Jacobs

Review of Earned Value Metrics
Final

A review of key indices
ORR / National Highways

30 April 2024

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Final

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Jacobs U.K. Limited
7th Floor, 2 Colmore Square
38 Colmore Circus, Queensway
Birmingham, B4 6BN
United Kingdom

T +44 (0)121 237 4000
www.jacobs.com

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Glossary

BCWP	**Budgeted Cost of Works Performed**
BCWS	Budgeted Cost of Works Scheduled
Capital Baseline	ORR recognised performance baseline for RIS2
CPI	Cost Performance Index
EAC	Estimate at Completion
ETTC	Estimated Time To Completion
EV	Earned Value
NHIDC	NH Investment Decision Committee
PCF	Project control framework
PMB	**Performance Measurement Baseline.** This represents the plan of work for National Highways for the entirety of the project and includes multiple contract/supply chain baselines, as well as National Highways activities into an integrated baseline – i.e. integrating scope, schedule, cost and risk.
RIS	Road Investment Strategy period
SME	Subject Matter Expert
SPI	Schedule Performance Index
TCPI	To Complete Performance Index

Executive Summary

Background

The Department for Transport (DfT) has outlined two performance indices in their manual for National Highways (NH) to evaluate the performance of schemes in relation to costs and schedules: the Cost Performance Index (CPI) and the Schedule Performance Index (SPI). The use of CPI and SPI differs between the Office of Rail and Road (ORR) and NH. For ORR, these metrics serve as tools for external performance monitoring. In contrast, NH and its supply chain utilise CPI and SPI primarily for contract and project management purposes, ensuring that projects are completed efficiently and within the allocated resources.

In completing this report, Jacobs has sought to ensure that it is consistent with the ORR guidelines for producing accessible reports. The guidance can be found here: https://www.orr.gov.uk/media/23638.

Purpose

The current study, jointly funded by National Highways (NH) and the Office of Rail and Road (ORR), aims to evaluate the effectiveness of earned value metrics used during the Road Investment Strategy period 2 (RIS2) with a view to considering potential improvements for RIS3. The focus is on determining the metrics' impact on achieving efficient delivery and exploring ways to enhance these measures for future project and programme delivery assessments. Key objectives include:

- **Assessing Utility**: Examining the usefulness of the metrics for monitoring purposes for ORR/DfT and as management information for NH.
- **Indicator Effectiveness**: Assess the usefulness of the metrics as leading or lagging indicators for monitoring the health of the enhancement portfolio.
- **Improvement for RIS3**: Suggestions on how to improve the value metrics for the upcoming RIS3.

Key components of the review were as follows:

- **Effectiveness of EV metrics**: Critically evaluate the effectiveness of earned value metrics as performance indicators in RIS2.
- **Data Quality and Compliance**: Assess the quality of underlying data and process compliance to ensure fitness for purpose.
- **Contribution to the Efficiency Outcomes**: Review the extent to which the metrics contribute to the 'Achieving Efficient Delivery' outcome.
- **Relationship with other financial and engineering level metrics**: Present an independent analysis of the correlation between earned value metrics performance and scheme performance against RIS delivery/finance commitments.
- **Improvements for RIS3**: Examine NH's plans for developing earned value or similar performance indicators for the remainder of RIS2 and into RIS3.
- **Extension of EV**: Consider the feasibility of using earned value measures for enhancements in development and for the renewals program.
- **Proposed Improvements**: Propose enhancements to earned value metrics for RIS3 reporting and monitoring.

Methodology

In order to deliver the study requirements we undertook the following:

- **Pre-engagement Questionnaires**: Conducted via MS Teams, targeting key staff from ORR, NH, DfT, and suppliers, with Jacobs being the sole supplier participant. The questionnaires aimed to gather initial insights on critical themes.
- **Workshops**: Two workshops complemented the questionnaires, utilising Mural sessions for brainstorming. These sessions facilitated a deeper understanding of each organisation's perspective on the study's key themes.
- **Using Jacobs experience:** Jacobs has extensive experience as SMEs with Earned Value Metrics, and we have applied this in undertaking our analysis.
- **Literature review:** The literature review conducted as part of the Earned Value Management (EVM) study examined the application of EVM in several major programs, including the London 2012 Olympics, Crossrail, and the Thames Tideway Tunnel. The review highlights the best practices and lessons learned from these programs to inform future performance monitoring.
- **Interviews with ORR and NH staff:** As part of our work, we undertook some direct interviews with ORR and NH. These interviews were semi structured and related to a number of key components of the work we are undertaking
- **Analytical Review of Data / Files:** We undertook reviews of data and files to assess the robustness of calculations and investigate relationships between EV and other financial and engineering metrics.

