

# Effective Management of Time

## in Mega Projects

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**wood.**

 **Project Controls**  
**EXPO**  
UAE, Middle East

# Outline



- 01 Introduction & Safety Moment**  
Presenter's Identity and Identity Theft.
- 02 Planning vs. Scheduling**  
The difference between project planning and scheduling.
- 03 Time Management Principles & Schedule Density**  
4 Core principles and the concept of 'schedule density'.
- 04 Dynamic Scheduling**  
The need for on-going dynamic scheduling to manage time.
- 05 Contemporaneous Delay Assessments**  
The need to contemporaneously assess the impact of delaying events.
- 06 Schedule Risk Analysis (SRA)**  
The need to analyze Schedule Risk quantitatively.

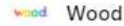


### Mehmet Gok

Senior Forensic Claim and Project Controls Manager MBA, PMP, CFCC, ACI Arb, DRMP, BCE

Talks about #claims, #megaprojects, #projectcontrols, #projectmanagement, and #planningandscheduling

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cbdc.jpg

ADNOC Carbon Black & Delayed Coker Project.



tupras izmir.jpg

TUPRAS Izmir Refinery Aliaga Turkey.

### Licenses & certifications



#### Associate of Chartered Institute of Arbitrators (ACI Arb)

Chartered Institute of Arbitrators (CI Arb) Scottish Branch  
Issued Nov 2020 · No Expiration Date



#### Project Management Professional (PMP)

Project Management Institute  
Issued Apr 2005 · Expires Apr 2024



#### Certified Forensic Claims Consultant (CFCC)

AACE International  
Issued Apr 2020 · Expires Apr 2023



#### Decision & Risk Management Professional (DRMP)

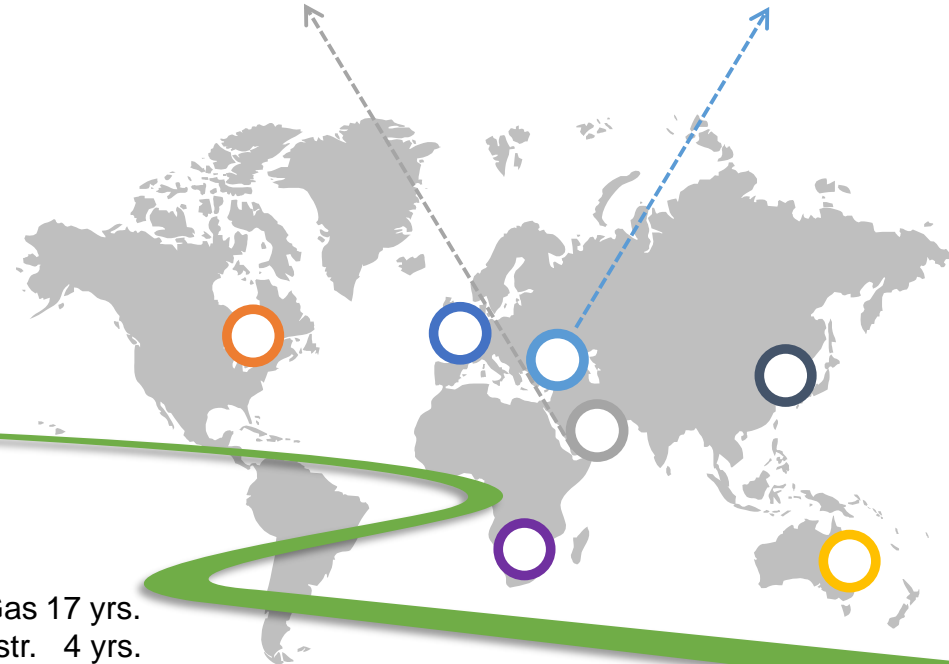
AACE International  
Issued Jan 2020 · Expires Jan 2023



1997

#### Worked 27 yrs on:

E	2 yr.	Oil/Gas	17 yrs.
EPC	7 yrs.	Infrastr.	4 yrs.
EPCM	6 yrs.	Mining	3 yrs.
PMC	12 yrs.	Power	3 yrs.



2014-present



Effective Management of Time in Mega Projects by Mehmet Gok



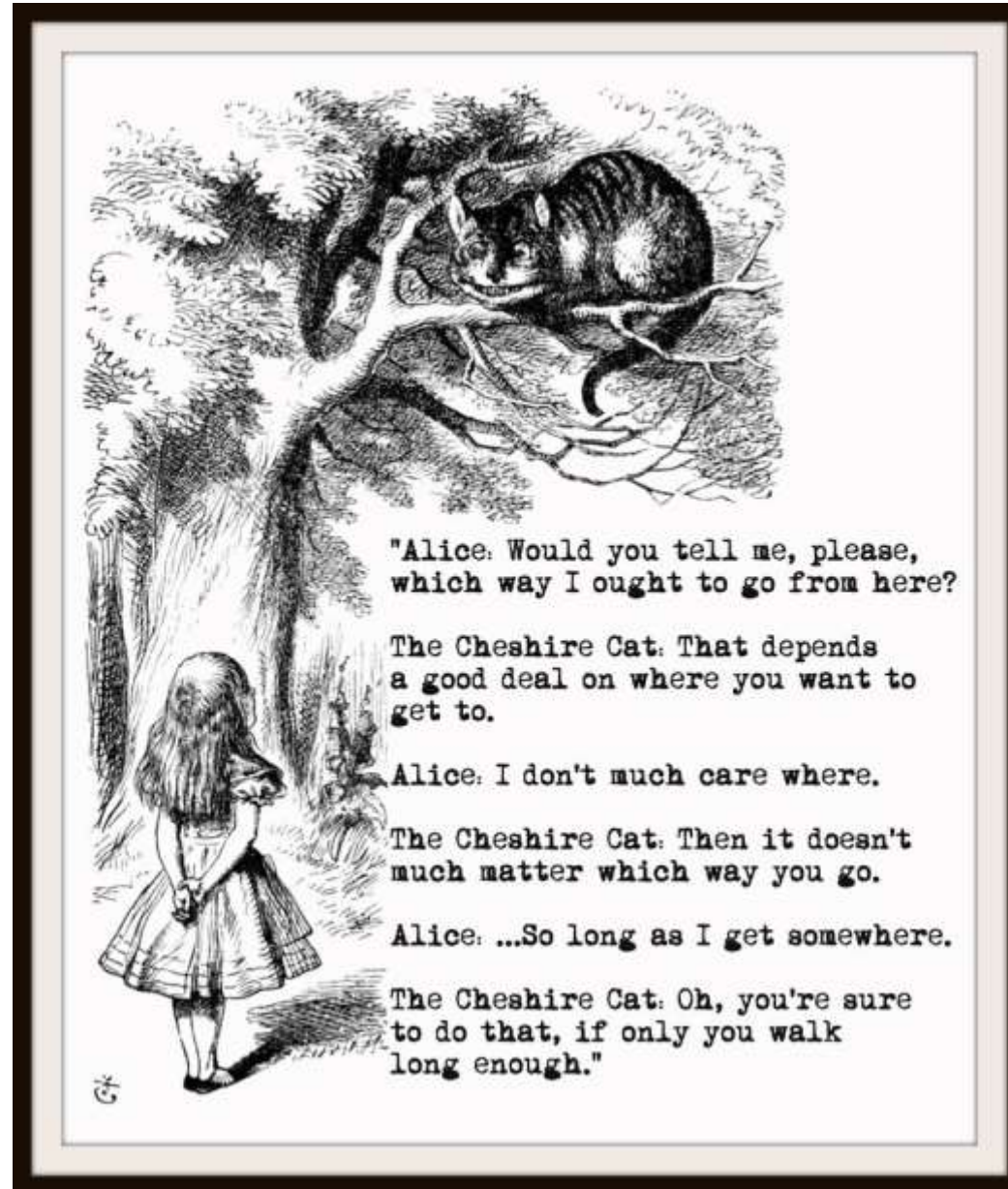
## Identity Theft

### Take steps to prevent identity theft

- Check your credit report regularly.
- Never respond to unsolicited requests for personal information.
- Monitor your account statements for unauthorized transactions.
- Be aware of your privacy settings on social media and suspicious emails which may be phishing for data.
- Install firewalls and virus-detection software on your home computer.
- Create complex passwords that identity thieves cannot guess easily.
- Destroy all documents containing your personal data.



