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Best in Class – Dashboards for Oil&Gas Projects
by Stephen J.C. Paterson
Featured Paper

Best in Class – Dashboards for Oil and Gas Projects

Stephen J.C. Paterson

Abstract

Reporting, effective reporting is key to a projects success during its life-span, while insufficient or incorrectly analyzed reporting dooms a project to failure. In today's environment with the advances in technology, managers and executives are reading reports on the move so concise analysis is key. The author reviews several sources including "Guild of Project Controls GPCCAR", "DAU Gold Card" and "NDIA's A guide to managing programs using predictive measures" to determine the optimum metric content for a project management dashboard for the oil and gas sector. Along the way, the paper researches the attributes and the target audience, before determining utilization of two metric groups, "common" and "unique" along with a recommended shortlist. The paper concludes by recommending content for page 1, page 2 and subsequent pages, from the shortlist, before providing recommended formats for the same.

Keywords: Dashboard, Project Reporting, Progress Reporting, Business Report Writing, Project Management, Charts, Tables

Introduction

Having spent more than 30 years in project controls on Oil and Gas construction projects, on-shore and off-shore, one of the most important activities in the project life-span is effective reporting. The art of reporting, and it is an art, is providing the correct information and analysis of the same to the key people to allow them to make informed decisions to make the project successful.

During these years, the author has been involved in the development of various dashboards to track progress, key KPI's, performance, and highlight issues requiring attention. However, each Project Manager, usually had different requirements, and while some indicators could be duplicated from project to project others needed to be developed to suit the project team's needs.

Based on the famous statement by William Cameron which is often attributed to none other than Albert Einstein, that "not everything that can be measured matters and not everything that matters can be measured"[1] this paper is going to review the following problem statement, "What should the ideal project management dashboard contain?". While the authors research is based on dashboards supporting the Oil and Gas Industry, it is only to be expected that other industries would have similar requirements.

Specifically, this paper wants to explore;

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[1] Quoteinvestigator. (2010, May 26). *1963, Informal Sociology, a casual introduction to sociological thinking by William Bruce Cameron, Page 13, Random House, New York. (Google Books snippet view) (Checked on paper: Fifth printing, January 1967; Copyright 1963).* Retrieved August 6, 2017, from http://quoteinvestigator.com/category/william-bruce-cameron/

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1. Proposed content and format for the first page of a dashboard.
2. Proposed content and format for the second page of a dashboard.
3. Proposed content and format for third and subsequent pages of a dashboard.
4. Considerations for ready prepared formats by software providers.
5. Proposed update to the Guild of Project Controls GPCCAR Communications module. [2]

Attributes of a dashboard

Review of the following documents, revealed the depth of metrics and key performance indicators available to generate a meaningful dashboard:

- Guild of Project Controls GPCCAR Module 9. [3]
- DAU Gold Card. [4]
- NDIA's A Guide to Managing Programs using Predictive Measures. [5]
- Oracle P6 EPPM standard dashboard reports. [6]
- Microsoft Project & Portfolio Management (PPM) standard dashboard reports. [7]

The GPCCAR Module 9 section 09.5.3.4 "Dashboard Reports" shows four examples, and refers to the DAU Gold Card, and section 09.5.5 "References & Templates" refers to the NDIA document mentioned above. Of the four examples provided, a good example of is the first one which shows the "Figure 21 - S-Curve from a Real Programme", see figure 1 below, as it provides a metrics ribbon along the top to provide management with an excellent view of the current status.

