

# Improving Project Certainty using Artificial Intelligence

Project Control Case Studies

6 – 7 June 2022



# Why Octant AI?

Major projects underperform, everywhere...

Risk of Cost Overruns  $\geq$  +50%

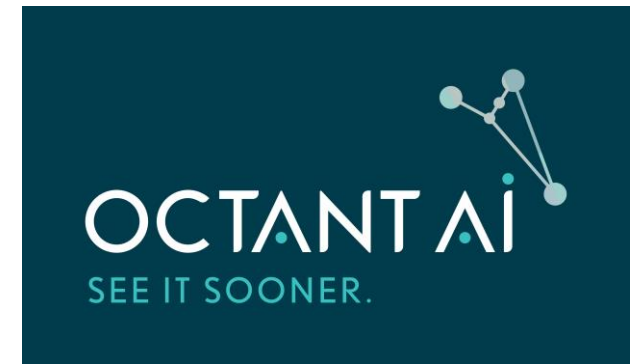
Project	Average cost overrun	% of projects with cost overrun $\geq$ 50%	Average cost overrun for projects $\geq$ 50%
Solar Power	1%	3%	50%
Wind Power	8%	0%	-
Energy Transmission	8%	4%	166%
Thermal Power	13%	14%	79%
Roads	25%	14%	111%
Defence	28%	27%	135%
Bridges	31%	20%	118%
Fixed Links	32%	23%	113%
Tunnels	33%	26%	102%
Power Plants	36%	17%	211%
<b>YOU</b>	<b>???</b>	<b>???</b>	<b>???</b>
Rail	42%	31%	111%
Buildings	51%	25%	158%
Museums	53%	33%	127%
Dams	90%	36%	240%
IT-led Change	107%	21%	519%
Nuclear Power	117%	53%	205%
Olympics	156%	79%	192%

... and this hurts everyone ...

- Ordinary citizens
- Shareholders
- Governments
- Businesses



... so we built Octant AI to improve major project success rates



# Poll: How satisfied are you with the cost performance of your projects?

- Highly Satisfied
- Satisfied
- Neutral/ I don't know
- Dissatisfied
- Highly Dissatisfied

# With Octant AI you can predict capital risk sooner



Octant AI is like a project heart rate monitor: it alerts you to portfolio and project risk across key indicators including cost, time, cash flow, revenue and margin.



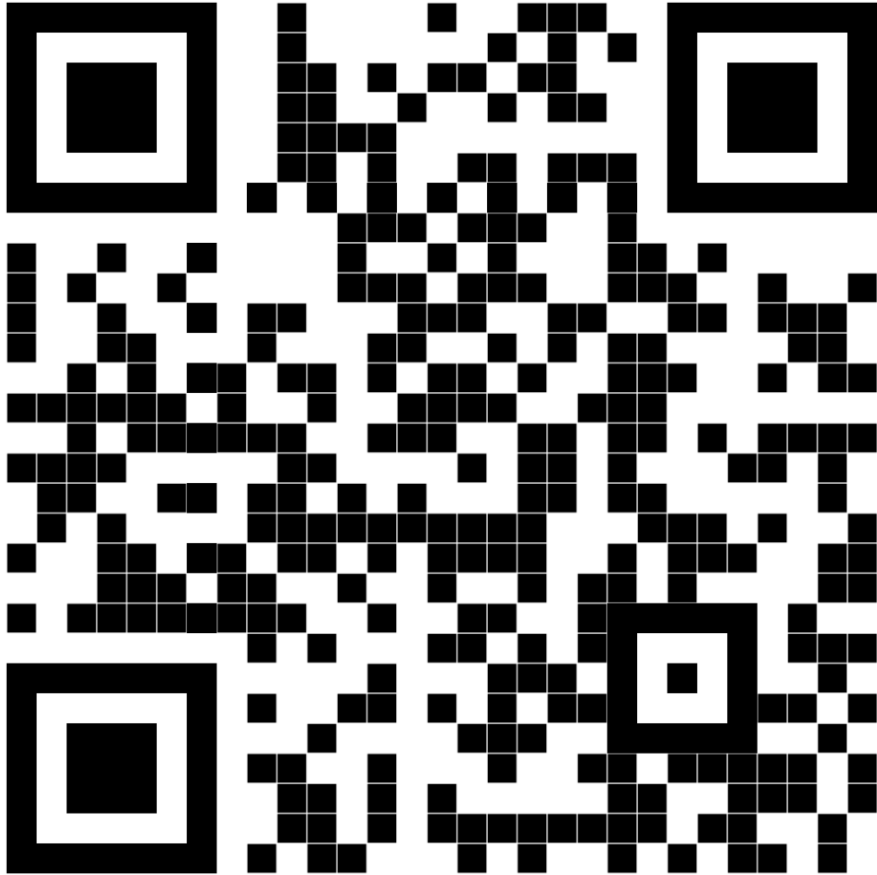
Octant AI helps project leaders with intelligent predictions and active guidance to improve portfolio and project performance through early warning, accurate forecasts, and better risk management.



We can demonstrate<sup>1,2</sup> that Octant AI improves:

- ✓ capital productivity by up to 10.7%
- ✓ cost forecasting accuracy by up to 87%
- ✓ early warning benefits of up to 40% of the project duration
- ✓ cost savings up to 3.3% of project value.

# You can sample Octant AI for free now



OCTANT AI

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## NEW TOOL: Find construction cost risk before it finds you

Octant AI has invested 4-years developing a one-of-a-kind tool that uses artificial intelligence to assess your project's cost performance risk in only 2 minutes. Combining AI with Big Data, our Octant Alert Tool gives project professionals a new way of reducing uncertainty using machine learning to reduce cost risk.