Findings

The key findings from our review are as follows:

Element of Scope	Findings
Effectiveness of EV in metrics as a performance indicator in RP2	• EV is a good performance indicator, widely used in project management. • For NH it is effective for internal management reporting against operational baselines, but not as a performance indicator • For ORR it is not an effective indicator of performance primarily because of a lack of reconciliation with the capital baseline and insufficient contextual information.
Improvements in earned value metrics	• There needs to be at least two baselines (the Performance Measurement Baseline (PMB) and the capital baseline) to ensure EV is used effectively by ORR/NH. • The reported EV metrics should be supplemented with contextual information, both quantitative and qualitative • An Earned Value metric based on final forecast cost and schedule would provide a very useful leading indicator. • The NH proposals would complement the above but are not fully developed yet to enable us to provide a firm view.
Review of data quality and process compliance	• There is good overall confidence in the EV calculations being undertaken • Our sample checks did not identify any errors in the calculations • Based on our review, we conclude that there is a good level of internal assurance being carried out on the EV calculations. • There is less confidence in input data and data from external sources that is used to calculate the EV metrics. • There are some issues we identified with the overall methodology including: A lack of a clear methodology on some components of the EV metrics (e.g. "percentage complete" is not prescribed); methodology not being consolidated into one document; insufficient description in documentation around why certain data is collected. • It is necessary to establish a "consistent unit of measure" for percentage complete on all types of scope.
Relationship between earned value metrics	• The capital baseline is the recognised baseline against which ORR would assess efficiency and performance. Therefore, to maintain an appropriate relationship between EV and Efficient Delivery, it is necessary that NH work towards the capital

and efficient delivery outcome	baseline and any revised capital baselines includes efficiency targets and are used by NH to drive performance. • The current EV metrics reported to ORR do not provide sufficient confidence for achieving efficient delivery, because they are detached from the capital baseline • It is also apparent that stakeholders do not identify a clear direct relationship between the EV metrics and the efficiency KPI • Based on our stakeholder discussions, we understand in some instances, there may be unwanted incentives to cost cut or descope projects to meet targets.
Extending the earned value metrics to development, renewals, and other programmes	• It seems to be feasible to extend EV to development and larger renewals – system infrastructure seems to already exists. • The contracts already allow it for development phase and major project led renewal projects, thus providing for a quick win • Benefits exist in terms of allowing consistent reporting for major NH investments. • To determine the EV threshold, a more detailed study is needed to assess the additional value provided versus the resources required
Relationship between Earned Value and other metrics	• Based on the available data we were unable to find a strong correlation between EV and scheme financial data • This may be because CPI and SPI use a different baseline to the capital baseline. • Where there was a weak relationship, it suggested larger schemes are more likely to have a more accurate SPI and CPI • We noted that the distribution of schemes for both CPI and SPI had a downward bias, and that the schemes were more likely to maintain schedule than cost.

Recommendations

We make the following recommendations for National Highways and ORR to consider for implementation. These findings are based on our extensive review, though we note where other evidence exists, this should be considered prior to finalising which recommendations should proceed to implementation:

- **Improvement in EV metrics for RIS 3 and monitoring:**
    - **Requirement for Multiple Baselines:** At least two baselines are required, the capital baseline and the PMB. This is to ensure that both ORR and NH can effectively use the EV metrics for their purposes.
    - Contextual information: We recommend addition contextual information is provided to ORR as part of the EV reporting, that includes:
        - ***Budget & EAC at project level % Complete***
        - ***EV derived Final Forecast Estimate (based on TCPI or similar data)***
        - ***Cost Variance*** – Difference between the Earned Value (EV) and the Actual Cost (AC).
        - ***Schedule Variance*** –Difference between the Earned Value (EV) and the Planned Value (PV).
        - Incorporating NH proposals, still in development, see section 3.2.2.
        - ***Qualitative data*** - As well as additional quantitative data being requested, we recommend that qualitative commentary is provided. This should describe how the performance of a scheme is progressing and set out what further risks to performance exist on the horizon.
        - ***An Earned value metric based on final forecast cost and final forecast schedule*** to provide a forwarding looking (leading) indicator view of outturn cost and schedule.
- **Data quality and process compliance:**
    - **Establish a "consistent unit of measure" for percentage complete on all types of scope that is expected to support earned value:** The absence of this provides room for interpretation and raises concerns around consistency of data that might be reported.

    - **Consolidation and formalisation of approach:** We believe that this is required to ensure consistent provision of EV data. This should include:
        - a clear methodology on the main components of the EV metrics (e.g. percent complete is not prescribed).
        - Methodology should be consolidated in one document to ensure effective data quality management and process compliance.
        - The methodology should cover assurance and validation of data.

- **EV and contribution to efficiency delivery outcome:**
    - **To maintain an appropriate relationship between EV and efficient delivery, it is necessary that any revised baselines being worked towards reflect an efficient baseline target and this drives NH behaviour.**
    - **Review relevance of the EV metrics to ensure they are driving the correct incentives:** In light of stakeholders not identifying a clear direct relationship between the EV metrics and with the efficiency KPI target.
    - **Review whether schemes delivered are consistent with expectations at the capital baseline and scheme setting stage**, which may involve some ex-post reviews (see section 3.4).
- **Enhancement of EV to renewals and development programme:**
    - **We would recommend that EV metrics are extended** which would include but not be limited to, any named renewals schemes or any schemes greater than a £m threshold as agreed between NH and ORR. This is to ensure effective performance monitoring. The detail and timeline should be discussed and agreed between ORR and NH.