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[2] Guild of Project Controls. (2015, October 3). Module 07 Baselining and communicating the schedule - Guild of project controls compendium and reference (CaR) | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet). Retrieved August 6, 2017, from http://www.planningplanet.com/guild/gpccar/baselining-and-communicating-the-schedule
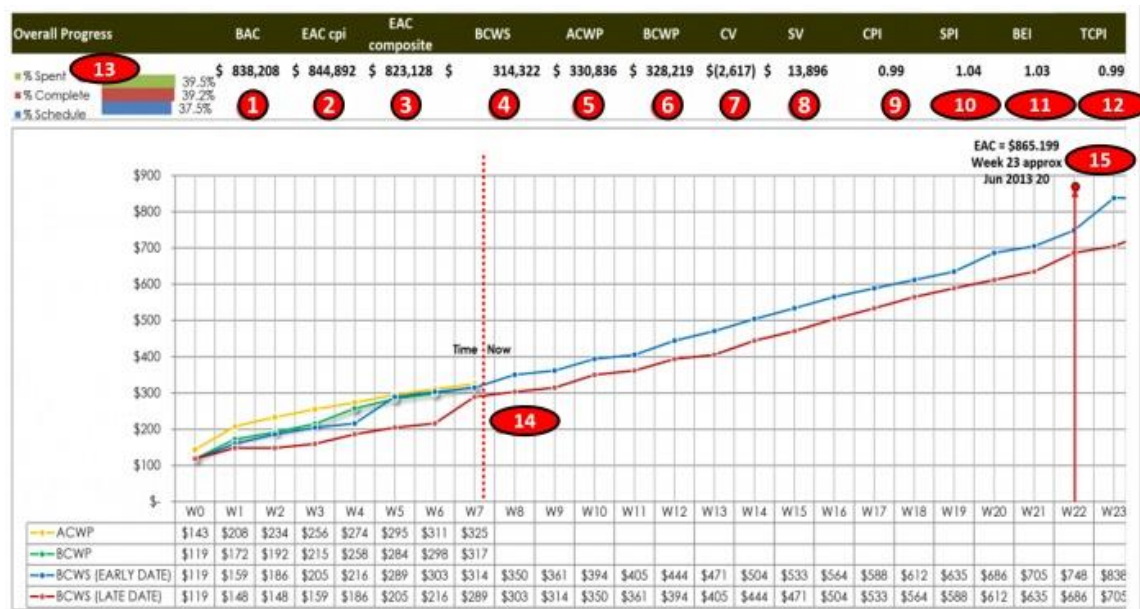
[3] Guild of Project Controls. (2015, October 3). Guild of project controls compendium and reference (CaR) | Project controls - planning, scheduling, cost management and forensic analysis (Planning planet). Retrieved August 6, 2017, from http://www.planningplanet.com/guild/gpccar/project-performance-forecasting

[4] Defense Acquisition University. (2015). *EVM general reference (gold-card)*. Retrieved from https://www.dau.mil/tools/t/EVM-General-Reference-(Gold-Card)

[5] National Defense Industrial Association / Integrated Program Management Division. (2014). *A guide to managing programs using predictive measures*. Retrieved from http://www.ndia.org/

[6] Primavera P6 Enterprise Project Portfolio Management [Computer program] 16.2. Redwood shores, CA, USA: ORACLE (2016).

[7] Microsoft Project & Portfolio Management (PPM) [Computer program] 2016. Redmond, WA, USA: Microsoft Corporation (2016).

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Figure 21 - S-Curve from a Real Progamme

Source: Giammalvo, Paul D (2015) Course Materials Contributed Under Creative Commons License BY v 4.0

In the example above, there are 7 projects in this program and this is the Level 1 Summary Report issued to management showing the overall program status as of the end of Week 7 of a 26 week program. The chart explained:

1. The Budget At Completion for this program was $833,208

2. The Estimate At Completion using the CPI formula was $844,128

3. The Estimate At Completion using the CPI X SPI formula was $823,128

4. Cumulative BCWS to date was $314,322

5. Cumulative ACWP to date was $330,826

6. Cumulative BCWP to date was $328,219

7. Cost Variance (CV) was ($2,617) meaning we were $2,617 OVER budget

8. Schedule Variance (SV) was $13,896, meaning we are $13,896 AHEAD of schedule in terms of money

9. Cost Performance Index (SPI) is 0.99 meaning we are only 1% worth of work behind schedule

10. Schedule Performance Index (SPI) is 1.04, meaning we are 4% AHEAD of schedule in terms of work completed.

11. Baseline Execution Index (BEI) shows we have FINISHED 3% more activities than we had planned to finish by this date.

12. To Complete Performance Index (TCPI) means we only have to work at 99% efficiency for the remaining time to finish on time and within budget

13. We have spent 39.5% of our money budget; we have earned are 39.2% of our budget and only 37.5% of the time allowed has elapsed.

