	ACTIVITY CHANGES	LOGIC CHANGES	DURATION CHANGES	DELATED ACTIVITY CHANGES	TOTAL
	2018-03-12	0	0	0	0	0	0	0
	2018-04-30	14	11	11	22	2	1	33
	Total		11	11	22	2	1	33
CRITICAL CHANGES FROM 2018-04-30								
	DATE	CRITICAL CHANGES	NEAR CRITICAL CHANGES	ACTIVITY CHANGES	LOGIC CHANGES	DURATION CHANGES	DELATED ACTIVITY CHANGES	TOTAL
	2018-04-30	0	0	0	0	0	0	0
	2018-05-01	1	1	1	1	1	1	6
	2018-05-02	1	1	1	1	1	1	6
	2018-05-03	1	1	1	1	1	1	6
	2018-05-04	1	1	1	1	1	1	6
	2018-05-05	1	1	1	1	1	1	6
	2018-05-06	1	1	1	1	1	1	6
	2018-05-07	1	1	1	1	1	1	6
	2018-05-08	1	1	1	1	1	1	6
	2018-05-09	1	1	1	1	1	1	6
	2018-05-10	1	1	1	1	1	1	6
	2018-05-11	1	1	1	1	1	1	6
	2018-05-12	1	1	1	1	1	1	6
	2018-05-13	1	1	1	1	1	1	6
	2018-05-14	1	1	1	1	1	1	6
	2018-05-15	1	1	1	1	1	1	6
	2018-05-16	1	1	1	1	1	1	6
	2018-05-17	1	1	1	1	1	1	6
	2018-05-18	1	1	1	1	1	1	6
	2018-05-19	1	1	1	1	1	1	6
	2018-05-20	1	1	1	1	1	1	6
	2018-05-21	1	1	1	1	1	1	6
	2018-05-22	1	1	1	1	1	1	6
	2018-05-23	1	1	1	1	1	1	6
	2018-05-24	1	1	1	1	1	1	6
	2018-05-25	1	1	1	1	1	1	6
	2018-05-26	1	1	1	1	1	1	6
	2018-05-27	1	1	1	1	1	1	6
	2018-05-28	1	1	1	1	1	1	6
	2018-05-29	1	1	1	1	1	1	6
	2018-05-30	1	1	1	1	1	1	6
	2018-05-31	1	1	1	1	1	1	6
	2018-06-01	1	1	1	1	1	1	6
	2018-06-02	1	1	1	1	1	1	6
	2018-06-03	1	1	1	1	1	1	6
	2018-06-04	1	1	1	1	1	1	6
	2018-06-05	1	1	1	1	1	1	6
	2018-06-06	1	1	1	1	1	1	6
	2018-06-07	1	1	1	1	1	1	6
	2018-06-08	1	1	1	1	1	1	6
	2018-06-09	1	1	1	1	1	1	6
	2018-06-10	1	1	1	1	1	1	6
	2018-06-11	1	1	1	1	1	1	6
	2018-06-12	1	1	1	1	1	1	6
	2018-06-13	1	1	1	1	1	1	6
	2018-06-14	1	1	1	1	1	1	6
	2018-06-15	1	1	1	1	1	1	6
	2018-06-16	1	1	1	1	1	1	6
	2018-06-17	1	1	1	1	1	1	6
	2018-06-18	1	1	1	1	1	1	6
	2018-06-19	1	1	1	1	1	1	6
	2018-06-20	1	1	1	1	1	1	6
	2018-06-21	1	1	1	1	1	1	6
	2018-06-22	1	1	1	1	1	1	6
	2018-06-23	1	1	1	1	1	1	6
	2018-06-24	1	1	1	1	1	1	6
	2							

Schedule Analysis Techniques and Technologies

Analyzing Critical Path Delay

Preferred Technique:

Windows Analysis

How Often:

Every Update

Technologies:

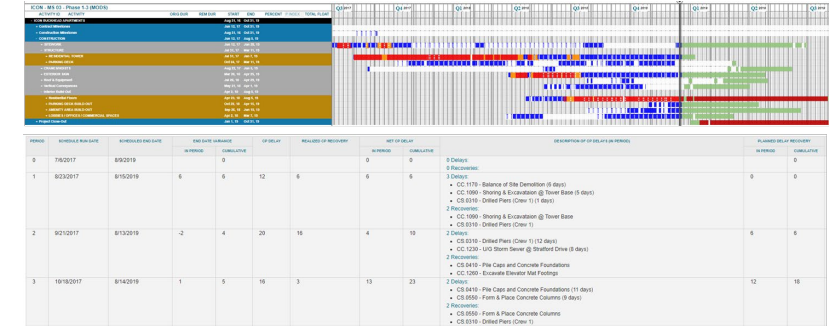
SmartPM™

Challenges:

Manual Process is specialized, time consuming, subjective and arguable

Tips:

The more analysis the better; Document Assumptions; Objectivity Wins; Graphics need to Speak



Analyzing Feasibility, Risk & Predictive Analytics

Preferred Technique:

Compression Analysis & Monte Carlo

How Often:

Every Update

Technologies:

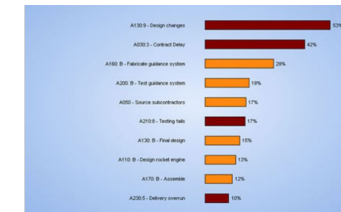
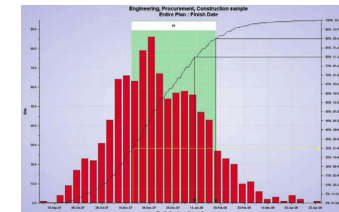
Primavera Risk, SmartPM™

Challenges:

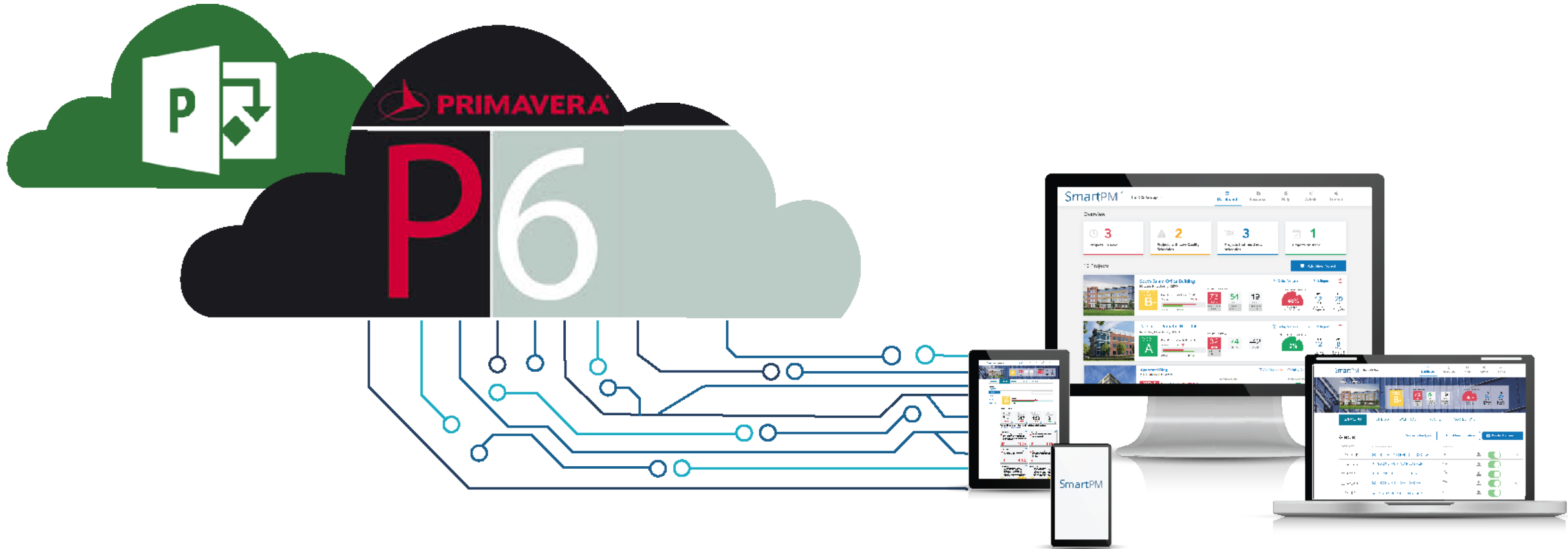
Manual Process is specialized & time consuming / Most tools lack intelligence and require a specialist

Tips:

Use Project Actuals to estimate Activity Distributions in Simulator; Use Critical Path Sensitivity data proactively; Reject overly compressed schedules. Be Objective.