Conclusion

In delivering this work, Jacobs has undertaken a wide consultation with various stakeholders, undertook our independent analysis and relied on the expertise of our SMEs. From our analysis we have made a number of observations around each of the key scope areas and have included a number of recommendations. We believe implementing these recommendations will increase the quality of the EV metrics, increase reliability and accuracy and support in driving future improvements in the way the performance measures are reported and understood. We appreciate that there is ongoing work being undertaken by NH and this will need to be considered in determining data and metrics to be used for RIS3.

1. Project understanding

1.1 Background

The DfT in their performance specification manual for NH set out the two separate performance indices[1] for National Highways to assess performance of schemes against costs and schedules. These are as follows:

- Cost performance index (CPI).
- Schedule performance index (SPI)

These indices measure cost and schedule performance across schemes being constructed, specifically between Project Control Framework (PCF) stage six and PCF stage seven. PCF stage six and seven related to the end cycle of the project, with stage six focused on construction, commissioning and handover and stage seven dealing with project closeout. The metric is prescribed, including frequency of reporting, reporting period, number of decimal places to report data to, as well as the specific calculations that are being undertaken.

Each metric reports against a benchmark figure of 1, where a figure > 1 shows performance better than budgeted/scheduled, whilst a figure of <1 shows performance worse than expected.

The CPI and SPI is calculated against the project measurement baseline (PMB). The focus of CPI and SPI for ORR and NH is different. For ORR, these metrics are used for external performance monitoring. For NH and the supply chain, the CPI and SPI are primarily used for contract and project management.

1.2 What are ORR and NH are trying to achieve with this study

The study is seeking to understand how effective the metrics have been for the purpose of monitoring the enhancement portfolio during Road Investment Strategy period 2 (RIS2), in particular whether there has been any demonstrable contribution to the outcome of **achieving efficient delivery.** In addition, the study is seeking to assess how the earned value metrics could be improved for future measurement of project and programme delivery. This is a jointly funded study between NH and ORR.

The purpose of this study is to conduct a broad-based review of the value of the metrics being used and to assess any potential changes than might be implemented for RIS3. In particular the report will consider:

- How useful the metrics are from a monitoring perspective for ORR.
- How useful the metrics are for National Highways as management information, and thus to support effective decision making.
- How useful the measures are as indicators, in particular as leading or lag indicators for monitoring and reporting on the health of the enhancement portfolio.
- How the value of the metrics might be improved for RIS3.

The specific scope points that this study seeks to respond to are as follows:

- critically evaluate earned value metrics effectiveness as a performance indicator in RP2;
- evaluate underlying data quality, process compliance and if it is fit for purpose;
- review the extent to which the earned value metrics performance indicators contribute to the 'Achieving Efficient Delivery Outcome' area;

[1] DfT's performance specification for NH and the methodology is set out in NH's operational metrics manual, a copy of which can be found here: ris2-operational-metrics-manual-july-2021-1.pdf (nationalhighways.co.uk)

- present an independent view of whether earned value metrics performance can be correlated with scheme performance against other RIS delivery/finance commitments;
- review National Highways' current plans for developing earned value (or similar) performance indicators in the remainder of RP2 and into RP3
- consider the feasibility of using earned value measures for enhancements in development and for the renewals programme; and
- propose improvements to earned value metrics for RIS3 reporting and monitoring.

The remainder of this report is structured as follows:

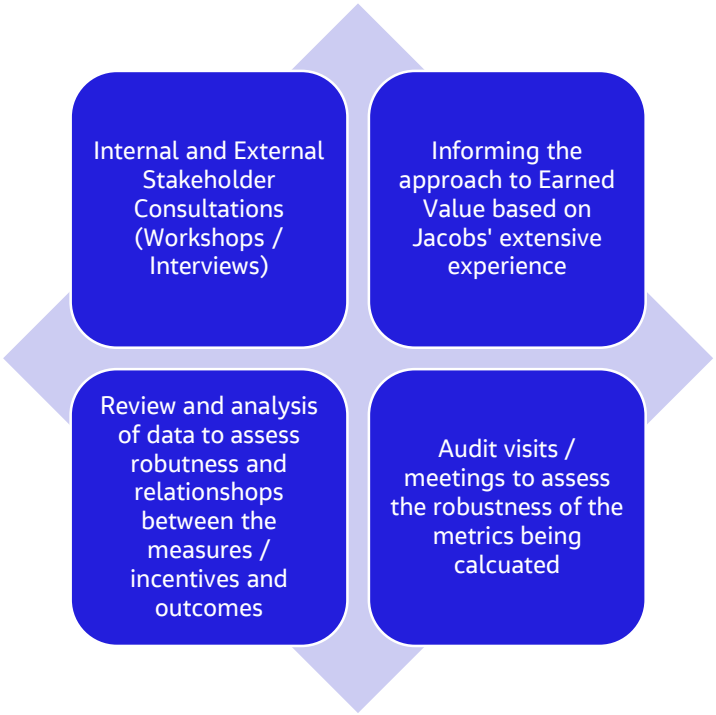
- **Section 2** sets out our overall approach
- **Section 3** sets out our findings
- **Section 4** presents our conclusions and recommendations
- **Appendix A** sets out the summary findings from the pre-engagement questionnaires
- **Appendices B and C** provide the raw data from the stakeholder workshops

2. Our approach

In order to delivery against the requirements for this study, we undertook a number of separate approaches. These are described below.