14. As of the end of Week 7, the projected completion date of this program is Week 23 and the P90 Estimated Cost at Completion is $865,199
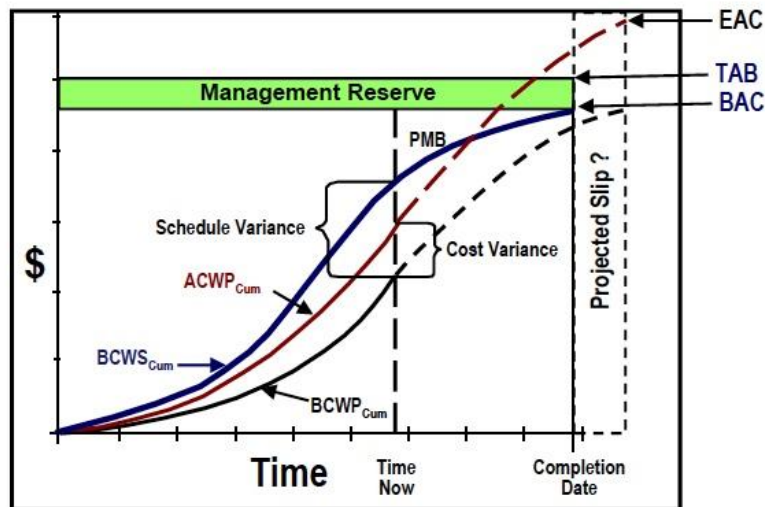
Figure 1 – GPCCAR Dashboard Example[8]

The DAU Gold Card is a one page document that defines terminology and equations for Earned Value (EV) and quite easily could be adapted into a one page dashboard. It covers the overall status, cost and schedule variances, efficiencies, performance against baseline and forecasting. What is nice about this layout is that the equations are also shown, and eliminates many questions from management as it's already spelled out for them in the template.

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[8] Guild of Project Controls. (2015, October 3). 09.5.3.4 Dashboard reports - Guild of project controls compendium and reference | Project Controls - planning, scheduling, cost management and forensic analysis (Planning Planet). Retrieved July 31, 2017, from http://www.planningplanet.com/guild/gpccar/project-performance-forecasting

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Figure 2 – DAU Gold Card [9]

NDIA's "A guide to managing programs using predictive measures" has several equations like that contained in the DAU Gold plus others that are schedule, resource and risk & opportunity related.

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[9] Defense Acquisjion University. (2015). *EVM general reference (gold-card)*. Retrieved from https://www.dau.mil/tools/t/EVM-General-Reference-(Gold-Card)

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Figure 3 – Extract from Table of Contents of NDIA's predictive measures guide [10]

Oracle's P6 Dashboards are a facility provided in the Enterprise Primavera Portfolio Management (EPPM) version of the software, please note that users of the standalone P6 Professional version do not have this facility and need to export data to create dashboards in MS Excel. Reviewing the P6 online help indicates that these dashboards use 'portlets' a name for a pre-determined metric, and a dashboard can be customized with up to 12 of these portlets. The online help facility runs through the operating instructions to create and customize the portlets but is lacking in graphics. It does however provide a list of available fields; ACWP, BAC,

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[10] National Defense Industrial Association / Integrated Program Management Division. (2014). *A guide to managing programs using predictive measures* – table of contents, Pages i & ii. Retrieved from http://www.ndia.org/

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BCWP, BCWS, BEI, CPI, CV, EAC, SPI, SV, VAC and TCPI. Therefor with some setting up, a P6 user has the fields to construct a customized "Gold Card" template.

