

Designing a “Best in Class” Dashboard Using Earned Value Metrics for an Indonesian National Oil Company ¹

Benito Agus Putranto

ABSTRACT

Project monitoring is vital to control the project, especially during the construction phase. Insufficient or limited information in the project dashboard could make it harder for project managers whenever the project starts to underperform. The current project management dashboard, which has been used by Pertamina, only provides information about planned progress compared to actual progress in terms of financial and physical progress for each corresponding project. The author applies the Earned Value Management method by using several sources to determine the optimum metrics for the project management dashboard for the Indonesia oil and gas sector. The metrics are selected from several sources such as ‘Guild of Project Controls GPCCAR’, “DAU Gold Card”, “NDIA’s A guide to managing programs using predictive measures”, and “Paterson’s Best in class – Dashboard for oil and gas projects”. By comparing the metrics from every source, an optimum metric is chosen based on the company's needs. The paper concludes with 29 metrics, which can be included in the company's project management dashboard.

Keywords: Dashboard, Project Monitoring, Planned Progress, Actual Progress, Earned Value Management, Cost Performance Index, Schedule Performance Index

INTRODUCTION

According to a research survey about project management done by International Project Management Association (IPMA), the Australian Institute of Project Management (AIPM), and Klynveld Peat Marwick Goerdeler (KPMG) in 2019, “only 19% of organizations can deliver successful projects”². It means that most of the time, the projects fail one way or another. This research, which collects the data from almost 500 respondents from 57 countries across the globe, also concludes that “70% of the organizations fail to deliver the project on time and 64% fail to deliver the project on a budget”³. That percentage indicates that it is becoming a likely event for the project to become failed and does not deliver the original goal of the project. Those data also mean in this ever-changing world, which comes with an increment of project

¹ How to cite this paper: Putranto, B.A. (2020). Designing a “Best in Class” Dashboard Using Earned Value Metrics for an Indonesian National Oil Company; *PM World Journal*, Vol. IX, Issue III, March.

² KPMG, AIPM & IPMA. The Future of Project Management: Global Outlook 2019. Retrieved from <https://www.ipma.world/assets/PM-Survey-FullReport-2019-FINAL.pdf>.

³ KPMG, AIPM & IPMA. The Future of Project Management: Global Outlook 2019. Retrieved from <https://www.ipma.world/assets/PM-Survey-FullReport-2019-FINAL.pdf>

complexity, it is a difficult task to achieve all four elements of cost, schedule, scope, and stakeholder satisfaction⁴. Those data also mean that it is becoming a more challenging job for the project managers to deliver the project successfully.

Nowadays, there are tons of construction project which are currently in the construction phase or planning phase in Indonesia. For example, in the oil and gas industry in Indonesia, Pertamina, as a National Oil Company, also spend a lot of money on a construction project. In 2019, the marketing directorate at Pertamina “spent 395 million USD for investment, and this number will increase even more in 2020 by 67,5% in 2020, which will be around 660 million USD”⁵. The stakeholders want the budget holder to ensure that the projects are finished on time, on budget, on scope, and risk. As for the Project life cycle, it is quite similar to what the Guild has, as shown in the figure below.

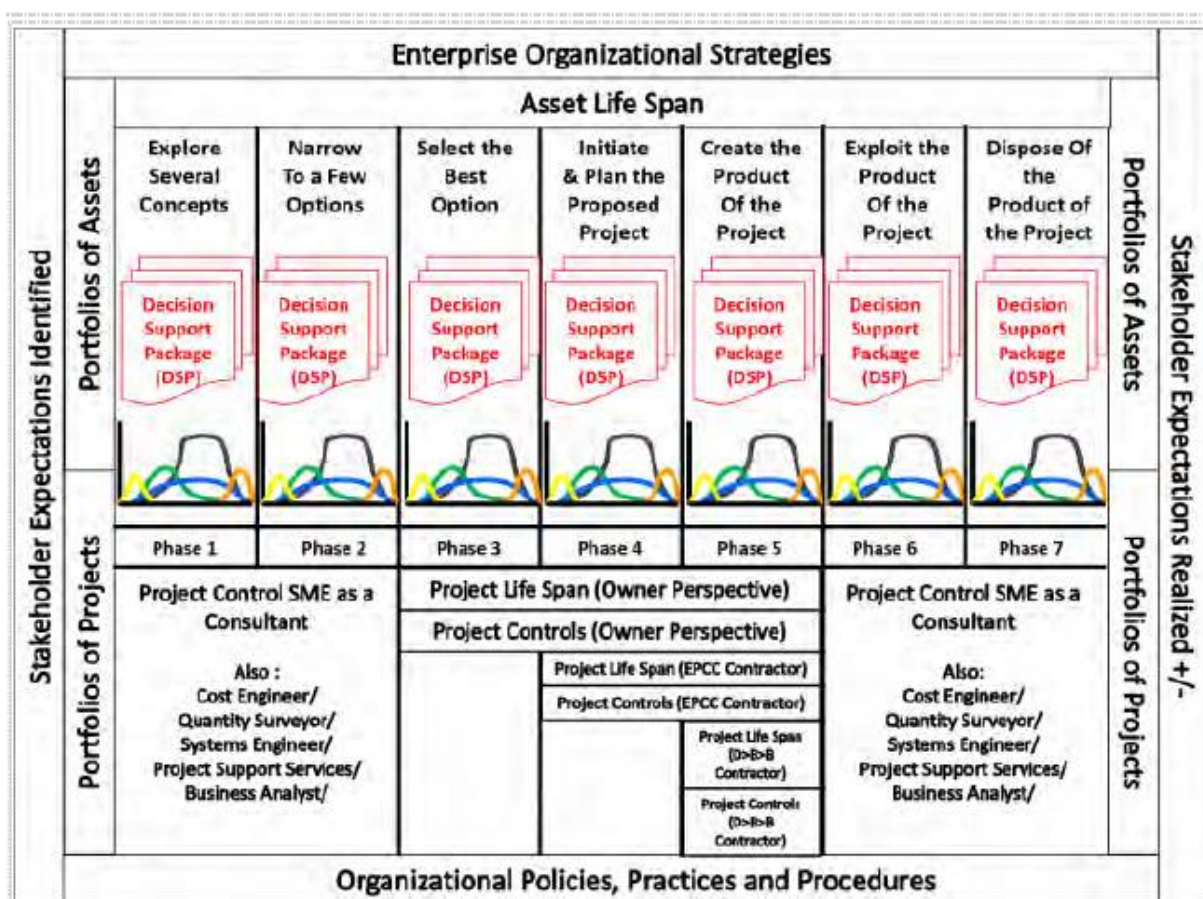


Figure 1. Project Management Methodology⁶

⁴ KPMG, AIPM & IPMA. The Future of Project Management: Global Outlook 2019. Retrieved from <https://www.ipma.world/assets/PM-Survey-FullReport-2019-FINAL.pdf>.

⁵ Pertamina (2019). Internal Report.

⁶ Guild of Project Controls. (2016, January 17). Introduction to Managing Project Controls. Retrieved from <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-project-controls>.

As shown in Figure 1 above, the Guild explains the approach for managing project control. There are seven phases in total, starting from exploring several concepts until disposing of the product of the project. Between each stage, the project owner had to take a risk register and several decision support package documents before asking a go or no go decision from the top-level management. Phase 1 DSP analyzes the Business Risk/Opportunities, Phase 2 analyzes the Technical Risk/Opportunities, Phase 3 analyzes Procurement Risk/Opportunities, Phase 4 analyzes Constructability Risk/Opportunities, and phase 5 analyze Execution Risk/Opportunities. Table 1 shows the decision support package deliverables for each stage, along with the primary purpose of each stage.

Guild of Project Controls Combined Asset and Project Phase Gate Names:	Deliverables from Each Phase			Primary Purpose of each Phase	Other Commonly Used Phase Gate Names
	WBS	Schedule Level	Cost Estimate Level		
Phase 1	Level 1	Level 1	Level 1	To explore several concepts, ideas, options or alternatives	Concept, Prefeasibility, Appraise, Assess, Identify, Rough Order of Magnitude; FEL 1, FED 1
Phase 2	Level 2	Level 2	Level 2	To narrow down the alternatives to the top 2-3 "better" options	Feasibility, Conceptual Design, Pre-Feed, Select, FEL 2, FED 2
Phase 3	Level 3	Level 3	Level 3	To select the "best" single option and "Initiate" the project	Design, Feed, Define, Develop, FEL 3, FED 3
Phase 4	Level 4	Level 4	Level 4	To refine and plan the project scope, cost, time and risks, and validate assumptions	Define, FEL 4
Phase 5	Level 5	Level 5	Level 5	To execute the project plan to create whatever benefit or business objectives (the "product" of the project) the project was undertaken to achieve	Execute
Phase 6	N/A	N/A	N/A	To exploit the PRODUCT of the PROJECT (the new Asset)	Operate
Phase 7	N/A	N/A	N/A	To decommission, dismantle or otherwise DISPOSE of the ASSET	Dismantle, decommission, recycle, sell

Table 1. Decision Support Package Document⁷

The difficult ones are the time and budget variables of the project. These variables usually monitored during stage 5 or the execution phase. As mentioned in paragraph 1, it is becoming a likely event that the project will exceed the designated time and budget, and that is something

⁷ Guild of Project Controls. (2016, January 17). Introduction to Managing Project Controls. Retrieved from <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-project-controls>.

that Pertamina is facing nowadays. The measure that the company takes is monitoring the project status, project's finance realization, and physical realization. However, this kind of monitoring only generates a general project status and thus lacking the detailed data that the management and stakeholders needed if they want to make a correct decision whenever the project meets an obstacle. Furthermore, to ensure that the project can deliver on time and within budget is to ensure that the contractor's performance is high⁸.