Cloud Based Scheduling



Complex Schedule Analytics Automation



The background of the slide is a deep blue gradient. It features several white, semi-transparent curved lines that sweep across the frame. Along these lines are various sized white circles, some solid and some with a slight glow, creating a sense of motion and connectivity. The overall aesthetic is clean, modern, and technological.

THE FUTURE OF SCHEDULING

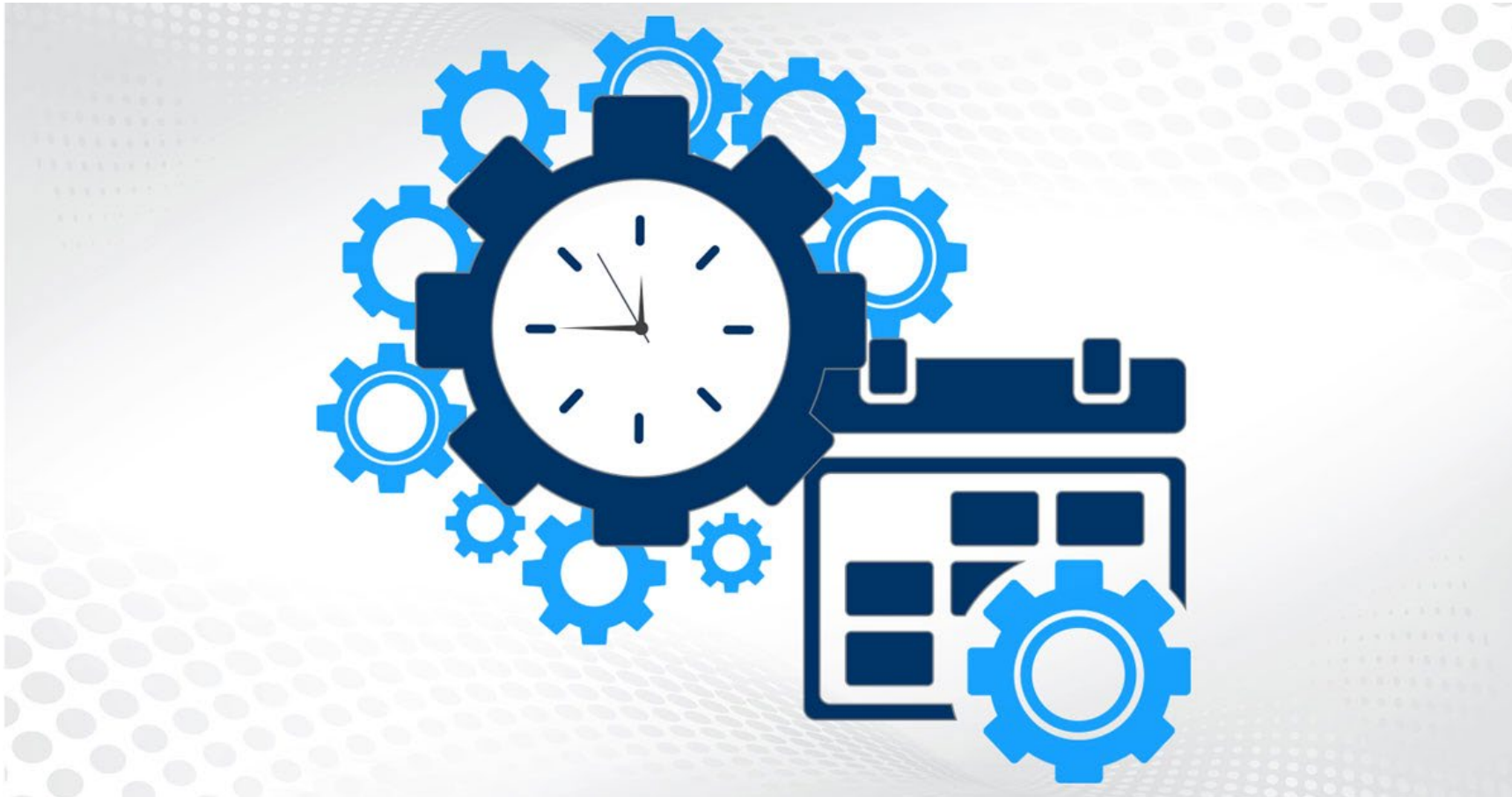
Mass Schedule Data Aggregation



Machine Learning & Artificial Intelligence



Scheduling Automation





THE EVOLUTION OF THE SCHEDULER

Preparing for the Future – Knowledge and Understanding



The Next Generation of Scheduling: Schedule-centric Analytics



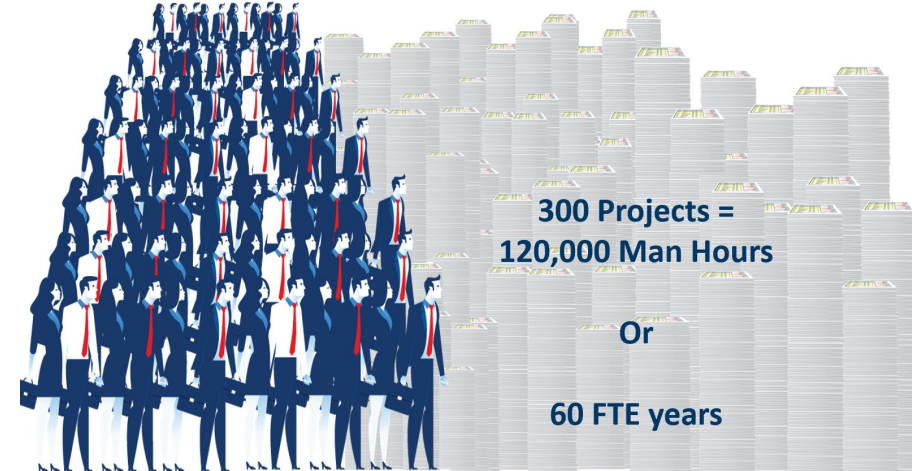