Further research revealed a white paper by Charles Wright called "Understanding Dashboards in P6 EPPM R8.0+"[11] which provided a clearer picture of how they function along with generated dashboard graphics, refer to figure 4 below. P6 has three categories of dashboards available, "P6 Dashboard", "Workspace" and "Workgroup" which have seventeen standard portlets, 9 standard Oracle Primavera Contract Management (O-PCM) portlets, and unlimited number of portfolio views that can be customized. Note, that the O-PCM portlets are only available when PCM, which is a separate oracle product, and EPPM are integrated. Reviewing the document indicates that these dashboards take some training, trial and error to perfect so it does not appear to be an easy process.
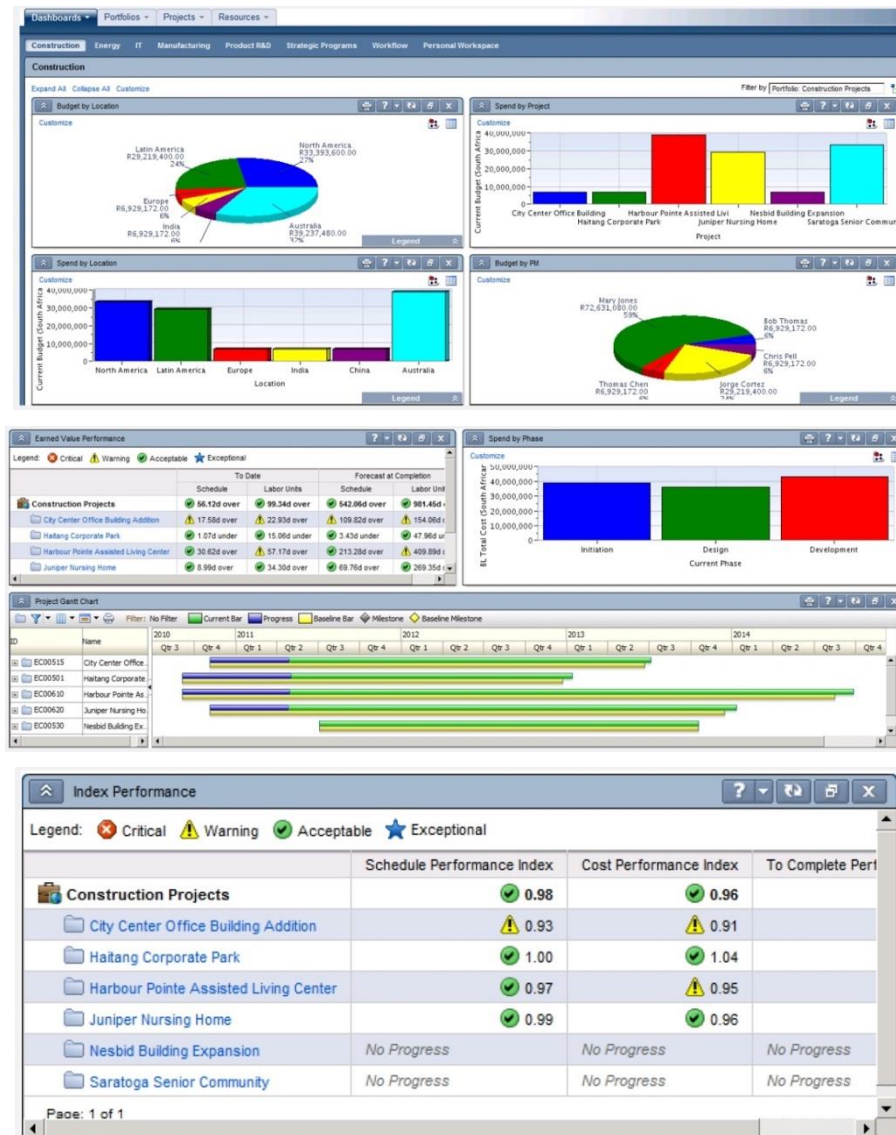
Figure 4 – Examples of P6 Dashboards [12]

[11] Wright, C. (2012). Understanding dashboards in P6. Retrieved from https://tensix.com/wp-content/uploads/2012/12/Understanding-Dashboards-in-P6.pdf
[12] Example P6 dashboards from Wright, C. (2012). Understanding dashboards in P6. Retrieved from https://tensix.com/wp-content/uploads/2012/12/Understanding-Dashboards-in-P6.pdf

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Microsoft Project Portfolio Management (PPM) dashboards are facility with the "Reports" menu dropdown options, which provides five options "Burndown", "Cost Overview", "Project Overview", "Upcoming Tasks" and "Work Overview". All appear to be able to be customized by the user should there be a need to do so. Review of the customization fields shows that the following are available; ACWP, BAC, BCWP, BCWS, CPI, CV, CV%, EAC, SPI, SV, SV%, VAC and TCPI. This allows any PPM user to be able to construct a customized "Gold Card" template. Research shows extensive coverage of dashboard development in both written and video tutorials for users wanting to learn to create customized ones. It's only to be expected since PPM is one of the Microsoft Office [13] suite programs.
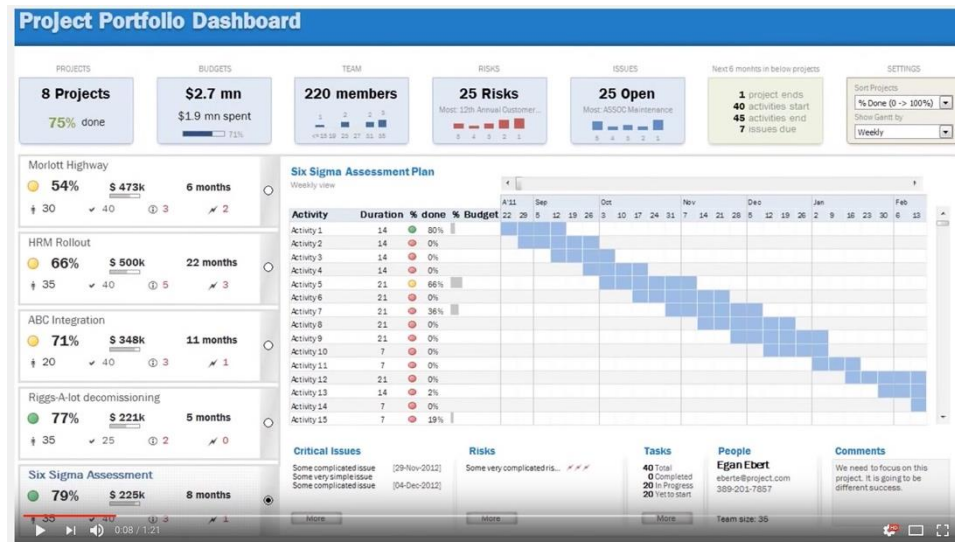
Figure 5 – Example of a customized PPM Dashboard [14]