Moreover, since the current monitoring report is based only on the realization, it neglects a possibility that the company also has a problem with its Baseline Cost Estimate for its construction projects. If the baseline cost estimate is too low, for example, it is more likely for that project to get a fault or erroneous results. Thus the need to analyze the accuracy of the cost estimate for ongoing projects also becomes a strategic issue for the top management.

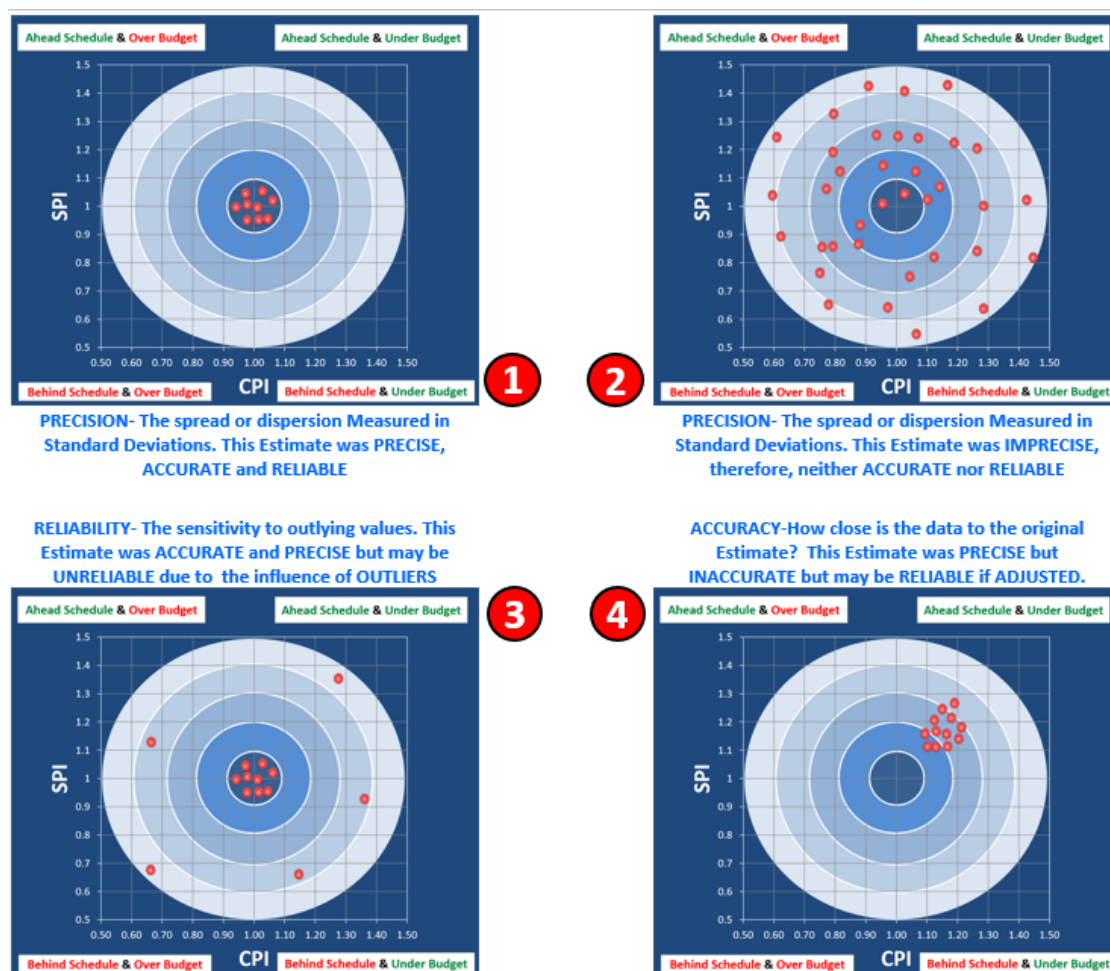


Figure 2. SPI & CPI Concepts of Precision vs. Accuracy vs. Reliability⁹

⁸ Taybi, Y. (2019). Is Earned Value Management (EVM) consistent with Sharia Law Will it help in fighting corruption? PM World Journal, VIII(VIII)

⁹ Guild of Project Controls. (2016, January 17). Assessing and Interpreting Progress Data. Retrieved from <http://www.planningplanet.com/guild/gpccar/assessing-interpreting-progress-data>

There is another approach that can be used for project monitoring and controlling, which is the performance-oriented approach by means of Earn Value Management (EVM) and integrate the concept of pay for performance. Earned Value Management (EVM) is a system consisting of a “toolbox” of tested and proven project management tools, techniques or methods for capturing physical progress, measuring, assessing and evaluating that tangible progress against an approved baseline and looking at both historical performance and predicted or forecast performance, analyzing and evaluating the impacts and making recommendation¹⁰.

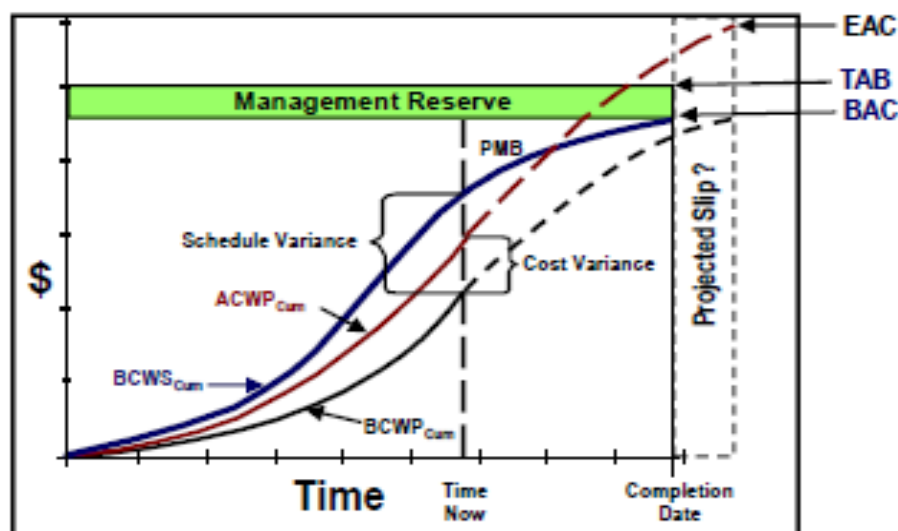
The controlling aspect is cost control, schedule control, and budget control¹¹. By using this performance-oriented approach, the project manager can give more detailed information to the appropriate stakeholders regarding the status of the project in real-time based. The monitoring can be done weekly or monthly by checking the Cost Performance Index (CPI) and the Schedule Performance Index (SPI). From the CPI and SPI, some wisdom like the actual cost, budget cost, and the estimated cost at completion can be checked by using this method, as shown in Figure 3.

¹⁰ Guild of Project Controls. (2016, January 17). Introduction to Managing Project Controls. Retrieved from: <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-project-controls>

¹¹ Malouni, F. (2010, April). PROJECT MANAGEMENT: EARNED VALUE AND PROMPT PAYMENT PRACTICES OBSERVED FROM VIEW OF ISLAMIC SYARIAH LAW. Retrieved November 2019



EARNED VALUE MANAGEMENT 'GOLD CARD'



VARIANCES Positive is Favorable, Negative is Unfavorable

Cost Variance	$CV = BCWP - ACWP$
	$CV \% = (CV / BCWP) \times 100$
Schedule Variance	$SV = BCWP - BCWS$
	$SV \% = (SV / BCWS) \times 100$
Variance at Completion	$VAC = BAC - EAC$
	$VAC \% = (VAC / BAC) \times 100$

OVERALL STATUS

% Schedule	$= (BCWS_{CUM} / BAC) \times 100$
% Complete	$= (BCWP_{CUM} / BAC) \times 100$
% Spent	$= (ACWP_{CUM} / BAC) \times 100$

EFFICIENCIES

Cost Efficiency	$CPI = BCWP / ACWP$	Favorable is > 1.0 , Unfavorable is < 1.0
Schedule Efficiency	$SPI = BCWP / BCWS$	Favorable is > 1.0 , Unfavorable is < 1.0

BASELINE EXECUTION INDEX (BEI) & Hit Task %

$BEI = \text{Total Tasks Completed} / (\text{Total Tasks with Baseline Finish On or Prior to Current Report Period} + \text{Tasks without baseline finish dates})$

$\text{Hit Task \%} = 100 \times (\text{Tasks in Denominator that Completed ON or Before Baseline Finish} / \text{Tasks Baselined to Finish within Current Report Period})$

ESTIMATE @ COMPLETION = ACTUALS TO DATE + [(REMAINING WORK) / (PERFORMANCE FACTOR)]

$EAC_{CPI} = ACWP_{CUM} + [(BAC - BCWP_{CUM}) / CPI_{CUM}]$
$EAC_{Composite} = ACWP_{CUM} + [(BAC - BCWP_{CUM}) / (CPI_{CUM} \times SPI_{CUM})]$

TO COMPLETE PERFORMANCE INDEX (TCPI) §

$TCPI_{Target} = \text{Work Remaining} / \text{Cost Remaining} = (BAC - BCWP_{CUM}) / (\text{Target} - ACWP_{CUM})$

§ To Determine the TCPI for BAC, LRE, or EAC Substitute TARGET with BAC, LRE, or EAC
To Determine the Contract Level TCPI for EAC, You May Replace BAC with TAB

Figure 3. Illustration of S-Curve¹²

¹² Defense Acquisition University. (2018, September). Earned Value Management 'Gold Card'. Retrieved from <https://www.dau.mil/cop/evm/Pages/Default.aspx>.