**Attribution:** Lewis Carroll [Charles Lutwidge Dodgson] (1832–1898), British author, mathematician, clergyman. Alice and the Cheshire Cat, Alice's Adventures in Wonderland, Ch. VI, Macmillan (1865).



# Our House is on Fire!

Desperately Seeking the Cheshire Cat



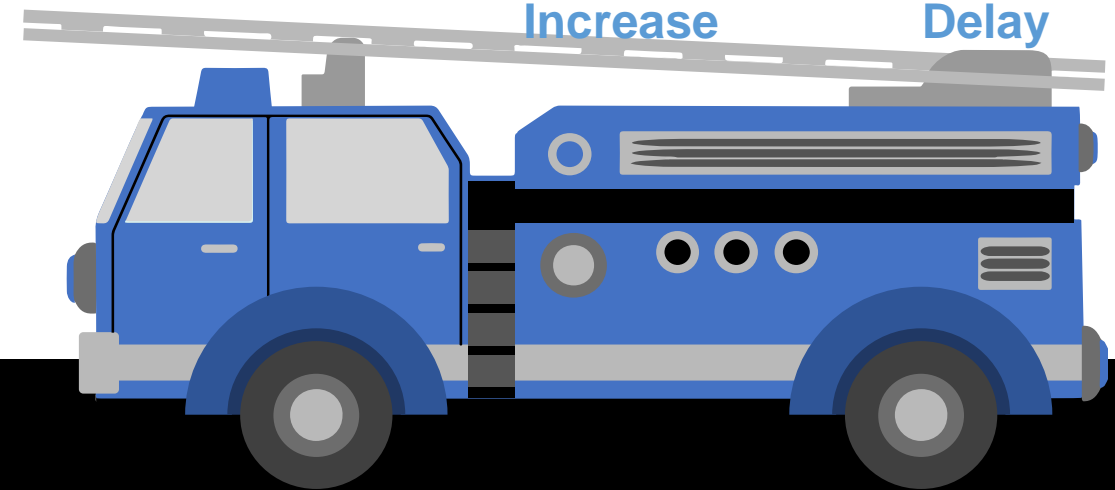
“Our house is on fire,” Bechtel told the audience. “Remember those three numbers and what they mean because I want them to haunt you the same way they haunt me.”

Early Aug 2016, Brendan Bechtel, speaking at the Construction Industry Institute (CII) conference, claimed that for megaprojects:

**98%**  
Failure Rate

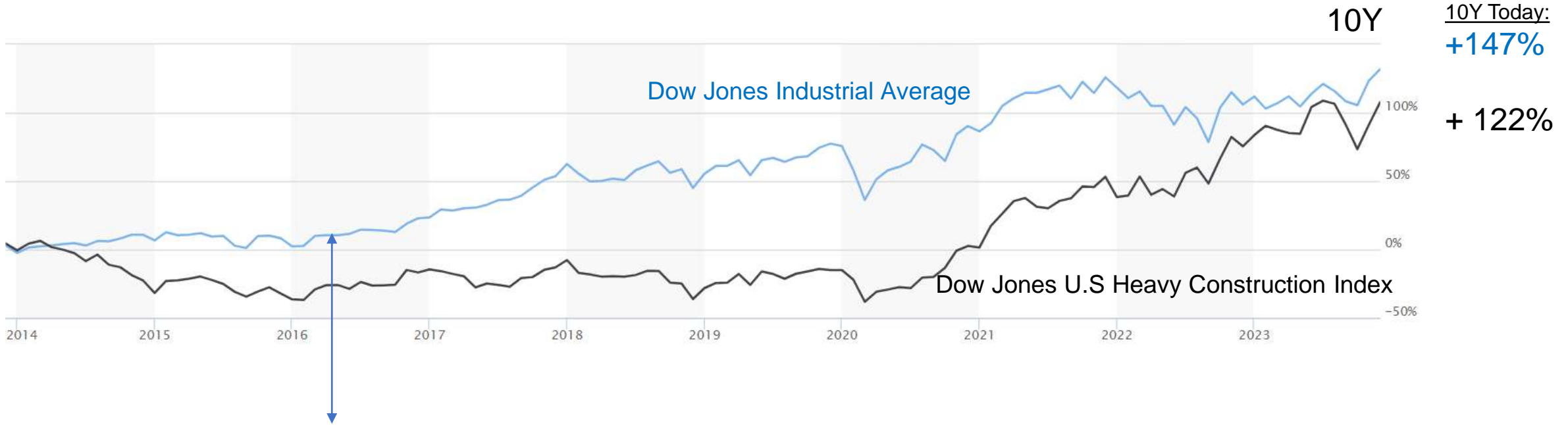
**80%**  
Cost Increase

**20**  
Months Delay



# We are not Delivering Financially

Dow Jones U.S. Heavy Construction Index vs. DJ Industrial Average (Dec 2013-2023)



Bechtel Speech, 2Y performance:  
+19% vs. -23%

Chart from marketwatch.com, 19.December.2023 data.

# McKinsey Global Survey Feb-2021

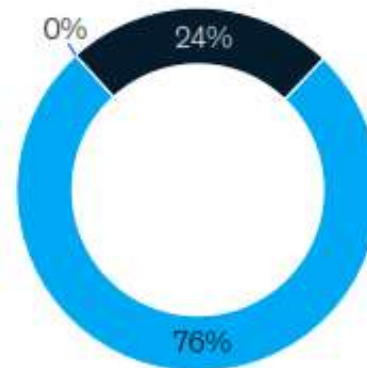
Exhibit 4

**Three-fourths of respondents believe a change in capital-project delivery is needed.**

**Leaders say talent shortages, rigid mind-sets, cost, and poor collaboration are holding the industry back**

Degree of change required in project-delivery model  
Respondents, %

- Only incremental optimization
- Redesign required
- No change required



Executives identified the top roadblock to change in their organization  
Respondents, %

**19**

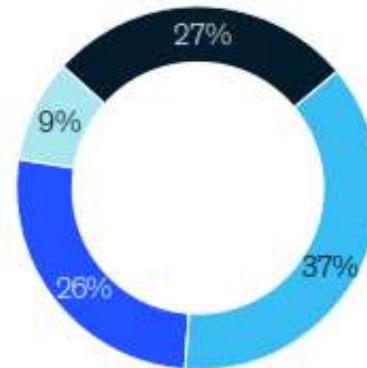
Talent and skill shortages

**18**

Clients', managers', and team members' mind-sets

Who should lead the change?  
Respondents, %

- Owner
- Joint effort among all parties
- Main contractor (EPC/EPCM)<sup>1</sup>
- General contractor