So, from the sources mentioned above there are several predictive measures or indicators, whichever term is preferred, that can be utilized in the development of an informative dashboard to monitor and control any project / program across a wide range of industries.

Based on the 30+years of first-hand experience in oil and gas sector, here are additional metrics that need to be included in the evaluation and analysis:

- An analysis narrative section.
- HSE statistic and leading indicators.
- Quality statistics and lag indicators.
- Key Milestone Table or Icicle chart.
- A section for drill-down metrics, the progress of which is included in the overall EV figure.

As well as the above documents, extensive research online pointed to several companies[15][16][17][18][19][20][21][22] who provide a Dashboard software, some free, some with monthly tariffs. They seem

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[13] Microsoft Office [Computer program] 2016. Redmond, WA, USA: Microsoft Corporation (2016).

[14] ExcelTutorials. (2015, November 12). *Official Trailer for Project Portfolio Dashboard* [Video file]. Retrieved from https://www.youtube.com/watch?v=QZnJOQJYo3c

[15] Creating a project dashboard in projectmanager.com. (n.d.). Retrieved from https://www.projectmanager.com/software/dashboard

[16] Dashboard gallery - Your one-stop shop for pre-built dashboards - Klipfolio. (n.d.). Retrieved from https://www.klipfolio.com/gallery

[17] Online project management software - ProjectManager.com. (2017). Retrieved from https://www.projectmanager.com

[18] Project Dashboard | Visual Project Snapshots for Project Managers. (2017). Retrieved from https://www.easyprojects.net/project-dashboard/

[19] Project management dashboard - Software bug tracking tool. (2016, November 9). Retrieved from https://exceldashboardschool.com/project-management-dashboard/

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to provide similar service to what an in-house Project Controls Team would generate but it's generated by people dedicated to producing these types of reports so it looks professional in appearance. There also appears to be wall screen dashboards offered, letting them run through the contents of the dashboard on various separate slides on the screen.

Targeting the Audience – Dashboard Visibility

Be it Contractor, Client or both, dashboards are about getting the message to the Team, Management and the Stakeholders, in a concise way that minimal questions are asked when the received. As this could very well turn out to be many individuals, some thought needs to be given as to what metrics go on each page 1, 2, 3, etc., as it may well take several pages for the complete dashboard.

It is normal practice for the dashboard to originate from the contractor as a contractual requirement from the client either to supplement or replace the weekly report. This in turn is taken by the client and consolidated into condensed report for the project team and home office management, who in turn further dissect and send up-line to the Senior executives and stakeholders.

Ideally, Page 1 should provide the concise status of where the project is and where it is headed along with risks, mitigations and actions being implemented. Normally the items that senior management and stakeholders target. Page 2 would expect the peripheral metrics which don't quite make the first page but still key for the project management team, and page 3 onwards contain the drill-down metrics and that are more useful for the project team that are dealing with the day to day issues.

In today's "age of technology", where individuals have access to smart phones, tablets, notebooks, etc., the format of the dashboard becomes more of an issue. Images need to be clearly read by the user while he/she is on the move. Some people may choose to view the dashboard on their phone but images will be small, others may use a tablet or notebook to view allowing slightly larger images, ultimately the definition will depend on the resolution of the product being used.