This EVM method has been around since the 1800s¹³. Nowadays, the technique has been used to generate real project monitoring, measuring, and control in underground mining projects¹⁴. In addition to that, a development for a project dashboard that consists of the optimum metric content for project management in the oil and gas project¹⁵. It means that monitoring projects by using this EVM method are becoming popular, and Pertamina should try to develop their current monitoring report by applying this EVM method in their reporting. Thus this paper will try to develop a dashboard for project monitoring, measuring, and control which can be used by Pertamina and wants to explore:

1. The dashboard's optimum metric content applicable to Pertamina's projects.
2. The find the benefit of the use of EVM by means of the dashboard for Pertamina.

METHODOLOGY

Step 1- PROBLEM RECOGNITION: “CURRENT INTERNAL PROJECT MONITORING VS EARNED VALUE METHOD”

Pertamina has its way for project monitoring, measurement, and controlling. However, it only presented actual financial and physical progress against the total budget or plan and reported on a weekly, biweekly, or monthly basis. The figure below shows the current project monitoring and controlling, which has been used yearly at Pertamina.

No	PIC	PROJECT	CONTRACT	CONTRACTORS	PHYSICAL PROGRESS (W-I DEC 2019)					FINANCIAL PROGRESS	JUSTIFICATION	ACTION
						E	P	C	Total	Total		
1	PM LPG	Project A	Rp 2,133,433,156,019	Kon. PT WIKA - Posco Eng	Plan (S-Curve)	8.45%	61.02%	30.40%	99.87%	99.79%		
					Aktual	8.47%	60.84%	30.47%	99.79%	95.00%		
					Deviasi	0.02%	-0.18%	0.07%	-0.08%	-4.79%		
2	PM LPG	Project B	Rp 390,500,000,000	PT Wijaya Karya (Persero)	Plan (S-Curve)	0.169%	79.04%	20.79%	100.00%	100.00%		
					Aktual	0.169%	79.04%	20.79%	100.00%	95.00%		
					Deviasi	0.000%	0.00%	0.00%	0.00%	-5.00%		

Table 2. Current Weekly Report Template¹⁶

¹³ Gillette, H. P., & Dana, R. T. (1909). Cost Keeping And Management Engineering. New York and Chicago: The Myron C. Clark Publishing Co.

¹⁴ Wibiksana, R. (2012). Earned Value Management: Adapted for use in Underground Mining Operations. PM World Journal, I(II).

¹⁵ Peterson, S. J. (2017, October). Best in Class - Dashboards for Oil and Gas Projects. PM World Journal, VI(X).

¹⁶ By Author.

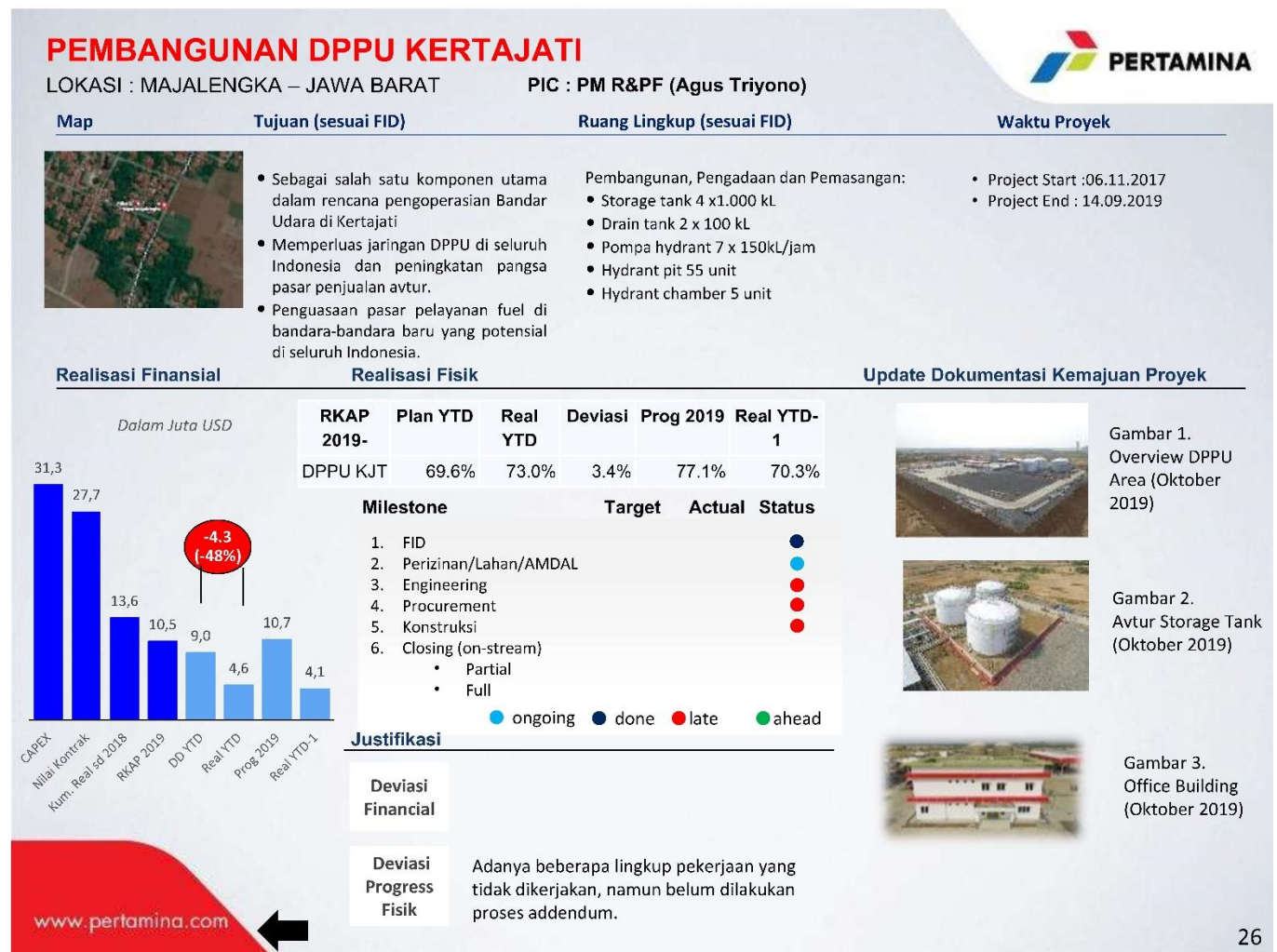


Figure 4. Current Monthly Report¹⁷

Based on those two figures above, there is only a limited number of information which can be collected from those reports such as:

1. Physical Plan YTD (%)
2. Physical Real YTD (%)
3. Financial Plan YTD (%)
4. Financial Real YTD (%)
5. Deviation (%)
6. Milestone status
7. Justification

¹⁷ By Author.

Referring to those two monitoring reports which are currently being used by the company can be considered as a bad practice. It is because those kinds of reports only give the project manager a piece of information about the project status, whether the project late or not. It does not provide the project manager any information about any possible risk, obstacle, and resource problem that the project maybe has. Oil and Gas construction projects usually come with significant capital investment and considered a high-risk project. This means this kind of project needs accurate and real-time project monitoring, measurement, control, and reporting to allow the project manager to manage the project and to help them respond to any problems they are facing, which could affect the project.

As described in the introduction part, other project management tools can be applied to upgrade the current report by means of EVM. “EVM based report presents the project’s schedule, cost, and scope performances in a certain period and since inception with the ability to be expanded to forecast the project performance at the completion.”¹⁸

The most popular EVM parameters are:

$$SPI = BCWP / BCWS$$

$$CPI = BCWP/ACWP$$

$$BCWP = \text{Physical \% Complete} \times BAC$$

Where:

SPI = Schedule Performance Index

CPI = Cost Performance Index

BCWS = Budget Cost Work Schedule

ACWP = Actual Cost Work Performed

BCWP = Budget Cost Work Performed

BAC = Budget at Completion

The company needs to improve their current monitoring dashboard since the current report only describes the year to date (YTD) data thus cannot be used to forecast the project completion date and budget based on the project performance.