OCTANT ALERT - TRY FREE

# Case Study #1 – Queensland Transport and Main Roads Portfolio capital management

Octant AI predicts total portfolio costs with 95% accuracy five months earlier than normal to provide a capital productivity improvement opportunity by up to 10.7% of portfolio value p.a.



Transport



\$AUD 27.5 Bn capital spend over 4 years



Projects from 2018 to 2021



Early warning and accuracy of total portfolio cost forecasting



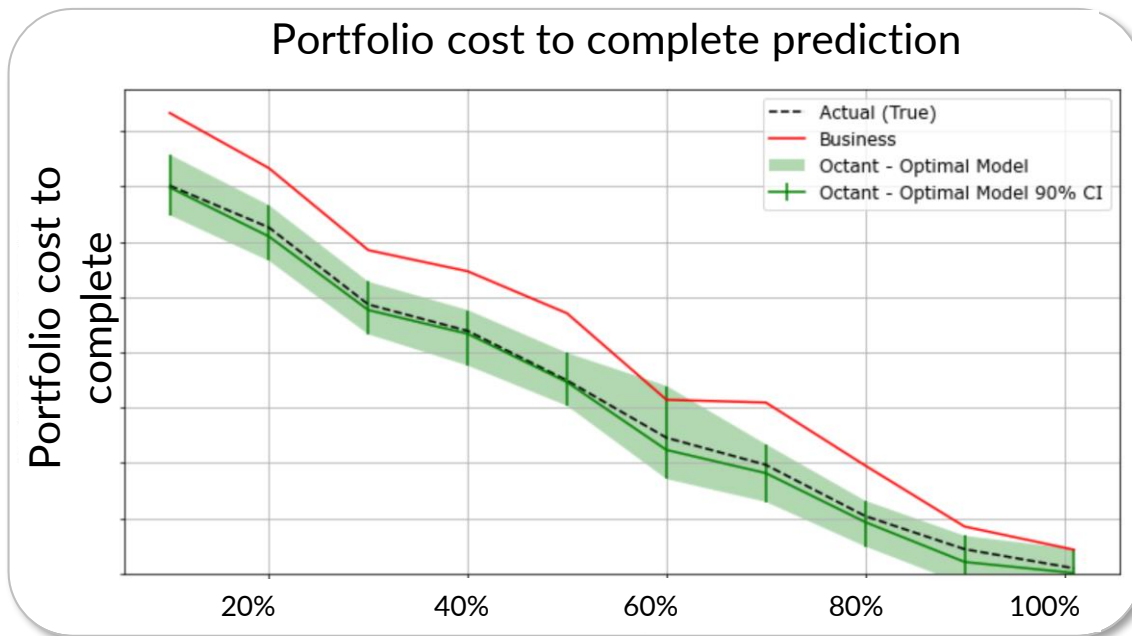
95% accuracy compared to actual costs, five months earlier to improve capital productivity by up to 10.7% of portfolio value and financial risk management



# Benefits: AI improves capital productivity and risk management through the whole lifecycle

## Challenge

Queensland Transport and Main Roads (QTMR) tends to over-estimate the true cost of its projects and delays release of contingency back to the portfolio. This decreases capital productivity.



## Solution

1. Octant AI predicts total portfolio costs with 95% accuracy compared to actuals and five months earlier than the business
2. Octant AI provides P10-P90 predictions of project and total portfolio costs that are well calibrated to actual costs

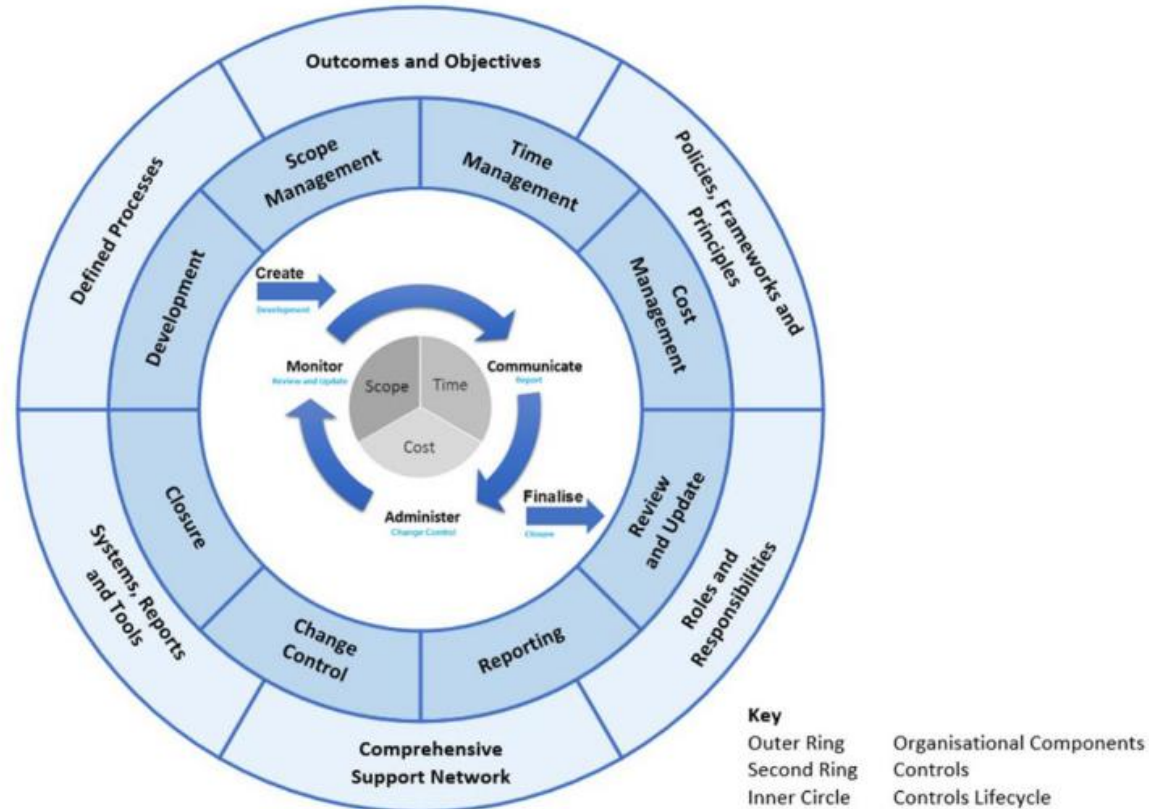
“[Octant AI] identified significant financial and delivery opportunities for the re-distribution of capital budget and/or contingency back into [the] portfolio” QTMR