On several projects, there were two main ways to target both contractor and client project teams so the latest information was available for their viewing; i) the dashboard was plotted on A1/A0 size paper and displayed in the numerous hallways around the office, and ii) the components that made up the compact dashboards were put onto individual slides and compiled into a revolving slideshow on wall screens in the hallways that had them installed around the project office. This was a very effective way of providing visibility to a large project team. It also had a big effect on office visitors, be it sub-contractors, supply chain representatives, visiting executives or VIPs, everyone commented on how informative the status was. As previously mentioned, these services now appear to be offered by several of the online companies that specialize in dashboard development services.

As mentioned above the author has been working several years preparing dashboards, predominantly for client teams and senior management, and recognizes that the more

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[20] Project management dashboards | iDashboards software. (2017). Retrieved from https://www.idashboards.com/solutions/project-management-dashboards/

[21] Smartsheet: Work Management and Automation Solutions. (2017). Retrieved from https://www.smartsheet.com/landing-b

[22] What is a dashboard? (2017). Retrieved from http://www.dashboardinsight.com/articles/digital-dashboards/fundamentals/what-is-a-dashboard.aspx

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information available, the harder it becomes to remain on one page of paper, be it, A4, A3, US Letter or 11 x 17, the task always remains daunting. Someone comes up with a let's add this or that suggestion, which ultimately comes as a trade-off as space to be utilized is at a premium or the dashboard increases in size. The key is to get the message contained in the information across to the audience along with solutions as to what is being/has been implemented against problem areas/issues. The best approach is to pull together an initial format then initiate several review cycles with the senior managers incorporating a listing of agreed upon comments.

Metrics

In reviewing the available metrics, there are two groups; 1) Metrics common to all the reviewed sources, and 2) Unique metrics that are not across all the sources.

As the "Common metrics" are across all the sources reviewed, these can be eliminated from being discussed further. Table 1 provides a listing of the "Common" metrics.

Common Metrics							
Type	**Metric**	**Formula**	**GPCCAR**	**DAU**	**NDIA**	**P6**	**MSP**
Schedule	Schedule Performance Index (SPI)	SPI = BCWP / BCWS	✔	✔	✔	✔	✔
	Schedule Variance (SV)	SV = BCWP – BCWS	✔	✔	✔	✔	✔
	Schedule Variance % (SV%)	SV % = (SV / BCWS) * 100	✔	✔	✔	✔	✔
	% Schedule	% Schedule = (BCWS$_{CUM}$ / BAC) * 100	✔	✔	✔	✔	✔
	% Complete	% Complete = (BCWP$_{CUM}$ / BAC) * 100	✔	✔	✔	✔	✔
	Baseline Execution Index (BEI)	Total Tasks Completed / (Total Tasks with Baseline Finish On or Prior to Current Report Period + Tasks 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	% 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$_{CUM}$ * SPI$_{CUM}$)]	✔	✔	✔	✔	✔
	To Complete Performance Index (TCPI$_{target}$)	TCPI$_{Target}$ = Work Remaining / Cost Remaining = (BAC – BCWP$_{CUM}$) / (Target – ACWP$_{CUM}$)	✔	✔	✔	✔	✔

Table 1 – Common Metrics [23]

The "Unique" metrics are shown in table 2 and are referenced against the specific source, please note that the GPCCAR references the "DAU Gold Card" and "NDIA" in several areas as being the recommended sources for metrics, however the uniqueness of the metrics is based on the source document. It is unlikely that all of these metrics would be used in a dashboard, so the project team would need to select those deemed suitable for use in their particular dashboard.

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Unique Metrics						
Type	**Metric**	**Formula**	**GPCCAR**	**DAU**	**NDIA**	**Other**
Schedule	Hit Task %	100 * (Tasks in Denominator that Completed ON or Before Baseline Finish / Tasks Baselined to Finish within Current Report Period)	*	✔		
	Critical Path Length Index (CPLI)	CPLI = (Critical Path Length + Critical Path total Float) / Critical Path Length	*		✔	
	Current Execution Index (CEI)	CEI = # Tasks Actually Completed During the Window (of the Denominator Tasks) / # of Tasks Previously Forecasted to Complete During a Defined Window	*		✔	
	Total Float Consumption Index (TFCI)	TFCI = (Actual Duration + Critical Path Total Float) / Actual Duration	*		✔	
	Time-Based Schedule Performance Index (SPIt)	SPIt = Earned Schedule (ES) / Actual Duration (AD)	*		✔	
	Independent Estimated Completion Date – Earned Schedule (IECDes)	IECD(bei) = SD + (PDWR/BEI) : (using BEI) / IECD(tfci) = SD + (PDWR/TFCI) (using TFCI) / IECD(spi) = SD + (PDWR/SPI) : (using traditional SPI)	*		✔	
Cost	Range of IEACs	IEAC1 = ACWP + ((BAC - BCWP) / CPI) / IEAC2 = ACWP + ((BAC - BCWP) / SPI) / IEAC3 = ACWP + ((BAC - BCWP) / (SPI x CPI)) / IEAC4 = ACWP + ((BAC - BCWP) / ((0.2 x SPI) + (0.8 x CPI)))	*		✔	
	Other IEACs	IEAC5 = ACWP + ((BAC - BCWP) / (EV / 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, Obervation & Intervention Cards - Planned vs Actual, Site Safety metrics 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 Status	# 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 metrics change as the project moves into different stages/phases.				✔