Step 2- FEASIBLE ALTERNATIVES

There are several references for project management tools that comply with Earned Value Management. Each reference reveals a set of metrics and indicators that can be used to generate a better and more detailed project dashboard. The references used in this paper are Guild of

¹⁸ Wibiksana, R. (2012). Earned Value Management: Adapted for use in Underground Mining Operations. PM World Journal, I(II).

Project Controls GPCCAR, DAU Gold Card, NDIA’s A Guide to Managing Programs using Predictive Measures.

- Guild of Project Controls GPCCAR The Guild develops dashboard reports which comply with the EVM method. The dashboard provides not only the SPI and CPI but also the baseline index (BEI) and the estimate at completion. This dashboard also comes up with a metric ribbon along the top of the dashboard, which gives an excellent project view and shows the current status, which can be used by the management. Figure 5 shows the Guild dashboard.

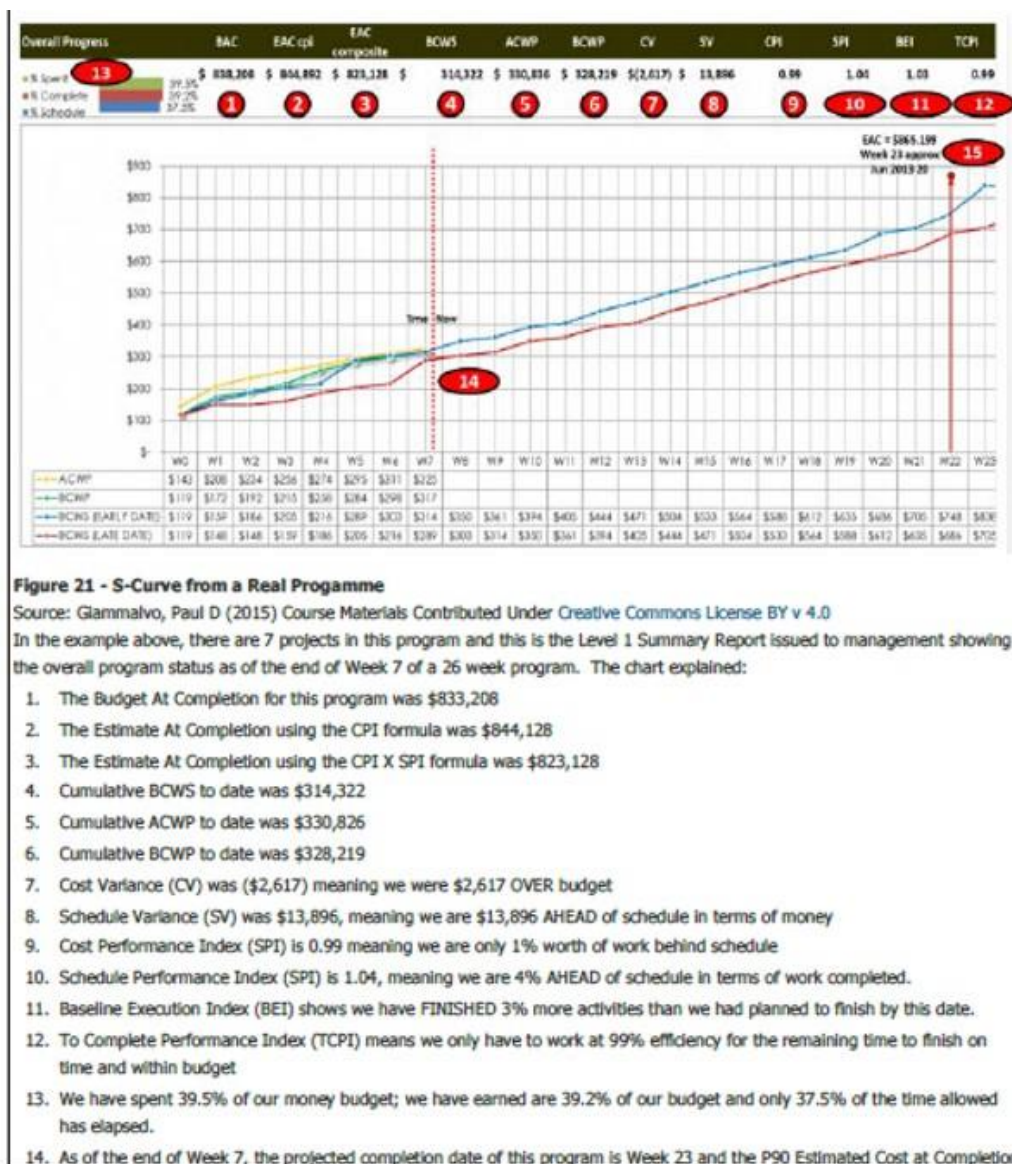


Figure 5. GPCCAR Dashboard Example¹⁹

¹⁹ Guild of Project Controls. (2016, January 17). Project Performance Forecasting. Retrieved from <http://www.planningplanet.com/guild/gpccar/project-performance-forecasting>.

- The DAU Gold Card

Another alternative for the dashboard metric is by adopting the metric in the DAU Gold Card, as shown in Figure 3. “This Gold Card covers the overall status, cost, schedule variances, efficiencies, performance against baseline and forecasting”²⁰.

- NDIA’s

NDIA also provides a number of metrics which can be used as an input for the dashboard. Those metrics are schedule metric, cost metric, staffing metrics, risk and opportunity metric, requirements metric, technical performance measurement, contract health metric, and supply chain metric.

Based on several references mentioned above, there are quite a lot of metrics or indicators for each reference. Using all of the metrics will also become trouble since that will make the dashboard very compact. That is why this paper will try to improve the company’s current dashboard by selecting and adding several metrics into the dashboard.

Step 3- DEVELOPMENT OF OUTCOMES

As mentioned in step 2 before, three references are being used in order to improve and upgrade the company’s current project dashboard. This paper will not compare all of the references and choose the best option, whereas this paper will review the metrics from each alternative and combined it all together into the new dashboard.

There are two groups of metrics based on those references. The first one is a metric common to all the references. The second one is unique metrics, which only count in some of the references. The first group can be described as “Common metrics” and shall be put into the dashboard without further analysis. Table 3 below shows the list of the “Common” metrics.

²⁰ Peterson, S. J. (2017, October). Best in Class - Dashboards for Oil and Gas Projects. PM World Journal, VI(X).

COMMON METRICS					
Type	Metric	Formula	GPCCAR	DAU	NDIA
Schedule	Schedule Performance Index (SPI)	$SPI = BCWP / BCWS$	✓	✓	✓
	Schedule Variance (SV)	$SV = BCWP - BCWS$	✓	✓	✓
	Schedule Variance % (SV%)	$SV \% = (SV / BCWS) * 100$	✓	✓	✓
	% Schedule	$\% \text{ Schedule} = (BCWS_{CUM} / BAC) * 100$	✓	✓	✓
	% Complete	$\% \text{ Complete} = (BCWP_{CUM} / BAC) * 100$	✓	✓	✓
	Baseline Execution Index (BEI)	Total Task Completed / (Total Task with Baseline Finish On or Prior to Current Report Period + Task without baseline finish dates)	✓	✓	✓
Cost	Cost Performance Index (CPI)	$CPI = BCWP / ACWP$	✓	✓	✓
	Cost Variance (CV)	$CV = BCWP - ACWP$	✓	✓	✓
	Cost Variance % (CV%)	$CV \% = (CV / BCWP) * 100$	✓	✓	✓
	% Spent	$\% \text{ Spent} = (ACWP_{CUM} / BAC) * 100$	✓	✓	✓
	Variance at Completion (VAC)	$VAC = BAC - EAC$	✓	✓	✓
	Variance at Completion % (VAC%)	$VAC \% = (VAC / BAC) * 100$	✓	✓	✓
	Estimate at Complete (EAC _{CPI} or EAC _{Composite})	$EAC_{CPI} = ACWP_{CUM} + ((BAC - BCWP_{CUM}) / CPI_{CUM})$ $EAC_{Composite} = ACWP_{CUM} + ((BAC - BCWP_{CUM}) / (CPI * SPI_{CUM}))$	✓	✓	✓
	To Complete Performance Index (TCPI _{target})	$TCPI_{Target} = \text{Work Remaining} / \text{Cost Remaining} = (BAC - BCWP_{CUM}) / (Target - ACWP_{CUM})$	✓	✓	✓

Table 3. Common Metrics²¹

Table 4 shows the “Unique” metrics, which referred to the specific source. The uniqueness of the metrics is based on the source document. In addition to that, Paterson (2017) add some metrics that need to be included. Among all of those unique metrics, the project team has to evaluate and analyze those metrics and then select several metrics that deemed suitable for their dashboard.