At a summary level we see this work being informed by four key activities:

Figure 1: Summary methodology



We believe that undertaking these core activities will allow us to provide a comprehensive and balanced answer to the questions that pertain to this study. These activities are described below in more detail. The methodology that we have implemented is consistent with what we described in our proposal. The approaches together have allowed us to conclude against the scope items of the study as described in section 1.2 above.

2.1 Stakeholder consultations

Our stakeholder consultations involved both a pre-engagement questionnaire and specific workshops that we organised around the key themes of the study. The group of stakeholders included representatives from NH, ORR, DfT and one supplier (Jacobs which we entirely separate from the study team).

A summary of the approach to the pre-engagement questionnaire and the workshop is set out below.

2.1.1 Pre-engagement questionnaire

Our pre-engagement questionnaire was carried out on MS Teams. The pre-engagement questionnaire was circulated to key staff at both ORR and NH. In addition, we invited wider stakeholders to complete the pre-engagement questionnaires. These included individuals from DfT and from suppliers (Jacobs was the only supplier to engage with this study). The focus of these pre-engagement questionnaires was to allow stakeholders to consider some of the critical themes in advance of more formal stakeholder consultations. The questionnaires were informed by Jacobs Subject Matter Experts (SME's) and stakeholder consultation analysts. The analysis of the pre-engagement questionnaire is presented in appropriate sections of this report.

2.1.1.1 Pre engagement questionnaire 1

The pre-engagement questionnaire for Workshop 1 comprised of 11 questions split into four sections:

- **Section 1 -** *'You and your role'*,
- **Section 2 -** *'Understanding the use of the EV metrics'*,
- **Section 3 -** *'Looking to the future of PI metrics'*, and
- **Section 4 -** *'Final thoughts'*.

Overall, 18 responses to the questionnaire were received, 6 of which were from ORR, 7 from NH, 1 from DfT, 3 from the supply chain and 1 from 'Other'. Details around the questions asked and a summary of the response is set out in Appendix A.

2.1.1.2 Pre engagement questionnaire 2

The pre-engagement questionnaire for Workshop 2 comprised of 14 questions split into three sections:

- **Section 1 -** *'You and your role'*,
- **Section 2 -** *'The relationship between EVM and outcomes, in particular efficient delivery'*, and
- **Section 3 -** *'Looking to the future of PI metrics'*.

Overall, 13 responses to the questionnaire were received, 6 of which were from ORR, 5 from NH, 1 from DfT, and 1 from the supply chain. Details around the questions asked and a summary of the response is set out in Appendix A.

2.1.2 Workshops

To complement the pre-engagement questionnaire, we undertook two workshops to help us further understand each organisation's views around key themes of the study. The workshops were informed by the data we received and our analysis of the pre-engagement questionnaires. For the workshops we undertook a Mural session where we split the wider group into breakout rooms to brainstorm critical themes. The raw data from the workshops (Mural Boards) is presented in Appendix B and Appendix C.

2.1.2.1 Workshop 1

For workshop 1 the following summary themes were obtained from the different stakeholders

- **Forward-looking:** Need to incorporate more forward-looking metrics (e.g., Estimated Time To Completion (ETTC), To Complete Performance Index (TCPI), Earned Value (EV), Estimate at Completion (EAC) . **(Advocates: NH workshop attendees, Supply Chain)**
- **Reporting:** Should be reported more often to ORR. **(Advocates: NH workshop attendees, ORR)**
- **Training:** Need for more training around the purpose of EVMs, how they're calculated, the data used, what they do/don't do, and who owns the metrics/how they should be updated. **(Advocates: NH workshop attendees, Supply Chain, ORR)**
- **Data quality:**
- Develop data quality as a Collaborative Performance Framework metric and develop a data quality dashboard. **(Advocates: NH workshop attendees*)**
- Drive EV metric up agenda of key project reporting requirements. **(Advocates: NH workshop attendees*)**
- **Alternative metrics:** ETTC, TCPI, EV, EAC, PPC, Baseline Management Metric. **(Advocates: NH workshop attendees*)**
- **Extended to more schemes:** Currently used in construction schemes, should be extended to renewal schemes/schemes in development. **(Advocates: NH workshop attendees, DfT, ORR)**
- **Baselining:**
- Need for greater clarity around which baseline (NH vs capital) has been applied and the difference between the two. **(Advocates: NH workshop attendees*)**
- Contractual baselines need to be regularly revised and more adaptable to individual contracts – need to be more proactive than reactive. **(Advocates: NH workshop attendees, Supply Chain)**
- **Behaviours incentivised:**
- **Transparency:** Need greater transparency around the data used and the calculations of the EVMs and encouragement of more open conversations and learning outcomes. **(Advocates: NH workshop attendees, Supply Chain, ORR)**
- **Reporting:** No concerns reported on reporting deadlines.
- **Assurance:** No concerns on assurance practices were picked up.