(*) = As GPCCAR refers to DAU/NDIA where there is tick in DAU or NDIA box, there is also a corresponding tick in GPCCAR

Table 2 – Unique Metrics [24]

NDIA lists some additional metrics, but these appear to be more in line with US Government projects or product type applications and while these metrics may be extremely useful in their application, these have not been considered for inclusion in an Oil and Gas industry type dashboard. Table 3 provides a listing of the "Other" metrics in the NDIA document.

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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	✔
	TBD/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 on the program	✔
	Program Funding Status	Actual and projected cumulative program funding compared to projected program expenditures plus potential termination liability	✔
	Reasearch, 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 3 – Other Metrics [25]

With the preclusion of Table 3 from the available metrics, it is expected that the dashboards be developed from the metrics outlined in Tables 1 "Common" and 2 "Unique". As the table 1 metrics are common to all sources, review of the 18 "Unique" metrics needs further analysis to determine which of them are worth including in the dashboard.

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[25] By author / Information Source: NDIA Guide to Managing Programs using Predictive Measures

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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 summating 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.

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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.

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- 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.

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- 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 it 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.

Table 4 provides a summary of the metrics along with the author's recommendations as to include or omit each one in the dashboard.

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 Estimated 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 & 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 Icicle chart.	Include	Format - Full or Lookahead
Procurement - Purchase Order Placement Status	Omit	
Procurement - PO Delivery status	Include	
Drill-down metrics	Include	Selection

Table 4 – Unique Metric Recommendations [26]

Out of the eighteen "Unique" metrics the Author recommends that thirteen of them be considered when developing the dashboard.

All potential dashboard inputs have now been defined, and by using the fourteen "Common" metrics plus the thirteen recommended "Unique" metrics, it is now possible to commence pulling together the contents/format of the pages.

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The graphics that will be shown in the following "contents" pages have been sourced from a variety of projects that the author has developed dashboards on. They are not all from the same project and have been used for presentation purposes only to provide the readers with an image of what these dashboards could look like. If the Controls Team has an excel expert these could be developed in one spreadsheet with multiple tabs being updated from a central data page which is completed by the team in a timely fashion to meet the reporting cycles.

The First Page Contents

The first page of a dashboard can be likened to that of a newspaper, the need to quickly grab the reader's attention so that the full document is reviewed. Failure to do that will ultimately result in a dashboard that sits in someone's inbox and gets opened periodically. The contents and layout of this page is critical for the success of the document.

Ultimately, it is envisaged that page one will include the following content:

- A brief executive narrative
- All the Common metrics
- Unique Metrics – Safety, Hit Task %, CPLI, CEI, Milestones, IEAC's