## Benefits

- ✓ Well calibrated P10-P90 predictions allow QTMR to confidently adjust capital levels to suit business risk and optimise capital productivity. For example, conservative organisations can choose predictions equal to or higher than P50 to maintain larger capital buffers. Alternatively, predictions less than P50 produce leaner capital buffers.
- ✓ Average saving of \$148,000 per project
- ✓ Extend the benefits of AI through time and cashflow predictions across the portfolio

# Octant AI augments and aligns well with Project Controls systems

Figure 6.1 TMR's Controls Framework



Source: Control framework part A: controls overview' (Queensland Department of Transport and Main Roads, 2020a).

“there is an opportunity to utilise **AI for cost forecasting and project completion** as a tool for project and portfolio/program managers to use in their **monthly reports and planning**.

As the AI application can provide **earlier warnings** compared to traditional methods, project managers can review and **identify project risks and countermeasures** to guarantee project performance”  
NACOE, p. 17



# Other sectors: Multiple forecasts with greater accuracy and early warning across diverse sectors

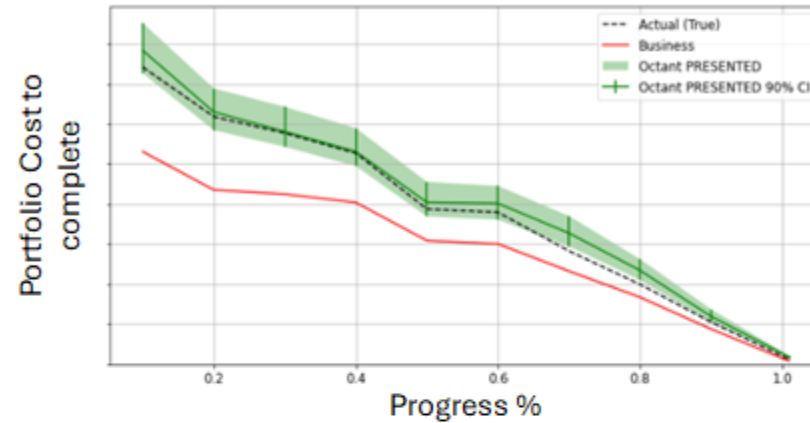
## Solution

These graphs compare Octant AI's cost, revenue and cashflow forecasts vs actuals on different, real-world portfolios (value \$AUD 0.35Bn - \$AUD 1.6Bn)

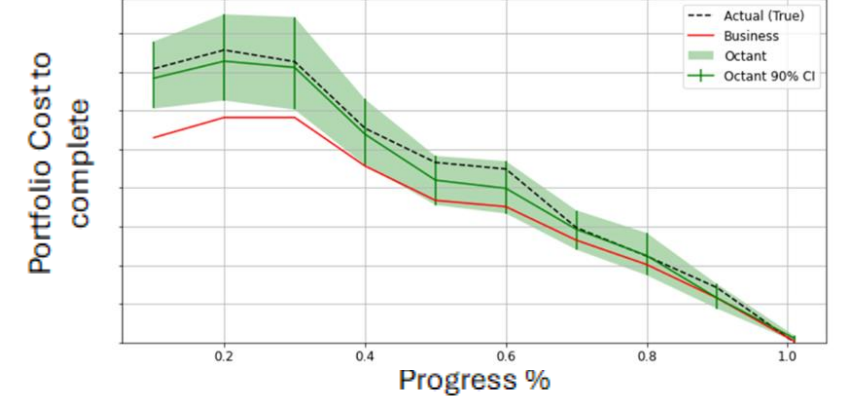
## Benefits

- ✓ Improved capital productivity
- ✓ Accuracy improved by up to 97%
- ✓ Early warning of up to five months
- ✓ Accurate P10-P90 confidence intervals compared to actuals

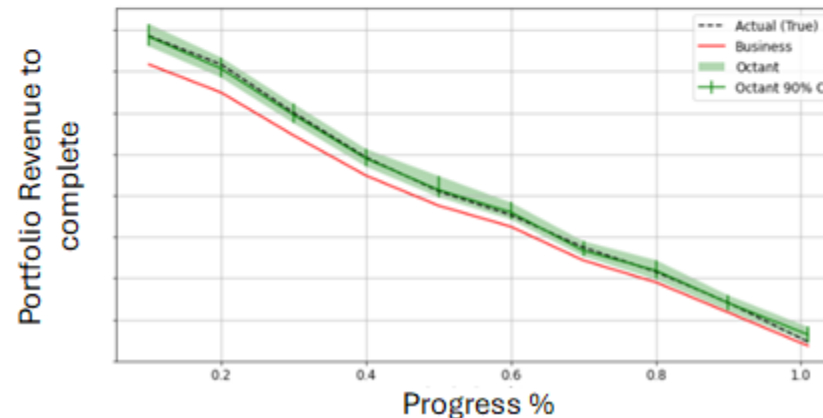
Portfolio Cost predictions – National Civil Constructor