2.1.2.2 Workshop 2

For workshop 2 the following summary themes were obtained from the different stakeholders:

- **Purpose of EVMs:** Used primarily for management and as an early-warning indicator for intervention requirement, not as a measure of true performance **(Advocates: NH workshop attendees and ORR)**
- **Supporting narrative/alternative indicators:** Should be used alongside other indicators (e.g., LEI, BEI, PPC, productivity, TCPI) and supporting narrative. **(Advocates: NH workshop attendees and ORR)**
- Data quality and implications: Any EVM/PI measure is subject to poor data quality, therefore there should be a focus on process improvements as well as simply replacing the types of measures. (**Advocates: NH workshop attendees***)

- **External factors act as a barrier to extending to development phase:** NH may have less control over schedule/cost in this phase due to external factors impacting cost and schedule (DCO JRs) **(Advocates: NH workshop attendees and ORR)**
- **Extension to renewals:** Needs to be proportionate – expense and resources required to estimate EVMs for smaller renewal projects may not be worthwhile. **(Advocates: NH workshop attendees and ORR)**
- Education of personnel and data quality would need to be driven up. **(Advocates: NH workshop attendees and ORR)**
- **Prioritise reporting of EV during construction:** Construction is number 1 priority. Need to gain a stronger understanding of what baseline data points performance should be based on at construction phase before extending to development/renewal programmes.
- Generally considered to work well as a project management tool/early-warning indicator if used correctly.

Note: An * reflects the 'thumbs up' function on mural (i.e. a comment that received a positive response from others at the workshop). This could have been by any of the stakeholders, ORR, NH or the supplier.

Using Jacobs extensive experience as SMEs

Jacobs have extensive experience in the establishment and implementation of Earned Value Management on complex Major Programmes. We used this expertise in conjunction with our experience of effective PMO reporting to support this review of EV metrics. Major Programme experience includes Sizewell C, Anglian Water Services, Lower Thames Crossing and Thames Tideway Tunnel.

At Thames Tideway Tunnel (c.£4.5bn Capex), the Jacobs SME supported the establishment of Earned Value Management within a Cost Management System that ensured accurate and consistent EV performance reporting was available across the programme and its four main delivery partners. This data was reported monthly to ensure forward looking EV and performance data was available to the programme leadership to support proactive and informed decision making. The baseline used was the original capital budget for client side reporting, but Tideway also used a PMB type baseline for internal performance metrics.

2.2 Literature review

As part of our review into EVM, we performed a literature review of several other Major Programmes that have employed EVM for performance monitoring:

- London 2012 Olympics
- Crossrail
- Thames Tideway Tunnel

London 2012 Olympics

As part of its learning Legacy, the Olympic Delivery Authority (ODA) has shared its tools and best practice to assist other Major Programmes. See link below:

https://webarchive.nationalarchives.gov.uk/ukgwa/20130403022318mp_/http://learninglegacy.independent.gov.uk/documents/pdfs/programme-organisation-and-project-management/23-cost-performance-report-ppm.pdf

The ODA made use of a Cost Performance Report (CPR) that was based on ANSI/EIA 748 Cost Performance Report 1 and was tailored to provide a concise monthly overview of cost and schedule performance at programme and project level.

The CPR held 100% of the programme scope using the established Work Breakdown Structure. This enabled the programme data to be drilled down to different levels to support further requirements such as programme scope at project level.

The CPR featured monthly and cumulative updates of baseline plan (Current Baseline Budget), earned value, actual cost, schedule variance, schedule performance index (SPI), cost variance, cost performance index (CPI), and budget at completion.

The CPR was also used as the common source for all percent complete calculations on the programme and features a block at the base which gave the planned and actual percent complete to Games time and in total or for the total programme and the various sub-groups. Programme controls used this report to identify high-level variances, prepare accompanying analyses and identify mitigating actions with input from project teams. The CPR formed an integral part of the monthly Delivery Partner Progress Report.

Potential benefit to future projects outlined in this document are that the CPR presents complex programme performance data in a simple, transparent format to highlight key variances and facilitate high-level analysis and discussion.

Crossrail

Crossrail also holds a Learning Legacy, and has shared its tools and best practice to assist other Major Programmes. See link below:

https://learninglegacy.crossrail.co.uk/documents/crossrail-approach-earned-value/

The aim of the Crossrail performance measurement regime was to provide a comprehensive, consistent, timely and reliable view of the programme's performance that predicted performance, and triggered management action to positively influence the outcome. Earned Value (EV) was one indicator of performance and was used in the context of other meaningful indicators of performance. The performance measurement regime was designed & developed to draw on the granular performance data provided at control account level. A data warehouse was implemented to capture all performance data to act as the 'single source of truth' and electronic dashboards were used as a business intelligence tool. These tools enhanced the quality of data and encouraged proactive behavioural change.