²¹ By Author

Unique Metrics						
Type	Metric	Formula	GPCCAR	DAU	NDIA	Paterson
Schedule	Hit Task %	$100 \times (\text{Tasks in Denominator that Completed ON or Before Baseline Finish} / \text{Tasks Baselined to Finish within Current Report Period})$	●	✓		
	Critical Path Length Index (CPLI)	$\text{CPLI} = (\text{Critical Path Length} + \text{Critical Path total Float}) / \text{Critical Path Length}$	●		✓	
	Current Execution Index (CEI)	$\text{CEI} = \# \text{ Tasks Actually Completed During the Window (of the Denominator Tasks)} / \# \text{ of Tasks Previously Forecasted to Complete During a Defined Window}$	●		✓	
	Total Float Consumption Index (TFCI)	$\text{TFCI} = (\text{Actual Duration} + \text{Critical Path Total Float}) / \text{Actual Duration}$	●		✓	
	Time-Based Schedule Performance Index	$\text{SPI} = \text{Earned Schedule (ES)} / \text{Actual Duration (AD)}$	●		✓	
	Independent Estimated Completion Date - Earned Schedule (IECDes)	$\text{IECD}(\text{bei}) = \text{SD} + (\text{PDWR}/\text{BEI}) : (\text{using BEI})$ $\text{IECD}(\text{tfc}) = \text{SD} + (\text{PDWR}/\text{TFCI}) : (\text{using TFCI})$ $\text{IECD}(\text{spi}) = \text{SD} + (\text{PDWR}/\text{SPI}) : (\text{using traditional SPI})$	●		✓	
Cost	Range of IEACs	$\text{IEAC1} = \text{ACWP} + ((\text{BAC}-\text{BCWP}) / \text{CPI})$ $\text{IEAC2} = \text{ACWP} + ((\text{BAC}-\text{BCWP}) / \text{SPI})$ $\text{IEAC3} = \text{ACWP} + ((\text{BAC}-\text{BCWP}) / (\text{SPI} \times \text{CPI}))$ $\text{IEAC4} = \text{ACWP} + ((\text{BAC}-\text{BCWP}) / ((0.2 \times \text{SPI}) + (0.8 \times \text{CPI})))$	●		✓	
	Other IEACs	$\text{IEAC5} = \text{ACWP} + ((\text{BAC}-\text{BCWP}) / (\text{EV}/\text{AC}))$	✓			
Resources	Resource Profile 1	Direct Workforce Profile Planned vs Profile Actual	✓			
	Resource Profile 2	Indirect vs Direct Ratio				✓
Risk & Opportunity	Risk & Opportunity Summary	Risk Matrix plus Risk Register of top 5/10 risks with mitigations	●		✓	
Contract Health	Contract Change Value	Status of All changes (approved, not-approved, pending)	●		✓	
Others	HSE Statistic and Leading Indicators	Recordable Hours, Lost Time Incident Ratio, Total Recordable Incident Ratio, Observation & Intervention Cards - Planned vs Actual, Site Safety metric evaluations				✓
	Quality Statistics and Lag Indicators	CARs, NCRs, Weld Rejection Rate - Acceptable vs Actual, Hydro-test Plan vs Actual				✓
	Key Milestone Table or Icicle Chart	Key Milestone dates in particular format				✓
	Procurement - Purchase Order Placement	# PO's Planned vs # PO's Actual				✓
	Procurement - PO Delivery Status	# Packages Planned for Delivery vs Actual delivery				✓
	Drill-down metrics, the progress of which is included in the overall EV figure	These metric change as the project moves into different stages/phases				✓

Table 4 – Unique Metrics²²

“NDIA also lists some additional metrics, but these have not been considered for inclusion in an Oil and Gas industry type dashboard”²³. Table 5 shows the listing of “Other” metrics from the NDIA.

²² Peterson, S. J. (2017, October). Best in Class - Dashboards for Oil and Gas Projects. PM World Journal, VI(X).

²³ Peterson, S. J. (2017, October). Best in Class - Dashboards for Oil and Gas Projects. PM World Journal, VI(X).

Other Metrics			
Type	Metric	Definition (and/or) Formula	NDIA
Schedule	SPIt vs TSPIed	A comparison of past and future schedule efficiency	✓
Cost	COI vs TCPIeac	Forecasted efficiency rate	✓
Staffing	Staffing Profile	A time-phased, 12-month rolling full-time equivalent (FTE) headcount by product, organizational, or functional area of individuals required on the program	✓
	Critical Skills Key Personnel "Churn"/Dilution Metric	Project team members are considered a Critical Skill if the loss of those individuals would directly or indirectly impact program technical requirements, compliance, cost or schedule performance, customer commitments, or program deliverables	✓
	Critical Resource Multiplexing Metric	% of personnel dedicated to the program vs the % that is spread across multiple programs	✓
Risk & Opportunity	Risk & Opportunity \$ vs Management Reserve \$	Visual gauge of the rate at which MR is being expended against the estimated risk exposure on a project	✓
	SRA Histogram (Frequency Distribution Graph)	Calculates the probability of achieving a specific schedule completion date	✓
	SRA Sensitivity (Tornado) Graphs	Used to identify that the activities most likely to drive the outcomes	✓
	Schedule Margin Burn-down	A tangible representation of the time associated with the risks to an end-item deliverable or contract event	✓
Requirements	Requirements Completeness	Indicates progress in eliciting and documenting all the requirements necessary for a final, completed system design. It compares planned completion with actual completion	✓
	Requirements Volatility	Measure of a not-yet-stable requirements baseline	✓
	TBR/TDR Burn Down	"To-Be-Determined" (TBD) or "To-Be-Resolved" (TBR) refers to the system, subsystem, or product requirements that have not been finalized, as listed or specified in the requirements documents or models	✓
	Requirements Traceability	A measure that determines how accurately a program's requirements are maturing to support a baseline solution at various Acquisition Phases	✓
Technical Performance Measures	Technical Performance Measure Compliance	Involves predicting the future values of a key technical performance parameter of the higher-level end product under development based on current assessments of products lower in the system structure	✓
Contract Health	Contract Mods	The trending contract modifications which helps predict the accuracy of the Performance Measurement Baseline (PMB) and ensures that the contract was written correctly	✓
	Baseline Revisions	Indicates lack of control to the PMB in the near term is when the percent change of baseline dollars approaches 6% or more. This metric, similar to contract modifications, helps to validate the integrity of the PMB.	✓
	Program Funding Plan	A measure of the funding stability of the program	✓
	Program Funding Status	Actual and projected cumulative program funding compared to projected program expenditures plus potential termination liability	✓
	Research, Development, Test and Evaluation, Actual Billings vs Forecast Billings	Measures how well the contractor is performing against forecast or planned billings	✓
Supply Chain	Parts Demand Fulfillment	Tied to On-Time Delivery (OTD), the percent measurement of total items received at the agreed upon Due Date	✓
	Supplier Acceptance Rate	The percentage of acceptable versus rejected delivered parts in a month for all approved suppliers	✓
	Supplier Late Starts	A supplier Late Start is any course of events that prevent a supplier from being able to begin manufacturing the items on a Purchase Order	✓
	Production Line of Balance	Means of integrating the flow of materials and components into the manufacture of end items in accordance with time-phased delivery requirements	✓
Other	Rayleigh Estimator	A nonlinear function used to model cumulative cost accrual in research and development (R&D) contracts	✓

NB: Information Source for Table : NDIA - Guide to Managing Programs using Predictive Measures

Table 5. Other Metric²⁴

Step 4- SELECTION CRITERIA

With the exclusion of Table 3 mentioned before, the dashboard will be developed from the metrics outlined in Table 1 and Table 2. However, further analysis should be made to review the 18 unique metrics and determine which of those unique metrics shall be put in the dashboard. Paterson (2017) had made an analysis of these unique metrics and can be shown in Appendix I. Table 6 shows the recommendation from Paterson (2017).

Metric	Recommendation	Comments
Hit Task %	Include	
Critical Path Length Index (CPLI)	Include	
Current Execution Index (CEI)	Include	
Total Float Consumption Index (TFCI)	Omit	
Time-Based Schedule Performance Index (SPIt)	Omit	
Independent Estimate Completion Date (IECDes)	Include	Analyze & Select
Range of IEACs	Include	Analyze & Select
Other IEACs	Include	Analyze & Select
Resource Profile 1	Include	
Resource Profile 2	Omit	
Risk and Opportunity Summary	Include	
Contract Change Value	Omit	
HSE Statistic and Leading Indicators	Include	Format - Compact
Quality Statistic and Lag Indicators	Include	Format - Compact
Key Milestone Table or Icicle Chart	Include	Format - Full or Lookahead
Procurement - Purchase Order Placement Status	Omit	
Procurement - PO Delivery Status	Include	
Drill-down Metrics	Include	Selection

Table 6. Unique Metric Recommendation²⁵

²⁵ Peterson, S. J. (2017, October). Best in Class - Dashboards for Oil and Gas Projects. PM World Journal, VI(X).

According to the table above, Paterson (2017) selected 13 unique metrics to put into the dashboard. This paper, however, will propose a new list of selected unique metrics based on the need of the company and stakeholder interest. The new list is shown in Table 7.