**17**

Cost

**10**

Poor collaboration and few win-win opportunities

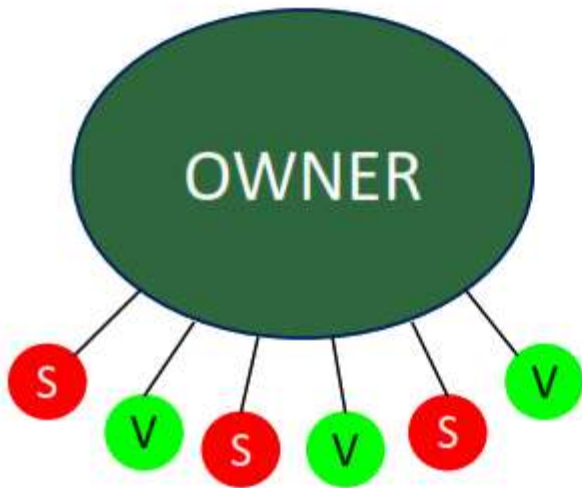
<sup>1</sup>Engineering, procurement, and construction/engineering, procurement, and construction management  
Source: Global survey of >300 industry leaders in capital projects



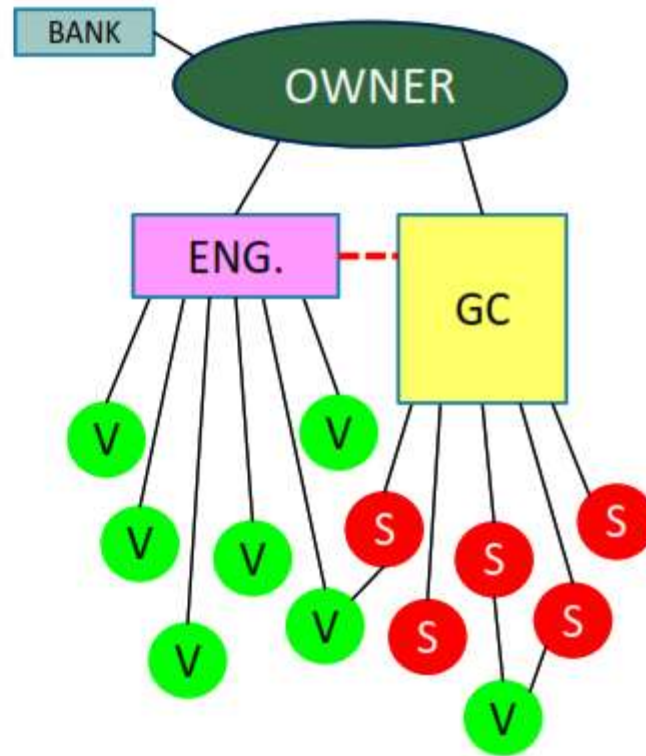
# Trends

Increasing Fragmentation and Complexity

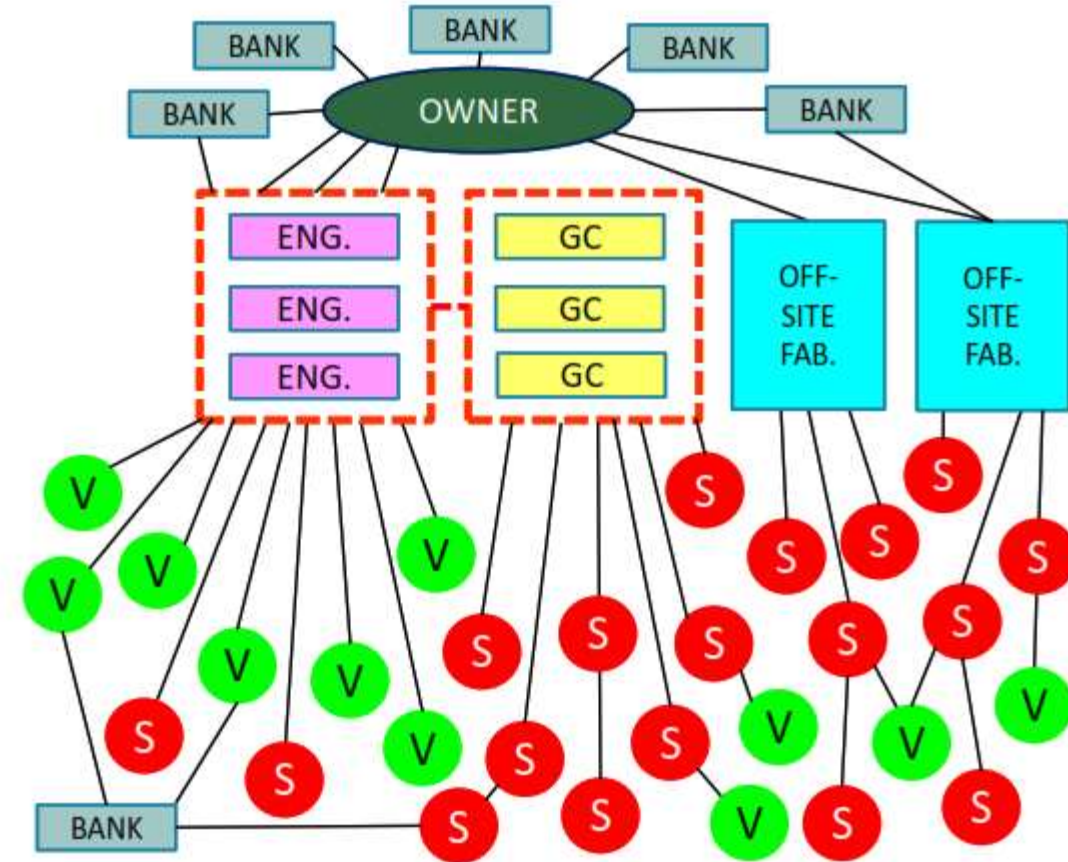
1960s  
(\$10s M)



1990s  
(\$100s M)



TODAY  
(\$1000s M)



From Stephen Cabano, 2019, slide 11.