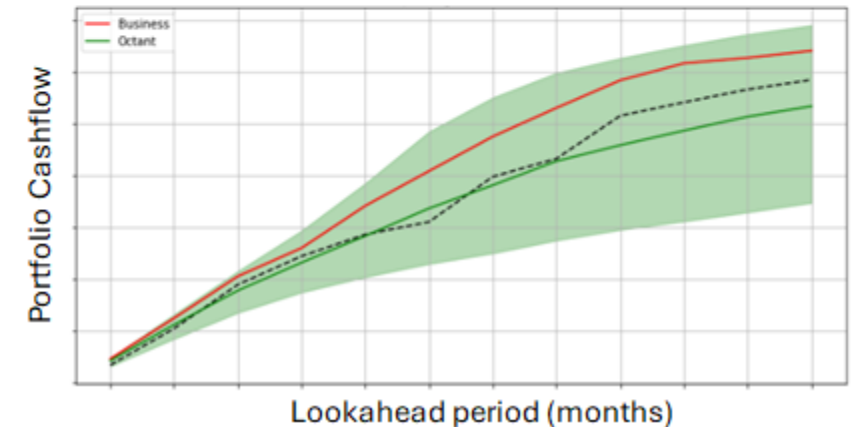
Portfolio Cost predictions – International Contractor



Portfolio Revenue predictions – National Building Constructor



Portfolio Cost predictions – Level Crossing Removals



Poll: How satisfied are you with the tools and methods you use *now* to control project cost and time risk?

- Highly Satisfied
- Satisfied
- Neutral/ I don't know
- Dissatisfied
- Highly Dissatisfied

# Case Study #2 – Early warning of cost overrun

Octant AI provides early and accurate warning of cost overrun and provides steady feedback on the final cost from recovery efforts. Site productivity is ultimately insufficient to overcome cost overruns at project completion but worse cost overrun was likely if no early warning was given at all.



Roads, bulk earthworks and underground services project



\$AUD 8.19M



Jan 2018 to Feb 2020



Early and accurate cost overrun warnings reduce severity of final cost overruns



98% accuracy from project start, avoids even worse overruns





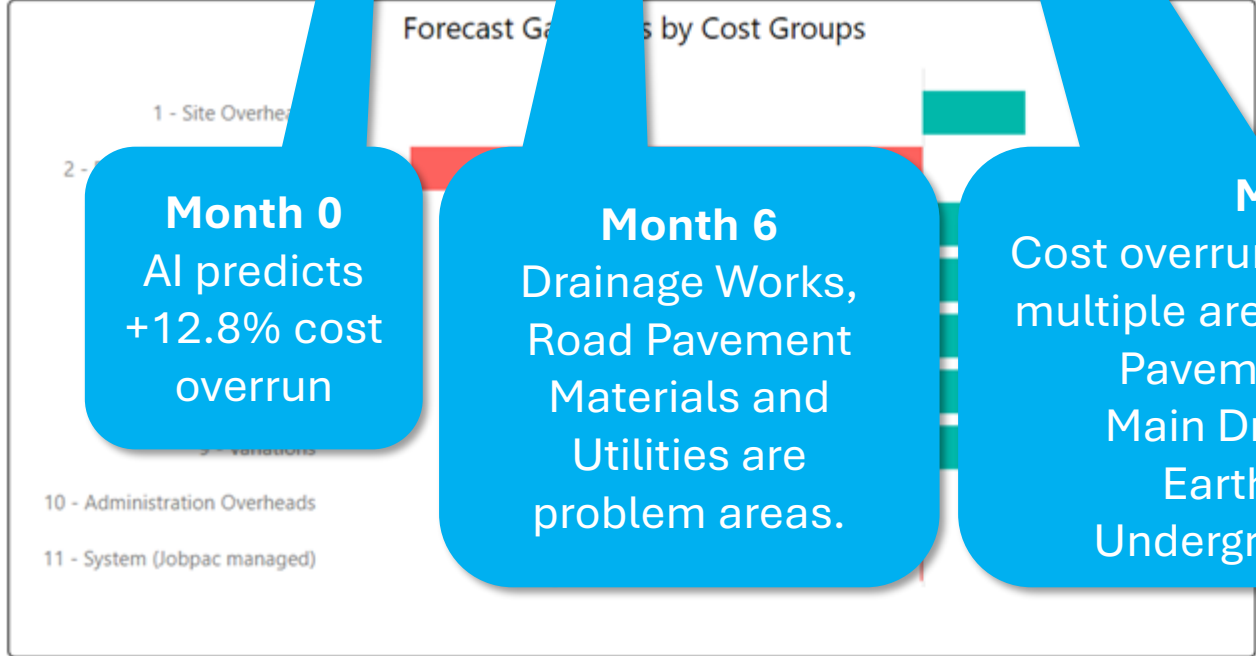
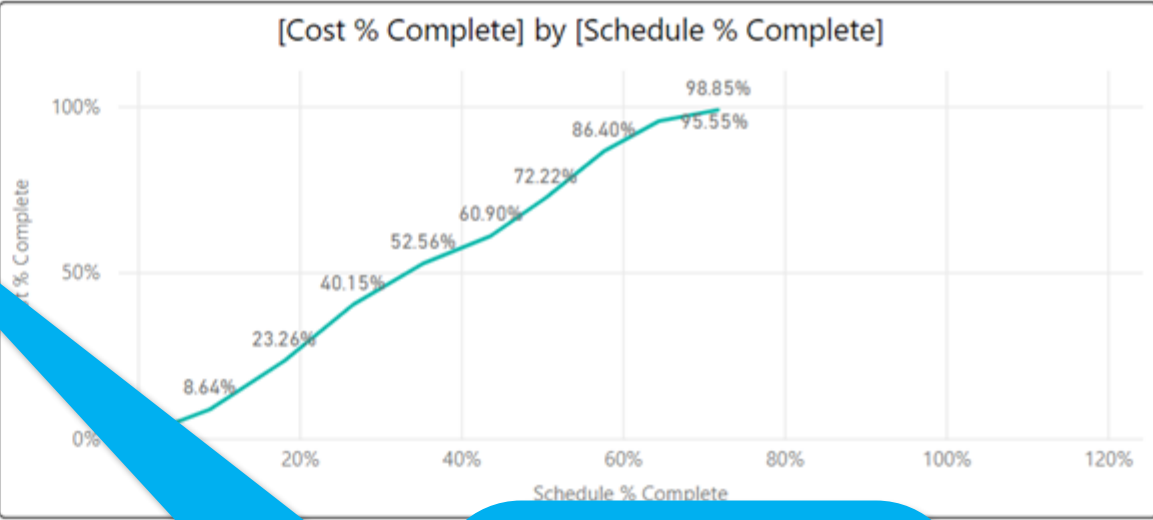
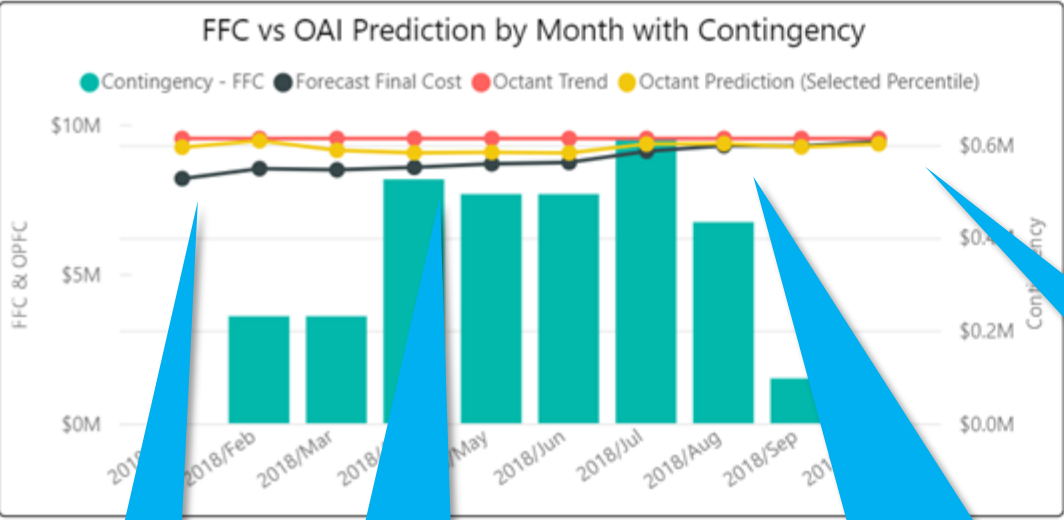
Project Search