Key learning points include the importance of defining the management information requirements as soon as possible in order that programme controls can be configured and implemented appropriately and efficiently. The importance of a 'single-source-of-truth' for performance data and the use of a 'data warehouse' enables informed decision making, rather than expending effort on assuring or testing the integrity of data or undertaking ad hoc and time consuming supplementary data analysis.

Key Lessons learned:

The need to prescribe earning methodologies – The contractors were responsible for determining the earning methodology for the contract. However, this could lead to inconsistencies in the methodology for common elements used for progress assessment against the work breakdown structure, especially those areas outside of scope that held physical measured quantities. The Programme Controls team had to provide additional guidance and prescribe earning methodologies to improve the consistency and integrity of the dataset.

SME Note - This lack of prescribed "earning rules" is a lesson learnt that can be absorbed by all major programmes including National Highways to ensure all contractors and projects are reporting progress and EV metrics in a consistent manner.

Unresolved change - Cost performance and schedule performance indices were adversely affected by the impact of unresolved change. For example, where project manager's instructions were issued for works to proceed without the cost and schedule impacts being agreed, the contractor would incur cost in progressing the newly instructed works, without the ability to earn the value against budgets. To mitigate this, 'what-if' scenario modelling were established across key contracts to ascertain the true cost and schedule performance indices by estimating the impact of unresolved change.

SME Note – As the budget is a key factor in the EV calculations this lesson learnt is also considered crucial. Agreeing the value of high value compensation events has been an issue for almost all major programmes and in the interim the Earned Value data can be compromised. The use of revised EV metrics to account for the likely value of the final Compensation Event values can help provide a more realistic EV and progress assessment.

Thames Tideway Tunnel

As Tideway is still an ongoing Major Programme, its learning legacy is still to be published but many of the lessons learnt at other Major Programmes such as Crossrail and London 2012 were incorporated into the PMO methodology.

As a £4 billion programme with multiple stakeholders and Main Work Contractors, the use of a strong and consistent WBS was considered crucial from the outset. The "earning rules" were established as part of the initial setup of the programme and were included in the contract documentation provided to the those tendering for works from the outset to ensure the projects were set up correctly from the outset. This ensured all Earned Value Metrics from each project team could be measured and assured on a consistent basis.

The PMO also established a Cost Management System as soon as possible to ensure all the costs and Earned Value would be available to support the project and its stakeholders using both the "regulatory baseline" as well as the Project Management Baseline that was updated to align to the contract and subsequent compensation events.

Earned Value metrics were reported on a monthly basis to the client leadership team and context provided on what was driving any changes to the CPI and SPI values provided. This was in turn supported by a project level Cost Performance Report (CPR) that identified the Current Baseline Budget, Forecast Cost, Current Actual Cost, and Earned Value metrics such as EV, schedule variance, schedule performance index (SPI), cost variance, cost performance index (CPI).

The CPR was provided as an appendix to support the main report which held high level key variance drivers. The CPR and other appendices were intended to support the data should a further deep dive be required by leadership or assurance teams on the data.

2.3 Interviews with ORR and NH staff

As part of our work, we undertook some direct interviews with ORR and NH. These interviews were semi structured and related to the following key components of the work we are undertaking:

- Review and validation of some of the key concepts and themes from the workshop
- Further discussion around specific items related to relationship of SPI and CPI with other measures.
- A discussion and review around the robustness of data used to report the CPI and SPI values.

The semi-structured nature of the interviews involved follow a core set of questions, but allowing for discussions to be focused on areas that were of most importance to NH and ORR.

We used this data to inform our conclusions for each of the scope elements.

2.4 Analytical review of data / files

The focus of the review of analytical files was threefold, as follows:

- To review existing documentation and allow us to form a view about whether the approach to reporting EV was appropriate from a methodology standpoint.
- To review offline calculations to assess whether the data for EV was being calculated correctly.
- To use data analysis to assess whether a relationship is present between EV and other scheme level and financial and delivery metrics.

We received various files from both ORR and NH and reviewed and analysed these to assess the above components of the study.

3. Findings

This section sets out the findings from our analysis for each element of the overall scope.

3.1 Effectiveness of EV in metrics as a performance indicator in RP2

The aim of this section was to assess the effectiveness of EV metrics as a performance indicator in RP2. From our pre-engagement survey questions we set out the following.