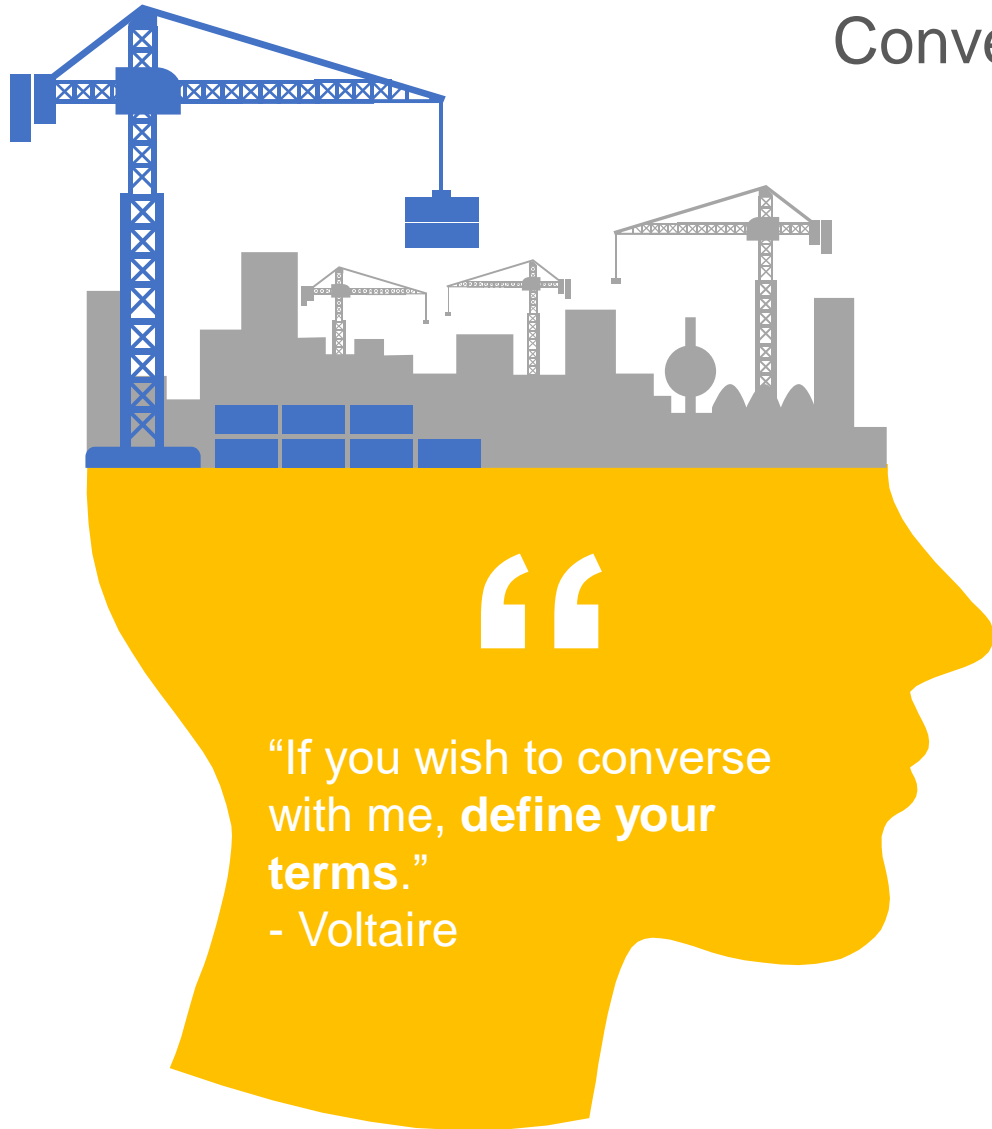
**S** Subcontractor

**V** Vendor / Supplier

# Planning vs. Scheduling

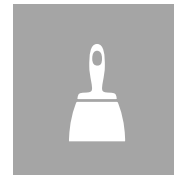


## Conversing with Voltaire



### Programme

Describes a static baseline target. Not used in mega projects.



### Project Planning

Largely an experience-based art, a group process requiring contribution from all affected parties for its success. The output from planning is documented decisions on how the work of the project will be accomplished.



### Scheduling

The science of using mathematical calculations and logic to model the project plan to predict when and where work is to be carried out in an efficient and time effective sequence.



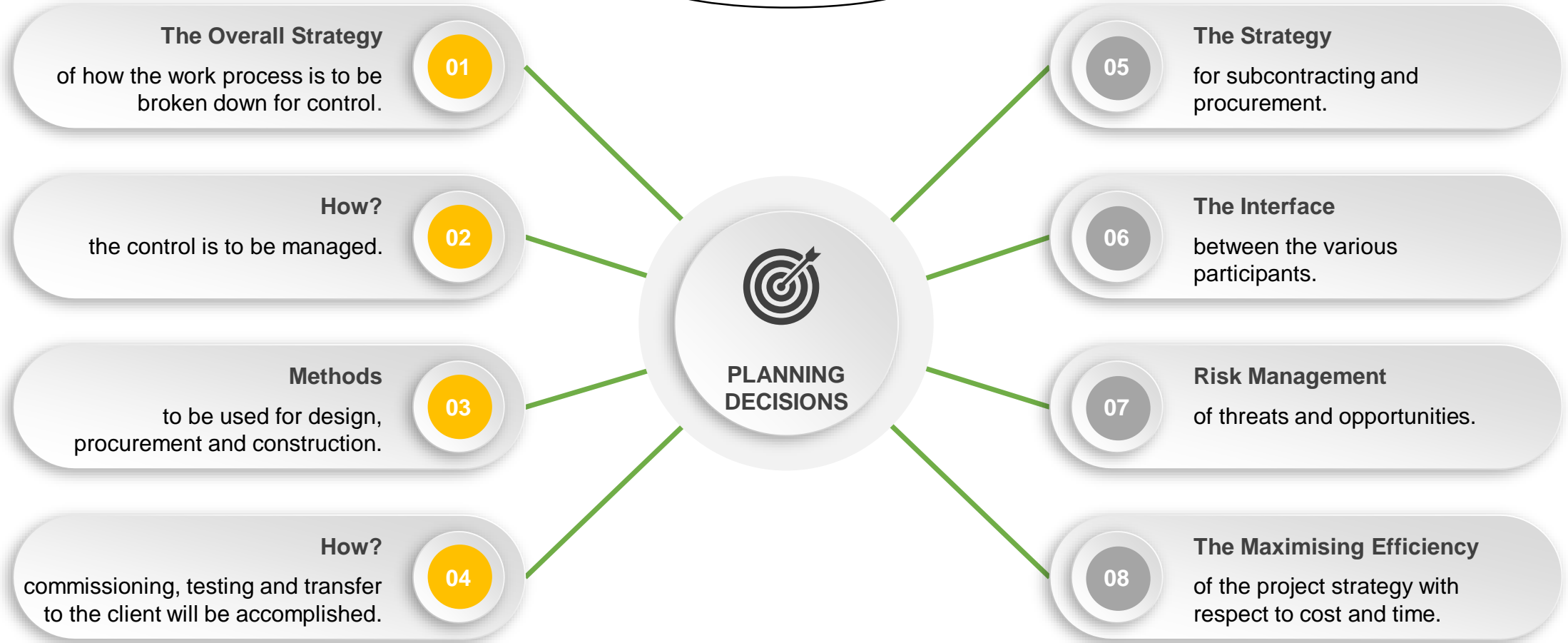
### Schedule

Describes a dynamic time model comprising the computerised calculated activity dates and logic. Schedule preparation must be a quality assured process against a standard which will ensure the integrity of the schedule, so that it can function as a time model.