Metric	Recommendation	Comments
Hit Task %	Include	
Critical Path Length Index (CPLI)	Include	
Current Execution Index (CEI)	Include	
Total Float Consumption Index (TFCI)	Omit	
Time-Based Schedule Performance Index (SPIt)	Include	
Independent Estimate Completion Date (IECDes)	Include	Analyze & Select
Range of IEACs	Include	Analyze & Select
Other IEACs	Include	Analyze & Select
Resource Profile 1	Include	
Resource Profile 2	Omit	
Risk and Opportunity Summary	Include	
Contract Change Value	Include	
HSE Statistic and Leading Indicators	Include	Format - Compact
Quality Statistic and Lag Indicators	Include	Format - Compact
Key Milestone Table or Icicle Chart	Include	Format - Full or Lookahead
Procurement - Purchase Order Placement Status	Omit	
Procurement - PO Delivery Status	Include	
Drill-down Metrics	Include	Selection

Table 7. Unique Metric New Recommendation²⁶

FINDINGS

Step 5- ANALYSIS AND COMPARISON OF ALTERNATIVES

In the new list, this paper proposed 15 unique metrics as well but a bit different compared to Paterson. The differences are shown in Table 8 below and will be explained, respectively.

No	Metric
1	Time-Based Schedule Performance Index (SPIt)
2	Contract Change Value

Table 8. Different Metric compared to Paterson's²⁷

²⁶ By Author.

²⁷ By Author

- Time-Base Schedule Performance Index (SPIt)

The SPIt is no different than the traditional SPI, which is to provide a measure of schedule efficiency to which the integrated master schedule has been performed to date”²⁸. The SPIt overcomes two fundamental obstacles with the measurement of SPI and Schedule, which are:

1. SPI Return to 1.0 and SV return to \$ 0 at the completion of the project, regardless of whether the planned dates were met or not.
2. The traditional SPI measures schedule variance in terms of money compared to SPI, which uses time.

Figure 6 shows these differences between SPI and SPIt.

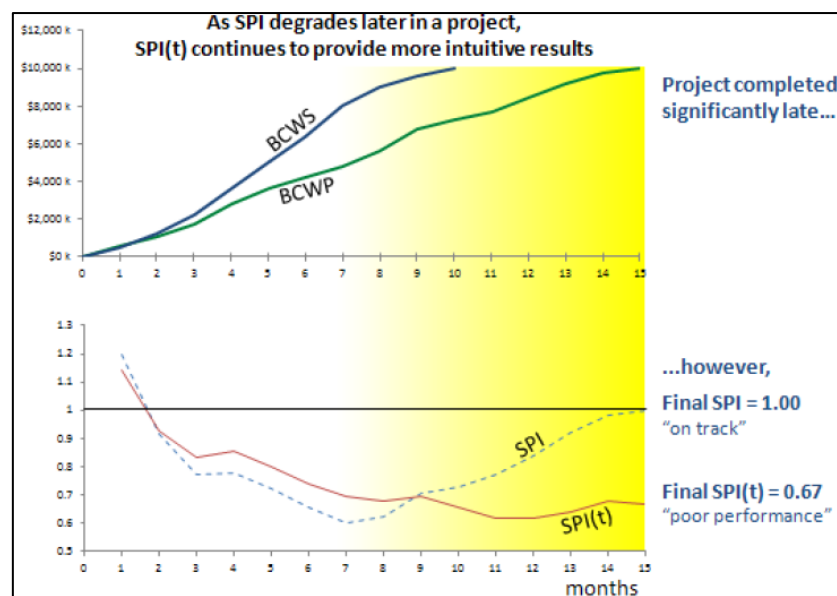


Figure 6. SPI and SPIt Differences²⁹

- Contract Change Value

This metric needs to be added to the dashboard in order to check whether there is a change in contract value or not. This tab will show the number of proposals in process, the proposal submitted, the proposal accepted/or rejected, and the total contract.

²⁸ NDIA. (2014). A Guide to Managing Programs Using Predictive Measures.

²⁹ NDIA. (2014). A Guide to Managing Programs Using Predictive Measures.

According to the internal data, 100% of the projects will have a contract change value. This contract change value needs to be monitored. According to the company's internal rule, the contract change value should be less than or equal to 10% or 110% from the initial contract value.

Step 6- SELECTION OF PREFERRED ALTERNATIVES

Based on the analysis from point beforehand, there are a total of 29 metrics that will be used in the company's dashboard, as shown in Table 9. All these metrics will surely become an improvised version for the current monitoring dashboard, as shown in Table 2 and Figure 4.

Type	Metric
1	Schedule Performance Index (SPI)
2	Schedule Variance (SV)
3	Schedule Variance % (SV%)
4	% Schedule
5	% Complete
6	Baseline Execution Index (BEI)
7	Cost Performance Index (CPI)
8	Cost Variance (CV)
9	Cost Variance % (CV%)
10	% Spent
11	Variance at Completion (VAC)
12	Variance at Completion % (VAC%)
13	Estimate at Complete (EAC_{CPI} or $EAC_{Composite}$)
14	To Complete Performance Index ($TCPI_{target}$)
15	Hit Task %
16	Critical Path Length Index (CPLI)
17	Current Execution Index (CEI)
18	Time-Based Schedule Performance Index (SPIt)
19	Independent Estimate Completion Date (IECDes)
20	Range of IEACs
21	Other IEACs
22	Resource Profile 1
23	Risk and Opportunity Summary
24	Contract Change Value
25	HSE Statistic and Leading Indicators
26	Quality Statistic and Lag Indicators
27	Key Milestone Table or Icicle Chart
28	Procurement - PO Delivery Status
29	Drill-down Metrics

Table 9. Combined Proposed Dashboard Metrics³⁰

³⁰ By Author.

Step 7- PERFORMANCE MONITORING

As mentioned in the introduction phase, Pertamina has a problem with project execution monitoring since the current dashboard provides such limited information about the project. This could lead to a project late, and the budget exceeds since the current dashboard only shows the planned vs. realization in both financial and physical terms. The figure below shows the Pareto Chart of the project's execution problems at Pertamina.

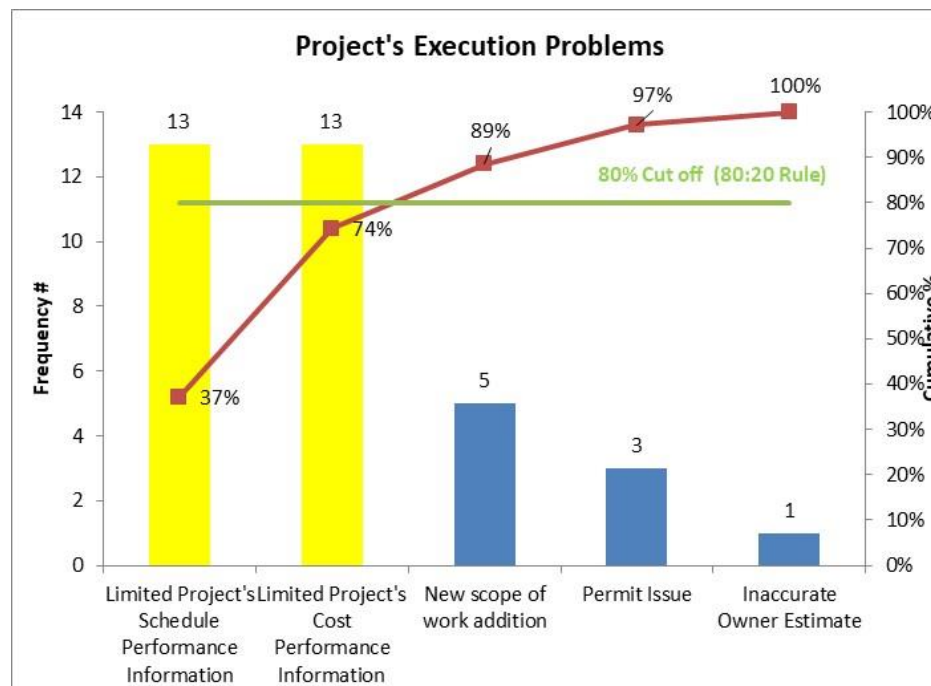
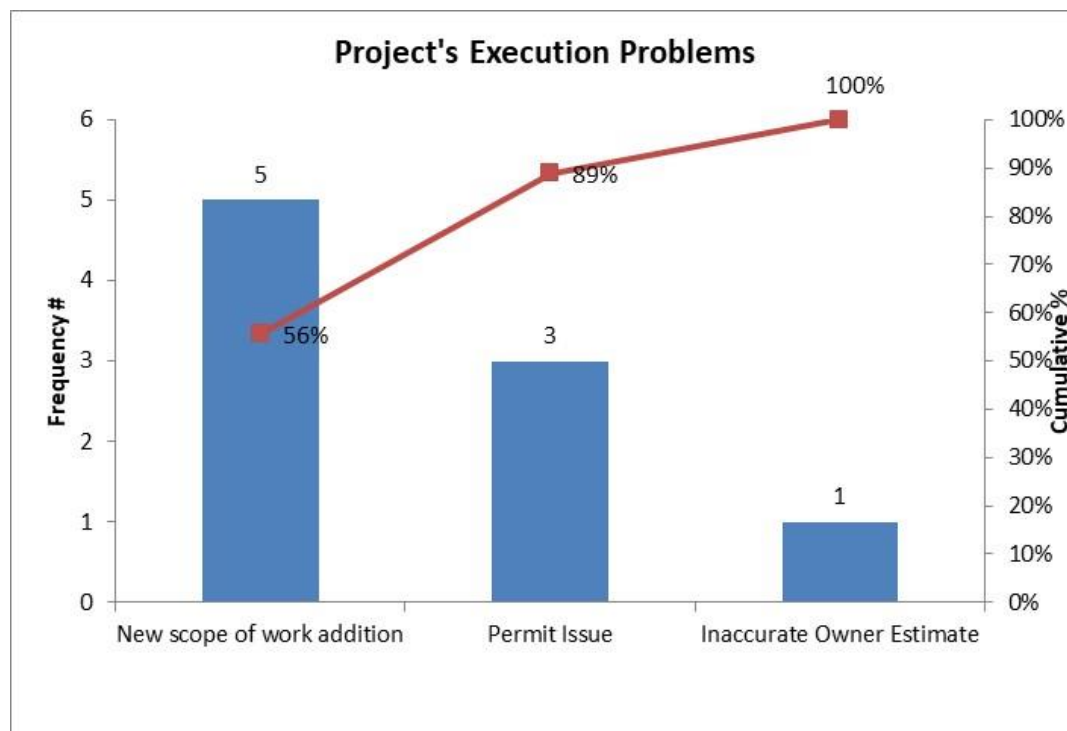