The three points above need to be formed into an informative layout.
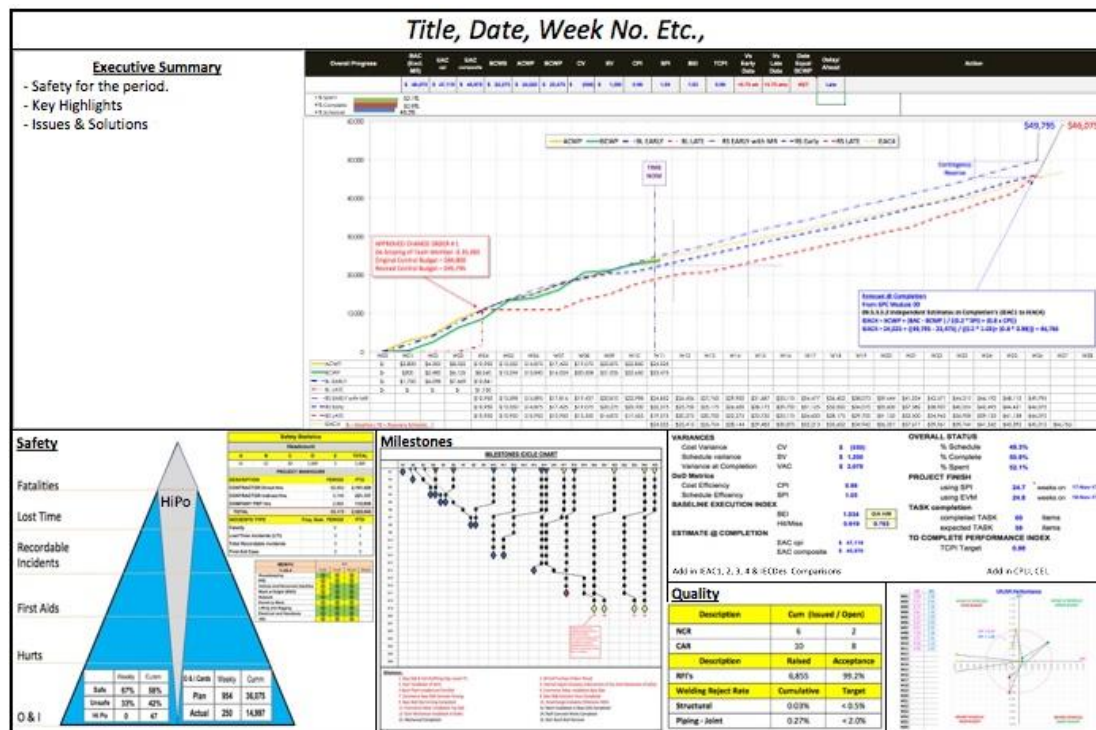
Figure 6 – Recommended First Page Template [27]

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The Second Page Contents

The second page should be compiled of the remaining "unique" metrics with the exception that the drill-down metrics start on page 3 onwards. The second page layout should look like this.

Figure 7 – Recommended Second Page Template [28]

Subsequent Pages Contents

The third and any subsequent pages should contain the appropriate drill-down metrics for the stage the project is in. As mentioned previously, these need to be meaningful and not every item that management suggest. Last thing anyone wants is "death by dashboards".

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Figure 8 – Recommended Subsequent Pages Template [29]

The contents of page 3 and any subsequent sheets can vary from week to week, and it all depends on the requirements of the project team, and of course the information being available. Having the information available to generate a large range of charts, tables, graphics, requires a good bit of interaction between the contractor/client, and the internal groups within both establishments. If the dashboard is to be a success then this interaction needs to be wide spread across the groups as both teams have one common goal to successfully complete the project.

Conclusion

The purpose of this paper was to:

1. Provide the proposed dashboard content of pages 1, 2 and subsequent pages.
2. Provide template recommendations to the software providers.
3. Solicit the Guild of Project Controls to use the contents of this paper to update/supplement the relevant sections of the GPCCAR regarding communications and dashboards.

Point 1 was established by providing the proposed templates contained in figures 6, 7 and 8.

Point 2 was demonstrated in table 1 "Common metrics" where it shows that all the information required to develop the "DAU Gold Card" is available within the program. The software providers should consider providing a "DAU Gold Card" template within their dashboard menu for users to choose as an option. This would be a very desirable addition for fellow professionals.

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Point 3 has been addressed by the development of this paper which will be forwarded to the Guild of Project Controls for their consideration for utilizing to update/supplement portions of the GPCCAR with the relevant sections of this paper.

To conclude, the author recommends that the contents/formats contained in the body of this paper be considered by fellow practitioners for utilization during dashboard development for reporting to their project management, senior executives and stakeholders.

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Stephen Paterson is an Oil and Gas professional with 35+ years of experience in project controls and construction management. Born in the Highlands of Scotland, he served an apprenticeship and gained a Higher National Certificate in Civil Engineering in the UK, before embarking on the adventure of expat living, working worldwide; Middle East, North & South America, Russia, Middle East, Far East, South East Asia, China and Australia. He just completed his last assignment in February of 2017, and currently, furthering his education by way of a distance learning mentoring course, under the tutorage of Dr Paul D. Giammalvo, CDT, CCE, MScPM, MRICS, GPM-m Senior Technical Advisor, PT Mitrata Citragraha, to attain Guild of Project Controls certification.

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