Percentile

29/01/18 Contract Start	16/02/19 Forecast End	\$9,670,261 Current Budget
\$9,416,692 Forecast Final Cost	< 10% Gain Project Fcst Class	\$9,350,158 Octant Prediction
		< 10% Gain Predicted Class

- Projects
- Select all
  - Current
  - Old

- Select all
- ACT
- NQ
- NSW
- NT
- SA
- SEQ
- VIC
- WA



Cost Code	Cost Code	Forecast Gain/Loss
3010	Stormwater P...	
4020	Sewer Manholes	
9010	Variation 10	
<b>Total</b>		

**Month 0**  
AI predicts +12.8% cost overrun

**Month 6**  
Drainage Works, Road Pavement Materials and Utilities are problem areas.

**Month 9**  
Cost overruns accumulated in multiple areas including Road Pavement Materials Main Drainage Works Earthworks and Underground Services

**Month 12**  
Final cost overrun: 15.0%

Legend: Original (purple), AI (green), Final (dark blue)

# Poll: How satisfied are you with the influence of Project Controls in improving project cost and time performance in your organisation?

- Highly Satisfied
- Satisfied
- Neutral/ I don't know
- Dissatisfied
- Highly Dissatisfied

# Case Study #3 - Active Loss Avoidance

Project team used OctantAI intelligent predictions to identify problem project sub-areas, develop recovery plans and implement them to prevent project cost performance deterioration. For example, by reviewing site resourcing and productivity, and work front prioritisation



Roads, bulk earthworks and underground services project



\$AUD 23M



June 2019 to Dec 2020



Octant AI implemented from project commencement to predict completion



Intelligent prediction initiates project actions to turnaround from 13% cost overrun to 4.3% underrun





### Octant Prediction

**\$336M** **(\$39.1M)**

Octant Predicted Final Cost      Octant Gain/Loss

FY1: FY19 FY20

Select ... ACT NSW NT QLD SA VIC WA

Select all Airport Bridge Building Construct... >

FY-Month

November ▼

Projects without Predictions: **3**

### Project Forecast

**\$297M** **\$317M** **(\$20.1M)**

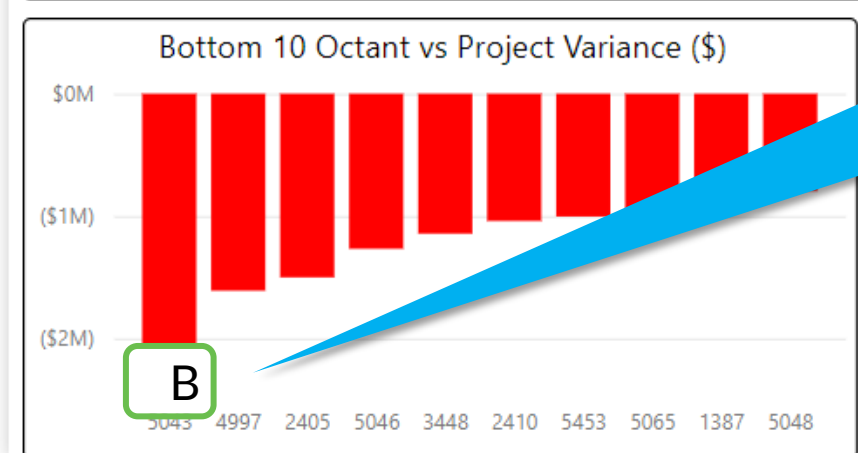
Current Budget      Forecast Final Cost      Forecast Gain/Loss