3.1.1 Stakeholder views

Figure 2: Pre-engagement survey Q4.1: "I find EV metrics useful in forecasting project performance"

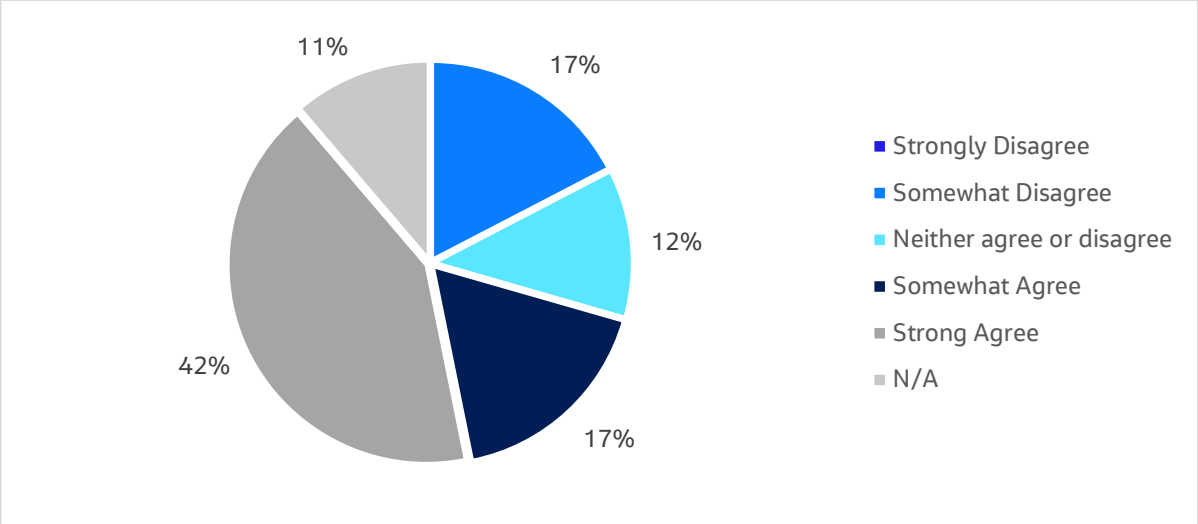
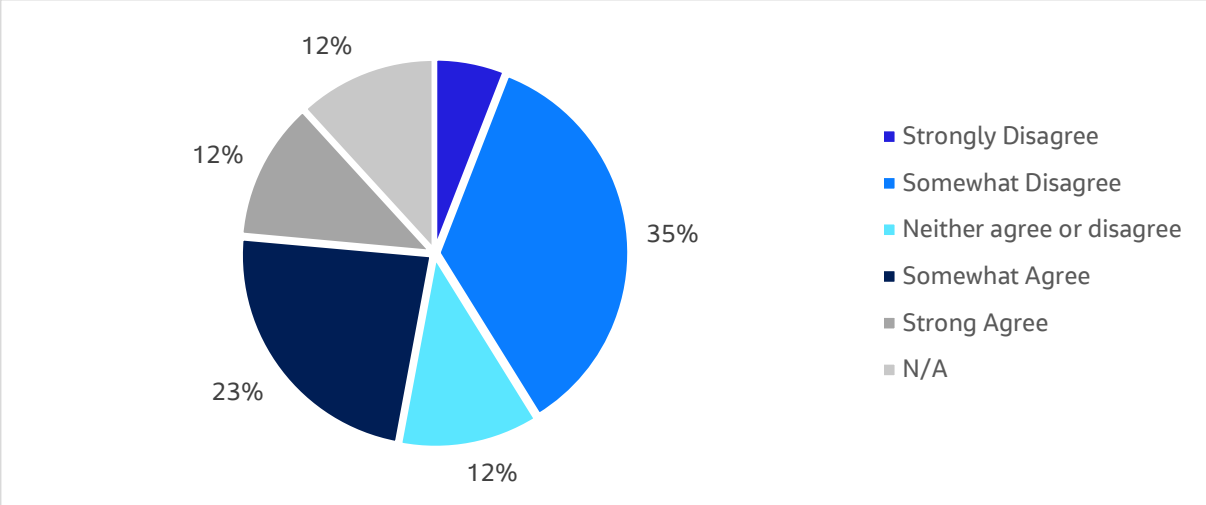


Figure 3: Pre-engagement survey Q4.3: "I feel EV are well understood across my organisation"



Comments that were made in the pre-engagement questionnaire are set out below.

- The metrics are not well understood or easy to report on in part due to the need to explain the differences in performance suggested by EVM and other measures.

- I use EVM as a "first trawl" of how a project is performing and use them to raise questions relating to a projects progress.
- It is difficult to understand to what extent we can rely on EVM to understand future project performance.
- It can be difficult to understand what the EV metrics are telling us as we know they are not based on delivery plan commitments but instead another unknown set of contract commitments.
- I think basis of EV is understood, but it is used more for reporting, than an early indicator or intervention tool.
- I find EV metrics, and the use of EV EAC very useful for assessing possible project forecast.

Figure 4: Pre-engagement survey Q6 How does your organisation use the EV metrics for decision making?