Man vs Machine – Who will be better at what?

1 Project \$25M = 400 Man Hours



Schedule Quality **100 Hours**
Delay Analysis **150 Hours**
Risk Analytics **150 Hours**

400 Hours

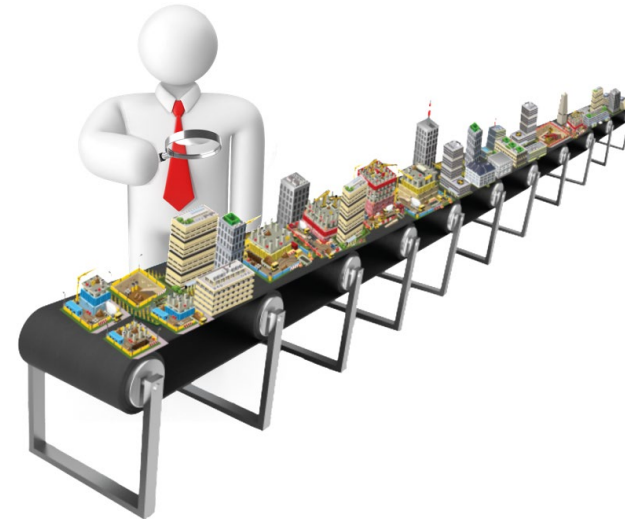
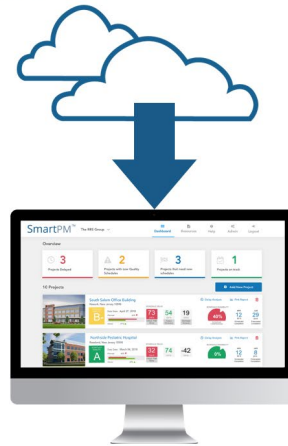
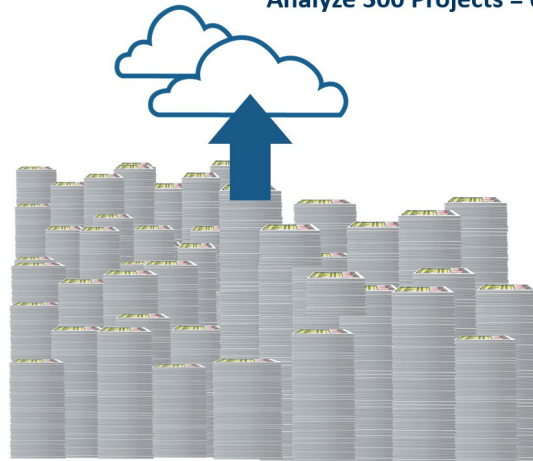


300 Projects =
120,000 Man Hours

Or

60 FTE years

Analyze 300 Projects = 0 Manhours



My Prediction(s) – The industry will become Enlightened through Technology

1. The Schedule and the data behind it will be recognized for what it is:
The most important data set in Construction.
2. Schedulers will be doing less busy work and more strategic work
3. There will be more Scheduling and Project Analyst roles, not less.



QUESTIONS/ COMMENTS?