Project	Curr Budget	Fcast Final Cost	OAI Predicted FC	Gain/Loss Variance	Fcast Gain/Loss	OAI Predicted GL	Months Elap
1385-Project8	\$8,130,686	\$8,050,398	\$8,042,381	\$8,018	\$80,288	\$88,305	
1386-Project9	\$4,054,668	\$4,149,291	\$4,687,063	(\$537,772)	(\$94,623)	(\$632,395)	
1387-Project10	\$4,888,901	\$4,882,128	\$5,821,391	(\$939,263)	\$6,773	(\$932,490)	
1388-Project11	\$5,187,158	\$4,901,697	\$4,453,070	\$448,627	\$285,462	\$734,088	
2405-Project27	\$13,110,020	\$13,487,139	\$14,988,256	(\$1,501,116)	(\$377,119)	(\$1,878,235)	
2410-Project29	\$13,678,150	\$15,160,533	\$16,200,507	(\$1,039,974)	(\$1,482,383)	(\$2,522,357)	
2421-Project36	\$4,601,641	\$5,238,330	\$5,663,964	(\$425,634)	(\$636,689)	(\$1,062,323)	
2424-Project38	\$7,171,704	\$7,786,230	\$8,560,366	(\$774,136)	(\$614,526)	(\$1,388,661)	
3448-Project151	\$4,451,204	\$5,215,414	\$6,359,132	(\$1,143,718)	(\$764,210)	(\$1,907,929)	
3466-Project169	\$8,453,166	\$8,163,360	\$7,839,862	\$323,498	\$289,807	\$613,304	
3475-Project178	\$3,936,766	\$4,345,508	\$4,571,936	(\$226,429)	(\$408,742)	(\$635,170)	
3476-Project179	\$1,850,346	\$1,853,699	\$1,756,579	\$97,119	(\$3,353)	\$93,766	
3477-Project180	\$1,013,010	\$998,267	\$1,058,610	(\$60,343)	\$14,743	(\$45,600)	
3478-Project181	\$8,074,051	\$8,594,032	\$8,803,156	(\$209,124)	\$230,919	\$21,795	
3479-Project182	\$8,222,122	\$8,264,603	\$7,165,963	\$1,098,640	(\$41,870)	\$1,056,770	
3480-Project183	\$8,958,700	\$9,122,235	\$9,715,571	(\$593,336)	(\$163,535)	(\$756,871)	
3481-Project184	\$2,901,799	\$2,421,167	\$2,872,296	(\$451,129)	\$480,632	\$29,503	
3482-Project185	\$1,629,003	\$1,703,734	\$1,778,762	(\$75,028)	(\$74,732)	(\$149,760)	
3483-Project186	\$2,120,661	\$2,120,661	\$2,273,303	\$52,901	(\$633)	\$52,268	
<b>Total</b>				<b>(\$18,980,785)</b>	<b>(\$20,127,326)</b>	<b>(\$39,108,110)</b>	

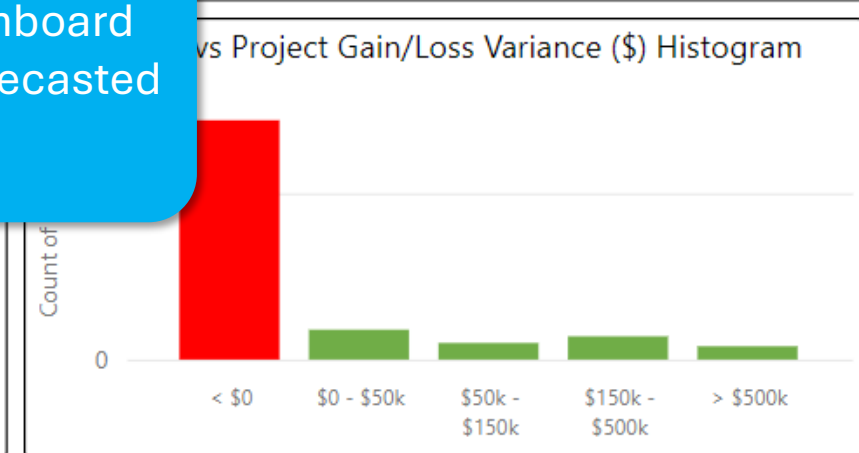
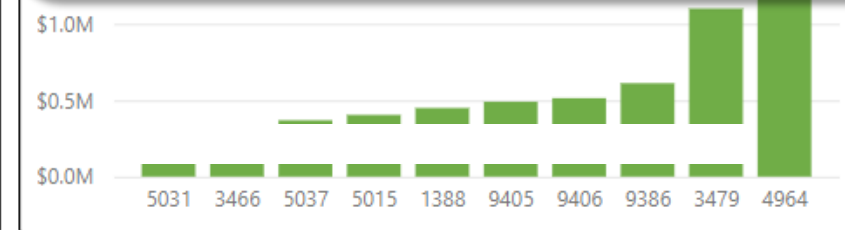
### Forecast vs Prediction Matrix