# What are Planning Decisions?

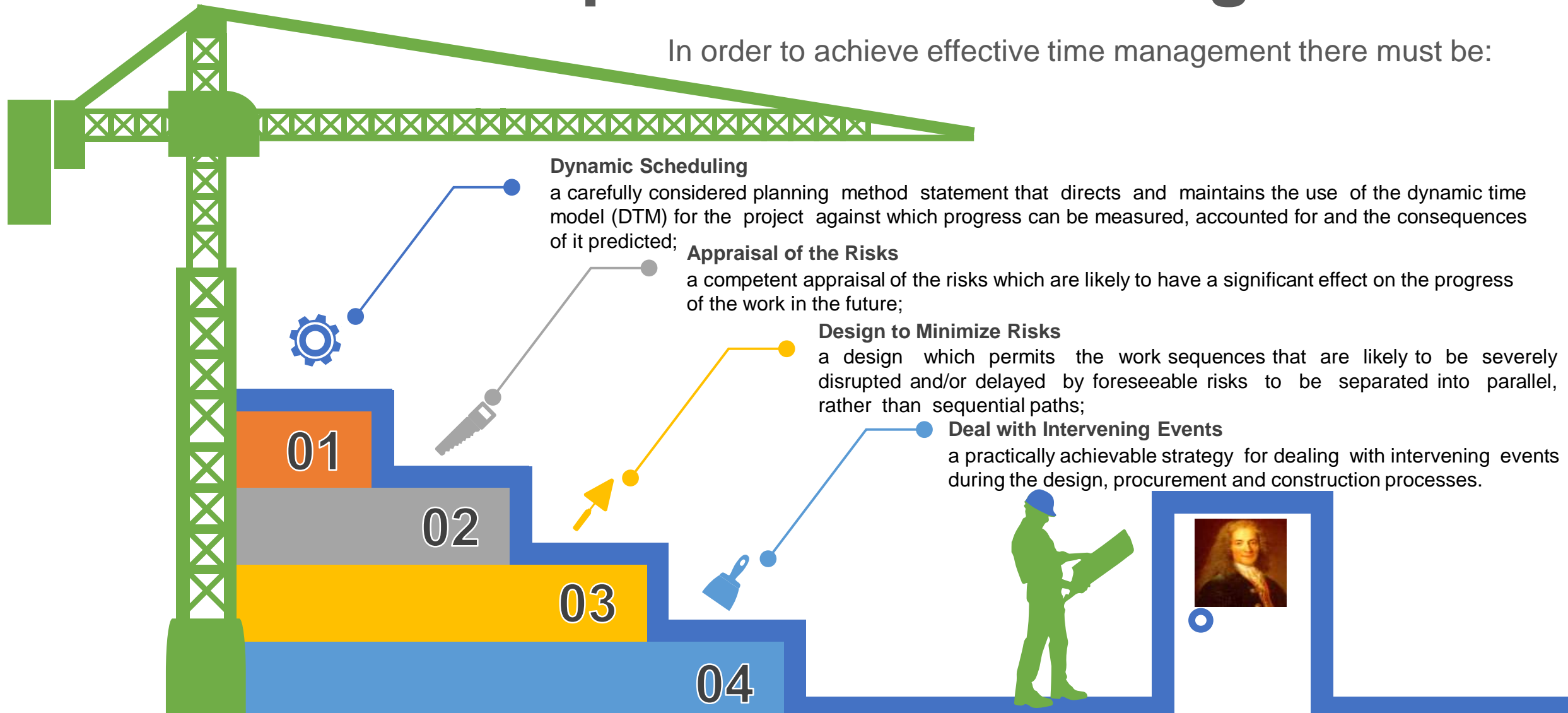


Planning must precede Scheduling

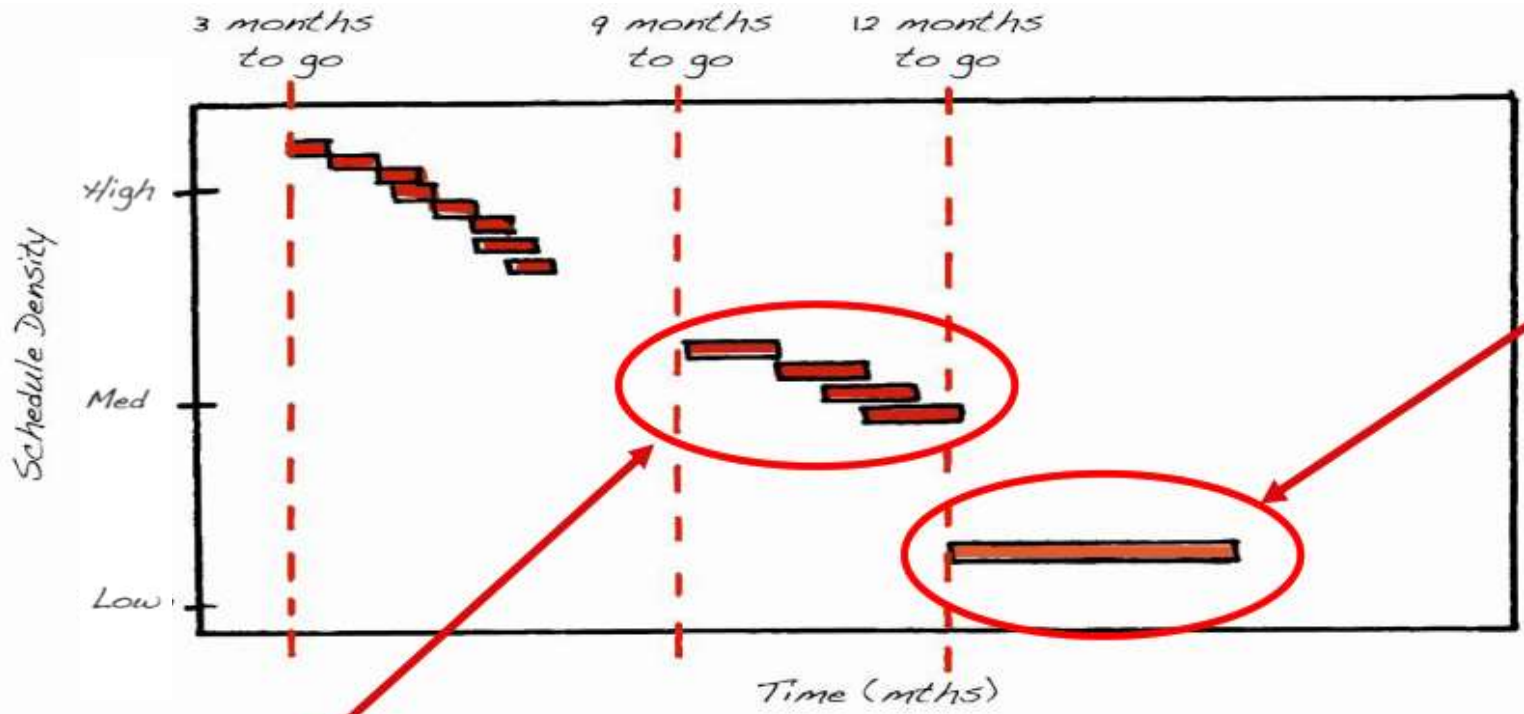


# Core Principles of Time Management

In order to achieve effective time management there must be:



# Graph of Schedule Density (1)



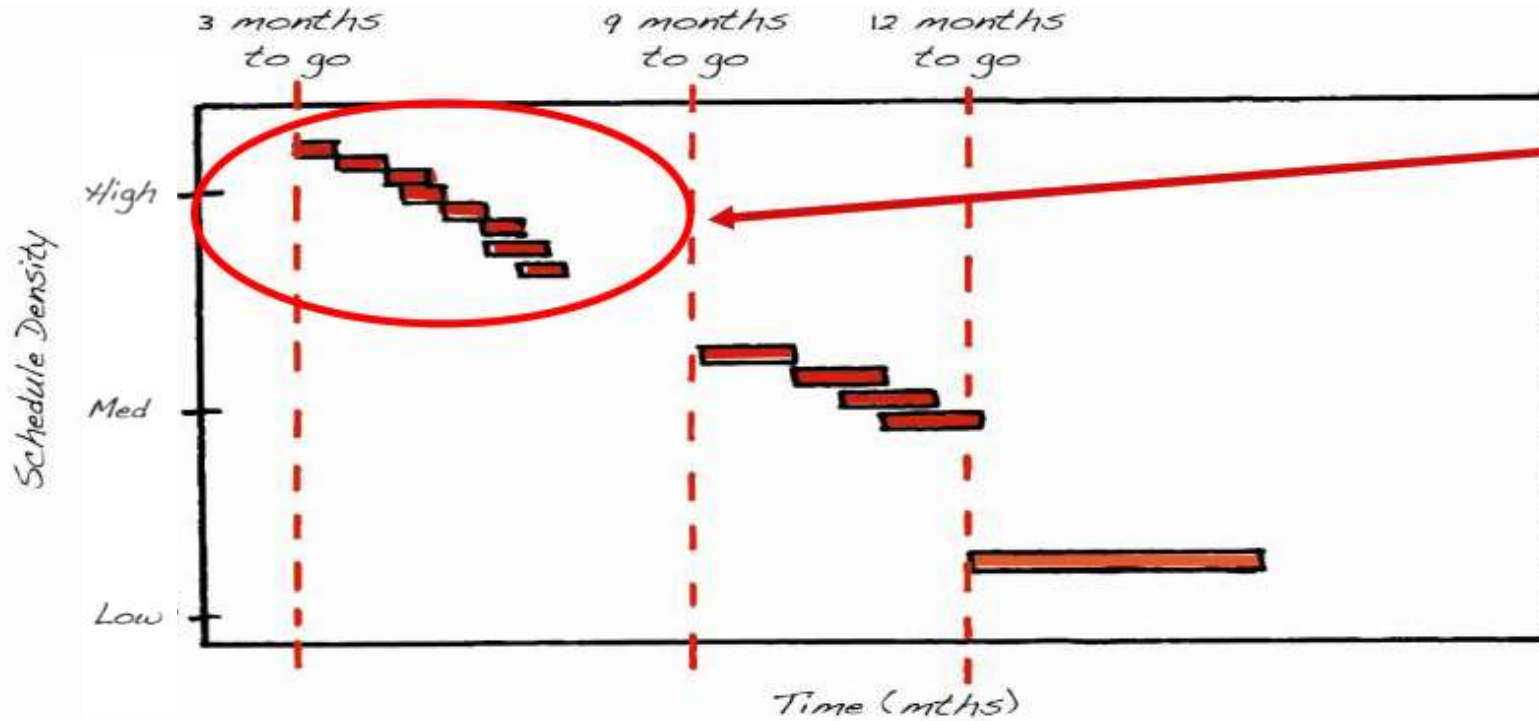
Low-density is appropriate for work, which is intended to take place 12 months, or more in the future.

Tasks may be several months in duration

Medium density is appropriate for work, which is intended to take place between 3 and 9 months after the schedule date. At this stage the work should be designed in sufficient detail to be allocated to contractors, or subcontractors. Task durations should not exceed 2 months.

“Guide to Good Practice in the Management of Time in Major Projects”, 2016, p: 42, Figure:2

# Graph of Schedule Density (2)



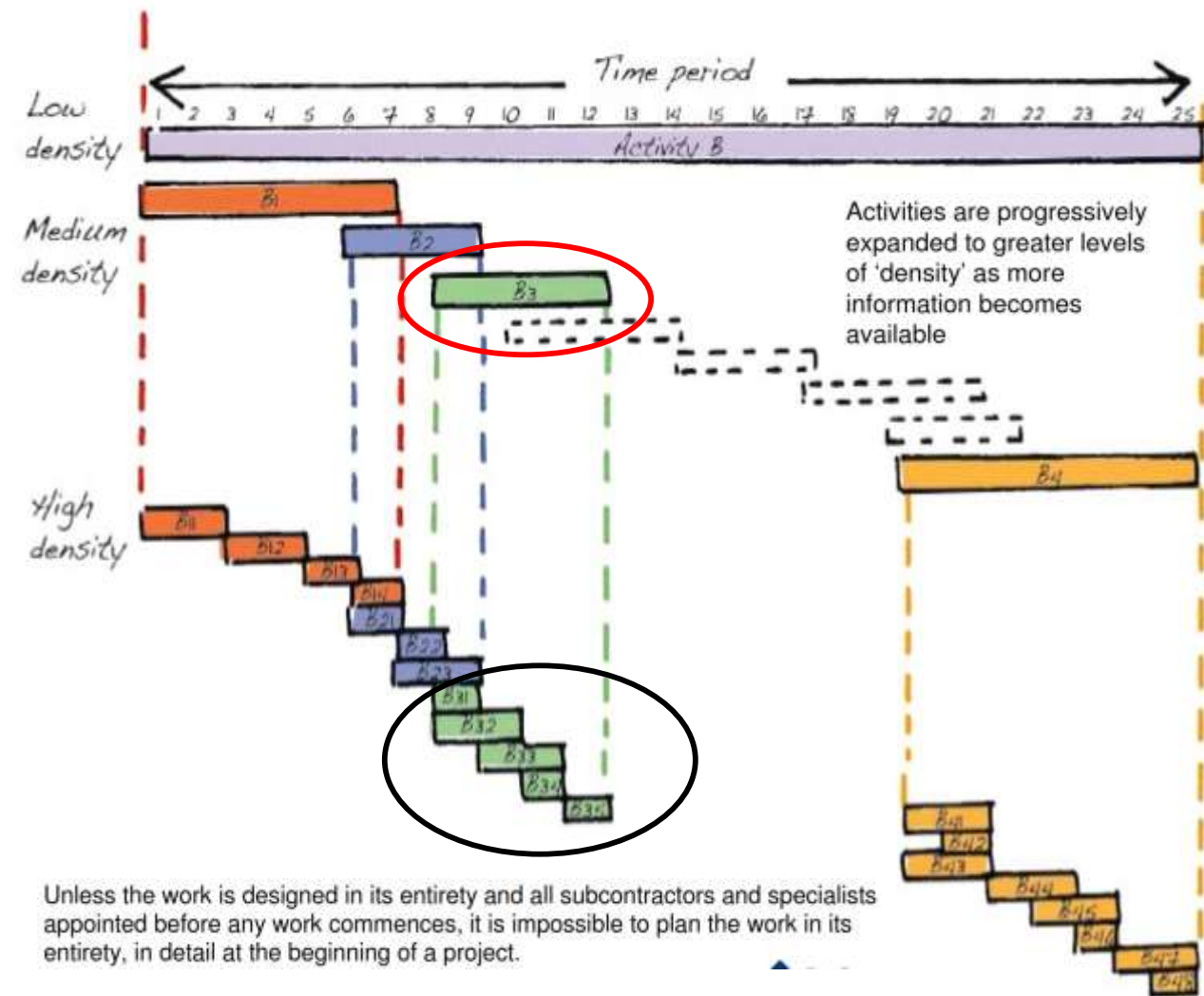
High-density scheduling is an essential prerequisite for undertaking work. The schedule is prepared with the people doing the work.