Figure 7. Project's Execution Problem Pareto Chart³¹

From the figure above, it can be seen that the majority of the problem comes from the project manager's inability to describe the project by the terms of Schedule and Cost. Because of that, the project manager cannot deliver a correct message to the stakeholders, and hence the stakeholders cannot give a quick response if the project is not performing well.

By applying the Earned Value Management and develop a new dashboard, the project manager can obtain more detailed information about the project, and thus if the project is showing a bad signal, the project manager could develop mitigation in order to overcome the obstacle or the risk. Figure 8 shows the Pareto chart after applying this EVM dashboard for project monitoring in Pertamina.

³¹ By Author

Figure 8. After Pareto Chart³²

CONCLUSIONS & RECOMMENDATIONS

This paper was undertaken to answer these questions:

- The dashboard's optimum metric content applicable to Pertamina's projects.
 - A new project monitoring dashboard is being developed by adapting the NDIA, GPCCAR, DAU, and Paterson's metric with a total of 29 metrics included in the dashboard.
- The find the benefit of the use of EVM by means of the dashboard for Pertamina.
 - Compared to the current project monitoring report, the new dashboard clearly provides more detailed information regarding the project status, project performance by means of time budget schedule, risk register, and HSE statistic as well

To conclude, the author will use the new dashboard as project monitoring tools for several ongoing projects in Logistic, Supply Chain, and Infrastructure Directorate in Pertamina. The Author will also recommend that the used metrics in this paper can also be considered by fellow practitioners for their project dashboard development.

³² By Author.

BIBLIOGRAPHY

1. Geneste, S. (2019). The True Origins of EVM: A historical approach to scheduling and incentive schemes. *PM World Journal*, VIII(IX). <https://pmworldlibrary.net/wp-content/uploads/2019/10/pmwj86-Oct2019-Geneste-the-true-origins-of-evm.pdf>
2. Giammalvo, P. (2013). Do Private Sector Small To Medium Sized, Entrepreneurial General Contractors Comply With ANSI 748? If yes, how, if not, why not? *PM World Journal*, II(IV). <https://pmworldlibrary.net/wp-content/uploads/2013/04/pmwj9-apr2013-giammalvo-do-small-contractors-comply-ANSI748-FeaturedPaper.pdf>
3. Giammalvo, P. (2013). Practical Look at How Private Sector Entrepreneurial Contractors Use Earned Value (And what “Lessons Learned” this might offer for State and Federal Governments). *PM World Journal*, II(VII). <https://pmworldlibrary.net/wp-content/uploads/2013/07/pmwj12-jul2013-giammalvo-practical-look-enterpreneurial-contractors-evm-FeaturedPaper.pdf>
4. Taybi, Y. (2019). Is Earned Value Management (EVM) consistent with Sharia Law Will it help in fighting corruption? *PM World Journal*, VIII(VIII). <https://pmworldlibrary.net/wp-content/uploads/2019/09/pmwj85-Sep2019-Taybi-is-evm-consistent-with-sharia-law.pdf>
5. Gillette, H. P., & Dana, R. T. (1909). *Cost Keeping And Management Engineering*. New York and Chicago: The Myron C. Clark Publishing Co.
6. Defense Acquisition University. (2018, September). Earned Value Management 'Gold Card'. Retrieved from <https://www.dau.mil/cop/evm/Pages/Default.aspx>.
7. GAO. (2015). *Schedule Assessment Guide*. Washington D.C.
8. NDIA. (2014). *A Guide to Managing Programs Using Predictive Measures*.
9. Malouni, F. (2010, April). *PROJECT MANAGEMENT: EARNED VALUE AND PROMPT PAYMENT PRACTICES OBSERVED FROM VIEW OF ISLAMIC SYARIAH LAW*. Retrieved November 2019.
10. Guild of Project Controls. (2016, January 17). Introduction to Managing Project Controls. Retrieved from <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-project-controls>.
11. Guild of Project Controls. (2016, January 17). Introduction to Managing Risk and Opportunity. Retrieved from <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-risk-and-opportunity>.
12. Guild of Project Controls. (2016, January 17). Introduction to Managing Project Progress. Retrieved from <http://www.planningplanet.com/guild/gpccar/introduction-to-managing-project-progress>.

13. IPMA. The Future of Project Management: Global Outlook 2019. Retrieved from <https://www.ipma.world/assets/PM-Survey-FullReport-2019-FINAL.pdf>.
14. Humphreys, G. C. (2018). *Project management using earned value* (4th ed.). Orange, CA: Humphreys & Assoc.
15. Besner, C. & Hobbs, J. B. (2006). The perceived value and potential contribution of project management practices to project success. Paper presented at PMI® Research Conference: New Directions in Project Management, Montréal, Québec, Canada. Newtown Square, PA: Project Management Institute.
16. Wibiksana, R. (2012). Earned Value Management: Adapted for use in Underground Mining Operations. *PM World Journal*, I(II).
17. Peterson, S. J. (2017, October). Best in Class - Dashboards for Oil and Gas Projects. *PM World Journal*, VI(X).
18. Guild of Project Controls. (2016, January 17). Project Performance Forecasting. Retrieved from <http://www.planningplanet.com/guild/gpccar/project-performance-forecasting>" <http://www.planningplanet.com/guild/gpccar/project-performance-forecasting>.
19. Guild of Project Controls. (2016, January 17). Assessing and Interpreting Progress Data. Retrieved from <http://www.planningplanet.com/guild/gpccar/assessing-interpreting-progress-data>" <http://www.planningplanet.com/guild/gpccar/assessing-interpreting-progress-data>.
20. Paterson, S. J. (2018, January). A Comparison Between 8 Common Cost Forecasting Methods. *PM World Journal*, VII(I). <https://pmworldlibrary.net/wp-content/uploads/2018/01/pmwj66-Jan2018-Paterson-comparison-of-8-common-forecasting-methods-featured-paper.pdf>
21. PWC. (2019). *Oil and Gas in Indonesia Investment and Taxation Guide*.
22. SHMA. (2013, April 21). Types of incentive plans. Retrieved November 11, 2019, from <https://managementation.com/types-of-incentive-plans>.
23. Microsoft Office [Computer program] 2016. Redmond, WA, USA: Microsoft Corporation (2016).
24. Project management dashboard - Software bug tracking tool. (2016, November 9). Retrieved from <https://exceldashboardschool.com/project-management-dashboard/>" <https://exceldashboardschool.com/project-management-dashboard/>.
25. Project Dashboard | Visual Project Snapshots for Project Managers. (2017). Retrieved from <https://www.easypjprojects.net/project-dashboard/>.
26. Project management dashboards | iDashboards software. (2017). Retrieved from <https://www.idashboards.com/solutions/project-management-dashboards/>.

27. What is a dashboard? (2011, November 28). Retrieved from <http://www.dashboardinsight.com/articles/digital-dashboards/fundamentals/what-is-a-dashboard.aspx>.
28. International Project Leadership Academy. (2012). Facts and figures – Why do projects fail? Retrieved from http://calleam.com/WTPF/?page_id=1445.
29. Shehab, E. (2016, November 13). The true cause of project failures | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet). Retrieved from <http://www.planningplanet.com/forums/project-management-issues-discussion/597661/true-cause-project-failures>.

APPENDICES

Appendix I: Paterson’s Metric Explanation and Selection

Hit Task %

- This metric looks at the number of tasks that were completed on or before the baseline finish, and divides it by the number of tasks baselined to be finished within the reporting timeframe.
- The formula provides a performance ratio. > 1.00 = Ahead of Schedule / 1.00 = On Schedule / < 1.00 = Behind Schedule.
- Clear indication if activity completions are being achieved on time. Provides excellent visibility for Management as to status of schedule.