Project Forecast Class

	> 10% Loss	< 10% Loss	< 10% Gain	> 10% Gain
Octant Class				
> 10% Loss	12	13	6	
< 10% Loss		19	14	
< 10% Gain		6	14	4
> 10% Gain		3	1	5



Intelligent portfolio performance dashboard identified distressed Project "B". AI forecasted cost overrun of nearly \$3.0M





# Project Search

## Project B

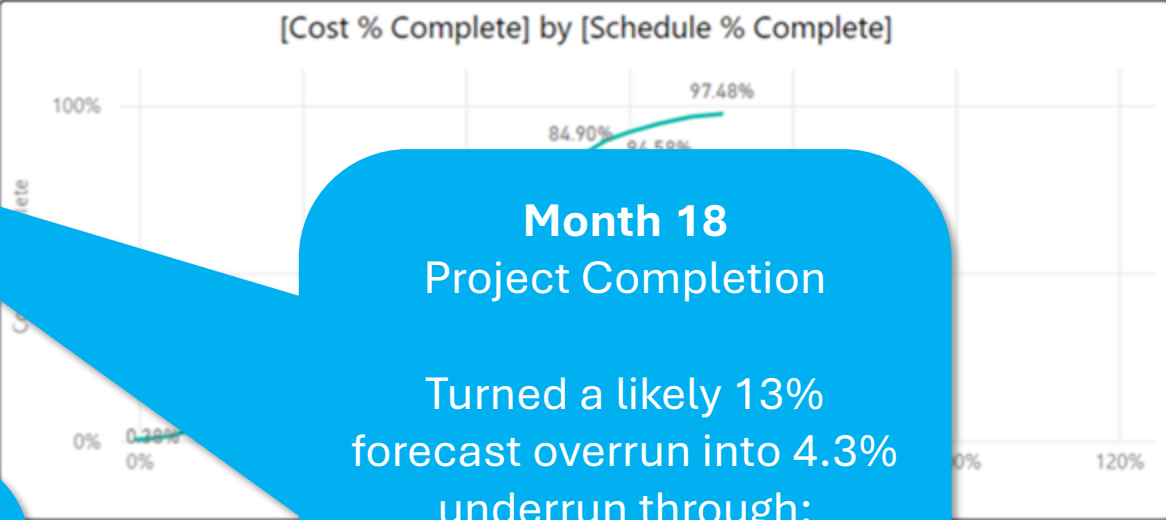
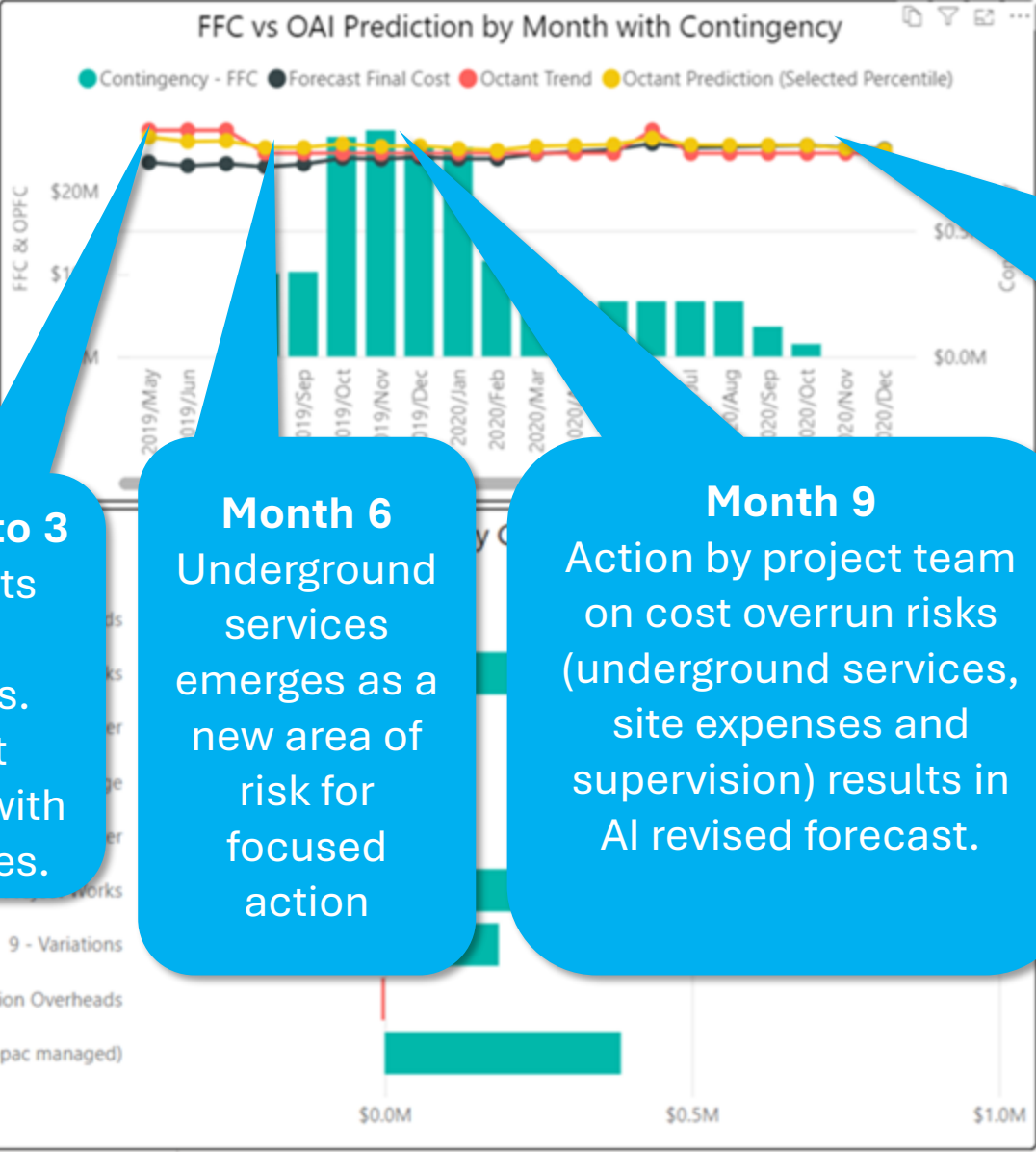
Percentile  
P50