Task durations should be no more than the update cycle

As the density is increased, adjustments to the plan take into account actual performance to date, resources, work content, and other factors necessary to achieve the overall schedule objectives.

“Guide to Good Practice in the Management of Time in Major Projects”, 2016, p: 42, Figure:2

# Illustration of Schedule Density



"Guide to Good Practice in the Management of Time in Major Projects", p: 43, Figure:3

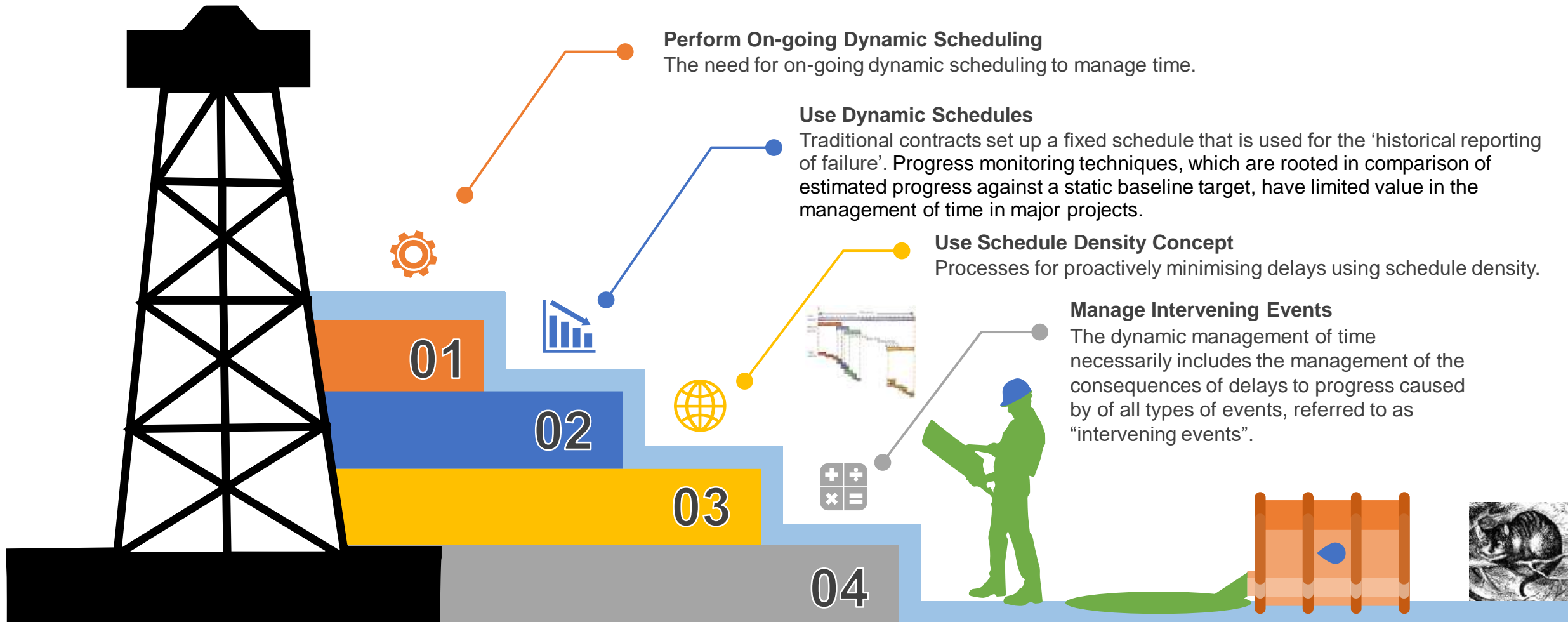
	Location	Zone	Area	Section	Item	Description	Activity ID
Low Density	A	B	A			Substructures	ABAZZ0000
Medium Density	A	B	A	A		Excavations	ABAAZ0000
	A	B	A	B		Piling	ABABZ0000
	A	B	A	C		Ground beams	ABACZ0000
	A	B	A	D		Floor slabs	ABADZ0000
High Density	A	B	A	C		Ground beams	ABACZ0000
	A	B	A	C	A	Formwork	ABACA0000
	A	B	A	C	B	Reinforcement	ABACB0000
	A	B	A	C	C	Placing concrete	ABACC0000
	A	B	A	C	D	Curing	ABACD0000
	A	B	A	C	E	Strike formwork	ABACE0000
	A	B	A	C	F	Backfill	ABACF0000

The activity coding structure (ID) maps high to medium to low density

"Guide to Good Practice in the Management of Time in Major Projects", p: 72, Figure:16

# Dynamic Scheduling

## Using Schedule Density





# Contemporaneous Delay Assessments

The need to contemporaneously assess the impact of delaying events



### In Real Time

Assessing delay events in real time is crucial for mega projects.

### Accurate and current schedules

Delay event must be assessed on accurate and current schedules.

### Effective Mitigation

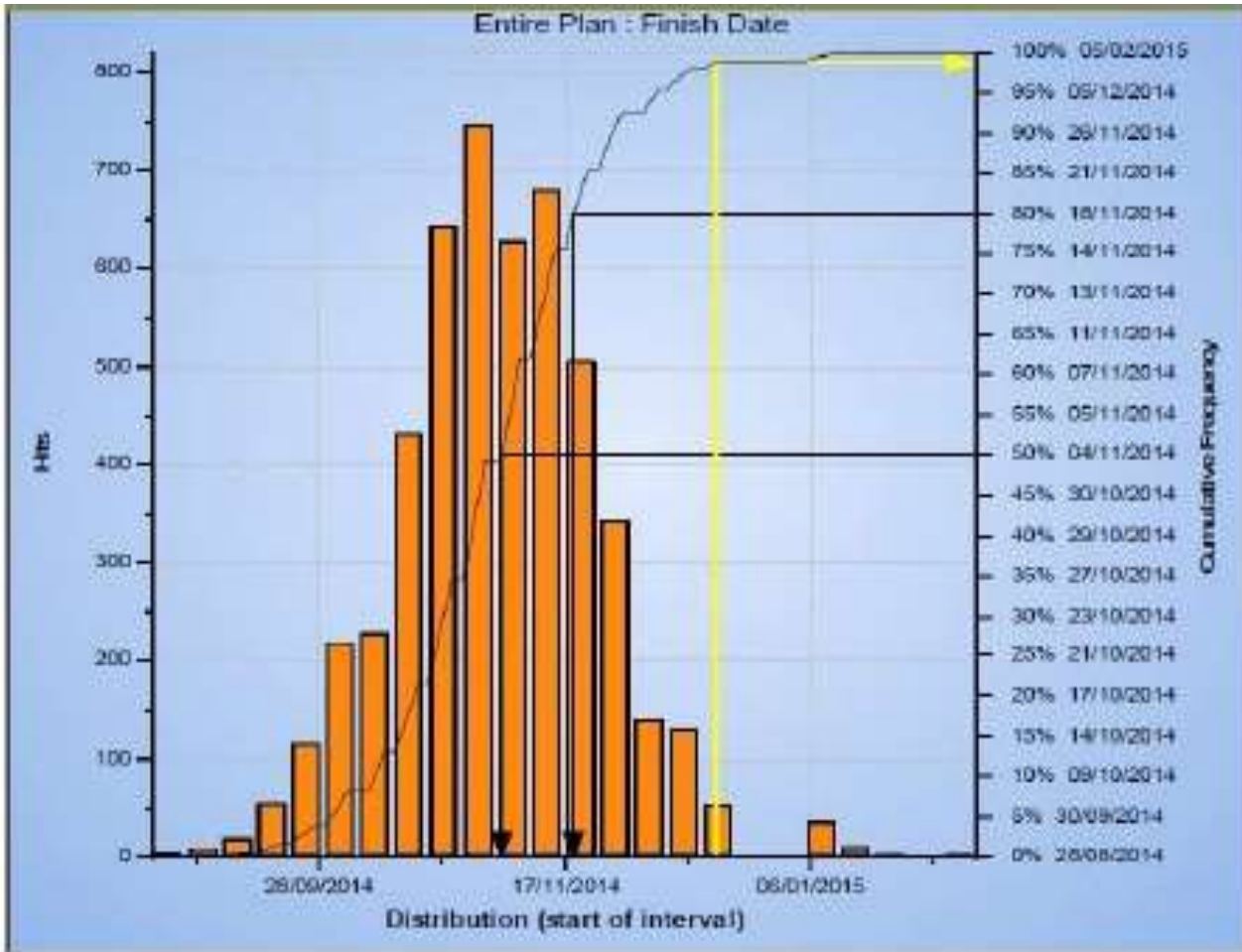
Mitigation can only be achieved using real time analysis on accurate and current schedules.