Critical Path Length Index (CPLI)

- This metric evaluates the risk conditions of the remaining schedule duration based on the float by looking at the number of working days remaining plus the value of the total float number on the last critical path activity. By adding these two figures and dividing by the number of working days remaining.
- Provides performance ratio. 1.00 = Effort is forecasted to progress as planned / > 1.00 = Forecasted project completion earlier than required / < 1.00 = Forecasted completion that does not support project deadlines.
- A forward-looking metric that is only affected by the activities on the project’s critical path.

Current Execution Index (CEI)

- This metric is about the efficiency of the team’s forecasting abilities, and looks at the number of tasks that were completed during the reporting window and divides it by the number of tasks previously forecasted to be completed during the reporting window.
- The formula provides a performance ratio. Green = or $> 75\%$ of tasks completed as forecasted / Yellow $< 75\%$ and $> 70\%$ of tasks completed as forecasted / Red $< 70\%$ of the tasks completed as forecasted. These threshold values can be adjusted to suit.
- Benefit of implementing this metric is to drive team behaviors by motivating and influencing them to focus on forecasting accuracy.

Total Float Consumption Index (TFCI)

- This metric is duration based and uses total float (TF) trending to determine an efficiency factor for the schedule. TFCI is derived by summing the actual duration plus the critical path total float then dividing the total by the actual duration.
- The formula provides a performance ratio. > 1.00 = Ahead of Schedule / 1.00 = On Schedule / < 1.00 = Behind Schedule.
- Viewed as a tool for assisting review of delinquent schedules.

Time-Based Schedule Performance Index (SPIt)

- This metric uses the earned schedule (ES) duration and divides it by the actual duration (AD). ES is the time originally planned on the BCWS curve to reach the current BCWP (ES = ED date – BL Start) (AD = Status date – BL Start).
- The formula provides a performance ratio. > 1.00 = Faster than planned rate of effort / 1.00 = Performing to Plan / < 1.00 = Slower than planned rate of effort.
- Provides a schedule efficiency measure, but focuses on the time element to give an accurate, intuitive and actionable range of results.

Independent Estimated Completion Date – Earned Schedule (IECDes)

- There are three methods noted, all using similar formulas but utilizing BEI, TFCI and SPI to provide differing independent estimated completion dates.
- The formula provides an estimated completion date based on the performance metrics.
- No clear fail/pass results, only provides a level of confidence that the forecasting accuracy is good/bad.

Range of IEACs (IEAC1, IEAC2, IEAC3, IEAC4)

- Four independent estimated at complete for cost forecasting, using various denominators; CPI, SPI, CPI x SPI, and factored SPI x factored CPI. The formula uses ACWP which is added to the result of BAC minus BCWP divided by the selected denominator.
- The formula provides a forecasted cost based on the denominator selected.
- As with the IECD these formulas provide a confidence level in the cost forecast.

Other IEAC (IEAC5)

- One additional IEAC recommended by the GPCCaR, as this formula is not listed in the NDIA document, but suggests it may provide a more accurate forecast. Metric formula - $ACWP + ((BAC - BCWP) / (EV / AC))$.
- The formula provides a forecasted cost.
- Another way to provide a confidence level in the cost forecast.

Resource Profile 1 (Direct Resources)

- A visual graphic or tabular view of daily/weekly/monthly “Direct” resources assessed by contractor(s) as being required to support the project to meet the goals/objectives.
- Can be split by craft or discipline or both.
- Provides clear indication if project has been resourced as per the schedule, and if it is not, what actions need to be implemented to achieve schedule.

Resource Profile 2 (Direct vs Indirect)

- A visual graphic or tabular view of the ratio of “Direct” resources vs “Indirect” resources.
- Reporting levels can be determined by Site Teams, but initial view should be at summary level, and if further detail required it can be split out.
- Depending on contract type, this metric can provide useful insight as to how productive the contractor is. If lump sum there is little need for this chart, but on a reimbursable project ensuring the contractor is not having an excess ratio is important.

Risk & Opportunity Summary (Matrix/Register)

- Based on the Project Risks identified in the register a summary risk matrix shows the assessment with regards Probability and Consequence of the risks, along with the top 5/10 risks in the register.
- If used correctly, this is a very valuable management tool.

Contract Change Value

- Covers several contractual change items such as; proposals in process, proposals submitted, proposals accepted/rejected. All reflecting what pressure is on the Contract value, which allows analysis to be performed to determine if the original contract value was a good or bad estimate, and was the scope well defined. Normally changes only occur if there are some ‘grey areas’ in the scope of work, or a modification has been requested by the client.

- Registers, Tables and charts can be used to provide status to the team.
- Depending on what level of costs the team are exposed to would determine what type of information is provided in the dashboard. Many Companies have different views on what should be made public regarding cost variances, a metric that can be useful, if its tracking approval cycles of changes.

HSE Statistics and leading indicators

- In today's safety environment, this is probably one of the most important metrics that needs to be included in a dashboard. There are many options on how to communicate how well the project is doing safety wise, but these need to be set-up very early in a project to capture all the data required to make the indicators meaningful. Too late waiting a few months into the project to set up what is required, needs communicating to all contractors ahead of commencing work on site, etc.,
- Mandated by management as a key metric in any dashboard.

Quality Statistics and leading indicators

- Like the HSE indicators, the Quality group have a very important part to play in progression of the project. Thought needs to be given to how a condensed status of key indicators such as Corrective action requests (CARs), Non-conformance Reports (NCRs), technical queries (TQs), weld rejection rates, etc., can highlight issues/performance that need attention.
- A key metric that takes time to get the right information in place, needs to be carefully thought through and provide the right message to management, cannot be left to interpretation of figures.

Key Milestone Table or Icicle chart

- Provides either the full view or a snapshot look-ahead of a projects key milestones. This metric can be shown in tabular format with planned, actual and forecast dates, or can be presented in the more powerful icicle chart view which shows at a glance how the status and trends of each milestone as the project progresses. This depends on the space availability in the dashboard.
- Management tools that is always requested to be included when developing dashboards.

Purchase Order Placement Status

- Front end metric that is used to drive both Engineering and Procurement – Engineering inputs are required for package developments, while procurement need to ensure vendor drawings and details are provided to engineering to progress layouts/detailed design drawings. Metric tracks the stages of PO development through to PO placement.
- Good front end metric until project is fully up and running, highlights the interface points between E&P phases.

Purchase Order Delivery Status

- Reports the planned delivery dates of equipment and materials that are tied to a Required-on-Site (RoS) date vs actual/forecasted deliveries, providing outlook in what has been achieved, and the float status of each package.
- Requires several departments input to keep current (Procurement, Expediting, Project Controls) but very effective metric which can allow what-if scenarios to be run if packages are forecasting late deliveries. Dates are tied to baseline schedule.

- Management like the visibility of where procurement packages are and if there may have to be workarounds should a package start slipping.

Drill-down Metrics

- Covers a wide range of KPIs that change in and out as the project progresses through its life span. These are associated with the weekly progress build-up, and which metrics are needing tracked. Items such as Productivity, Discipline KPI's such as; engineering drawing releases, steel fabrication, steel assembly, piping spool fabrication, etc., are items to be considered. Suggested that information is held at detail level, but graphics are summary level, to permit further interrogation if required.
- These are very project team orientated, but need to be used with caution, otherwise drill-downs requests can get excessive, and people lose focus on what is important.

Metric	Recommendation	Comments
Hit Task %	Include	
Critical Path Length Index (CPLI)	Include	
Current Execution Index (CEI)	Include	
Total Float Consumption Index (TFCI)	Omit	
Time-Based Schedule Performance Index (SPI)	Omit	
Independent Estimated Completion Date (IECDs)	Include	Analyze & Select
Range of IEACs	Include	Analyze & Select
Other IEACs	Include	Analyze & Select
Resource Profile 1	Include	
Resource Profile 2	Omit	
Risk & Opportunity Summary	Include	
Contract Change Value	Omit	
HSE statistic and leading indicators	Include	Format - Compact
Quality statistics and lag indicators	Include	Format - Compact
Key Milestone Table or Gantt chart.	Include	Format - Full or Lookahead
Procurement - Purchase Order Placement Status	Omit	
Procurement - PO Delivery status	Include	
Drill-down metrics	Include	Selection

About the Author



Benito Agus Putranto

Jakarta, Indonesia



Benito Agus Putranto is project engineer with five years of professional experience in the oil and gas sectors. Currently, he works as an engineer at Pertamina, the national oil company of Indonesia. During his career, he has an experience as an engineer, cost estimator, project control, and has been involved in several projects such as LPG Terminal, Fuel Terminal. He holds a bachelor degree in Civil Engineering from Gadjah Mada University (UGM) and he is attending a distance learning mentoring course, under tutorage of Dr Paul D. Giammalvo, CDT, CCE, MScPM, MRICS, GPM-m Senior Technical Advisor, PT Mitrata Citragraha, to attain Certified Cost Professional certification from AACE International.

Benito lives in Jakarta, Indonesia and can be contacted at benitoap.910@gmail.com