3/06/19 Contract Start	2/10/21 Forecast End	\$26,715,488 Current Budget
\$25,116,163 Forecast Final Cost	< 10% Gain Project Fcst Class	\$24,975,122 Octant Prediction
		< 10% Gain Predicted Class

Projects

- Select all
- Current
- Old

- Select all
- ACT
- NQ
- NSW
- NT
- SA
- SEQ
- VIC
- WA



Cost Code	Cost Code Description	Forecast Gain/Loss
100*	Commission	
505u	Actew / BMD Con Works	
4010	Sewer Pipework	
1004	Travel	
3010	Stormwater Pipew	
2050	Underground Ser	
1006	Site/Services Setu	
1007	Site Running Expe	
3020	Maintenance Holes	
2180	X	
6010	Existing Services Location	
1008	Small Tools & PPE	
<b>Total</b>		

**Month 0 to 3**  
AI detects cost overruns. Project respond with deep dives.

**Month 6**  
Underground services emerges as a new area of risk for focused action

**Month 9**  
Action by project team on cost overrun risks (underground services, site expenses and supervision) results in AI revised forecast.

**Month 18**  
Project Completion

Turned a likely 13% forecast overrun into 4.3% underrun through:

- Proactive action on cost overrun risks
- Encouraging strong performance on activities with least overrun risk



# Poll: How likely is it you would use AI to improve project performance in the next 12 months?

- Highly Likely
- Likely
- Neutral/ I don't know
- Unlikely
- Highly Unlikely

# Conclusion



Octant AI is like a project heart rate monitor: it alerts you to portfolio and project risk across key indicators including cost, time, cash flow, revenue and margin.



Octant AI helps project leaders with intelligent predictions and active guidance to improve portfolio and project performance through early warning, accurate forecasts, and better risk management.



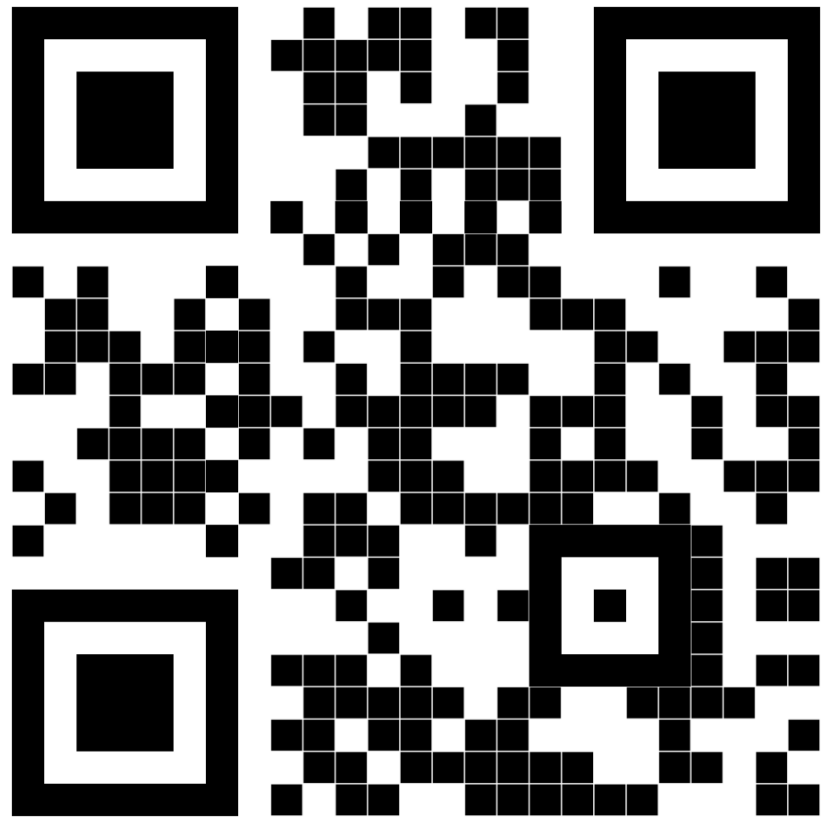
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- ✓ cost savings up to 3.3% of project value.

# References

1. Aldana, A., K. Hay, C. LeGrand, P. Schmidt, and M. Bereni. 'O18:Exploring the Use of Artificial Intelligence (AI) Solutions to Improve the Accuracy of Project Delivery Forecasts'. Research. Brisbane: National Asset Centre of Excellence, April 2021. [https://www.nacoe.com.au/wp-content/uploads/2021/04/015402-NACOE-O18\\_AI-application-for-project-forecast.pdf](https://www.nacoe.com.au/wp-content/uploads/2021/04/015402-NACOE-O18_AI-application-for-project-forecast.pdf).
2. Quezada, George. 'Endeavour Programme + BMD Urban: Lessons Learnt from AI in Practice on Major Projects'. *IQ Magazine - Infrastructure Association of Queensland*, Q4 2020. <https://www.iaq.digital/iq/edition-1/flipbook/40/>

# THANK YOU



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EXPO