# Schedule Risk Analysis (SRA)



Using Monte Carlo Simulation

Finish Date Histogram



Schedule Sensitivity Index Tornado Chart



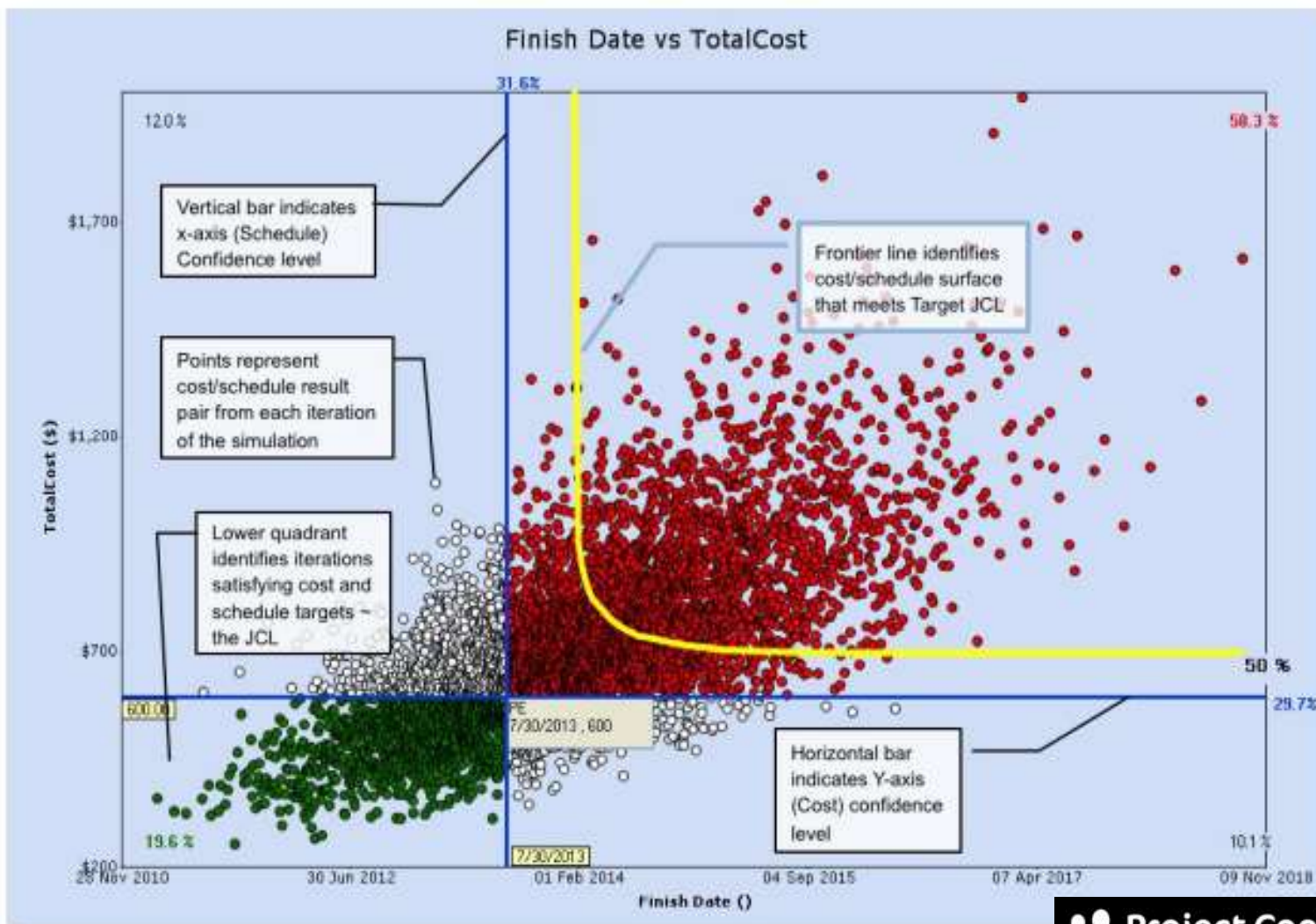
Confidence Level	Construction (MC)	Commissioning (RFSU)
Deterministic (Contract Dates)	7-Nov-2014 (P<1)	28-Mar-2015 (P<1)
P50 (50% Confidence)	24-Mar-2014 (+138 d)	12-Aug-2015 (+136 d)
P80 (80% Confidence)	29-Apr-2014 (+174 d)	17-Oct-2015(+171 d)

# JCL Scatterplot



## Joint Cost and Schedule Confidence Level (JCL) analysis

- The scatter plot shows iterations of cost and schedule risk analysis.
- Each scatterplot dot represents a specific result, or scenario, from the simulation calculation (cost and schedule).
- The x-axis represents the final completion date, and the y-axis represents the final cost through that completion date.
- The blue-line crosshair itself reflects the project's point estimate (baseline plan) where the \$600 million project cost is at a 29.7 percent confidence level (CL) and the 7/30/2013 completion date is at a 31.6 percent CL.



"NASA Cost Estimating Handbook Version 4.0, Appendix J", 2015, p: 17, Figure: J-6.



# What the Future Holds?

## 4D and 5D Scheduling



**3D:** Abbreviation for three-dimensional object or model comprising length, height and width.

**4D:** The addition of the time schedule as the fourth dimension to a virtual 3D model.

**5D:** The addition of cost/value-related information as a fifth dimension to a virtual 4D model.

*“Can we leverage advanced computing power to improve project outcomes?”*

# Discussion



## Questions?



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- *“Roll out of electric excavators and robotic equipment in construction is anticipated to improve productivity of the construction industry while lowering human intervention.”*
- *The Owners need to address the business value of capital spending. Owners are not in the business of building projects.*
- *The contractors need to focus on providing value, not spending manhours.*
- *Need to engage legal, accounting, procurement, etc. in the solution.*
- *Think below brands. They revolutionized their industries. We need to as well. If we do not do it, someone will do it for us!*



amazon

Google

N

IBM

airbnb

TESLA

Project Controls  
EXPO  
UAE, Middle East



**THANK YOU**



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