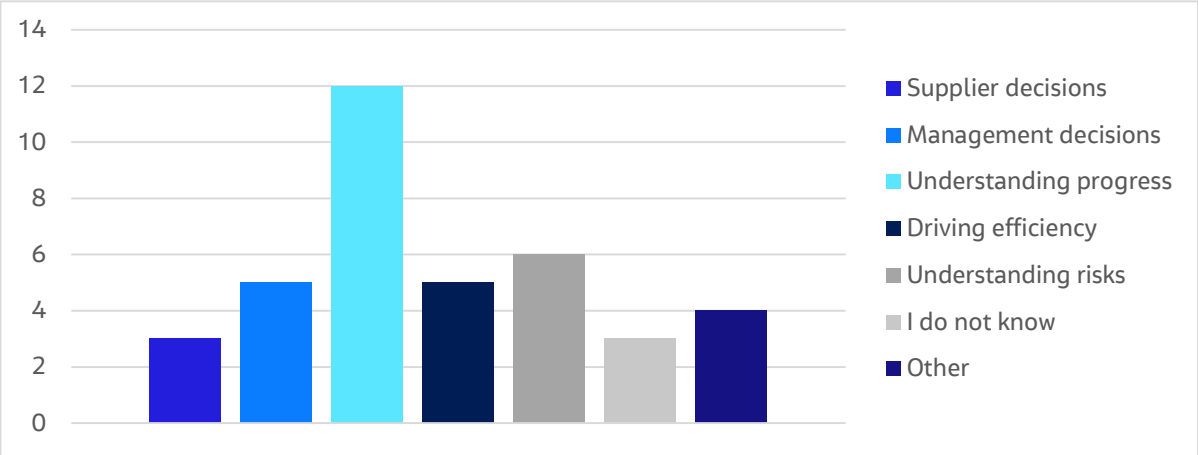


Figure 5: Pre-engagement survey Q7 What, if any, issues do you currently find with the EV measurements?

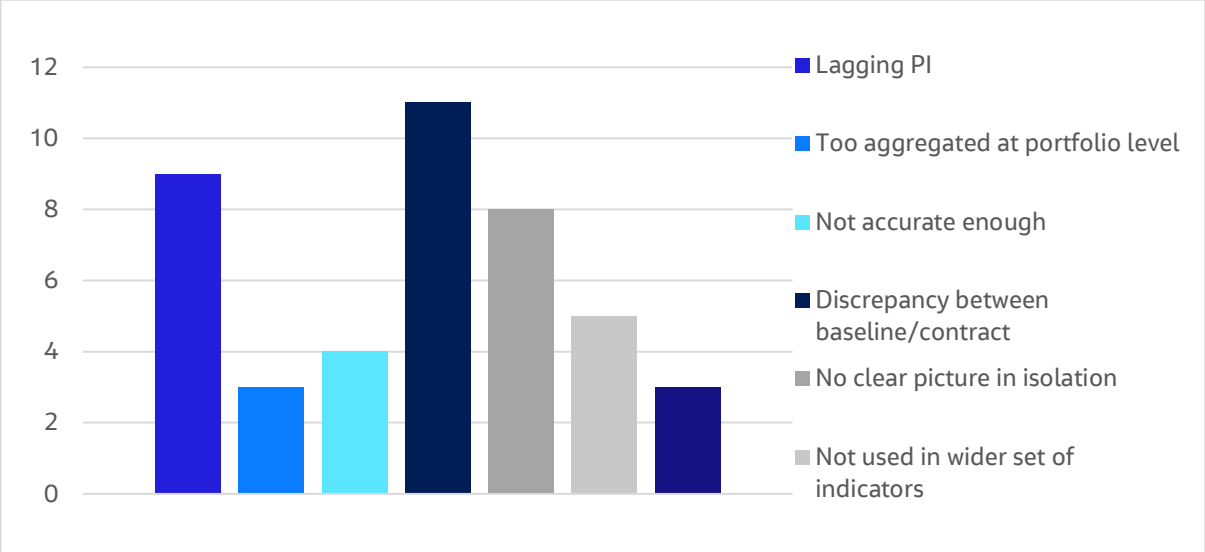


Table 1: Summary of key findings from stakeholder workshop 1 – current usefulness of EVM

Question	NH feedback	ORR feedback	Supply chain feedback
How can the metrics be made more useful for specific purposes?	• Need to be more forward looking. • Should be introduced at project-level monthly reviews.	• More frequent reporting to ORR as early warning of quarterly reported performance. • Clarity over when the baseline has been changed and why. • Relate to NH performance against commitment.	• Need visibility of data used to calculated EVM. • Need to update baselines following approved contractual change. • Metric could be weighted depending on size/complexity of project.
What can be done to improve understanding of EV metrics?	• Need for more training/education on quality control, the data used, and the importance of the metrics at both NH and supply-chain level.	• High level explanation within Performance Monitoring Statements of CPI/SPI definition • Consistent training and agreement on what they do/don't do. • Keep up to date. • Communication between different parts of the business and different organisations that generate/use the metrics (particularly related to RIS/Delivery plan documents)	• As long as training is given to the right individuals, it's a good thing.
How have EV metrics been used to influence decision making?	• Used at project level as early warning indicator and where a project is headed if immediate intervention plans are not developed. • Identified issues can be escalated to programme level. • Currently reported at year-end – however this is not the correct approach.	• Used as part of picture of NH performance but seen as secondary to external costs and schedule commitments.	• Used in resource management when a project is slipping.

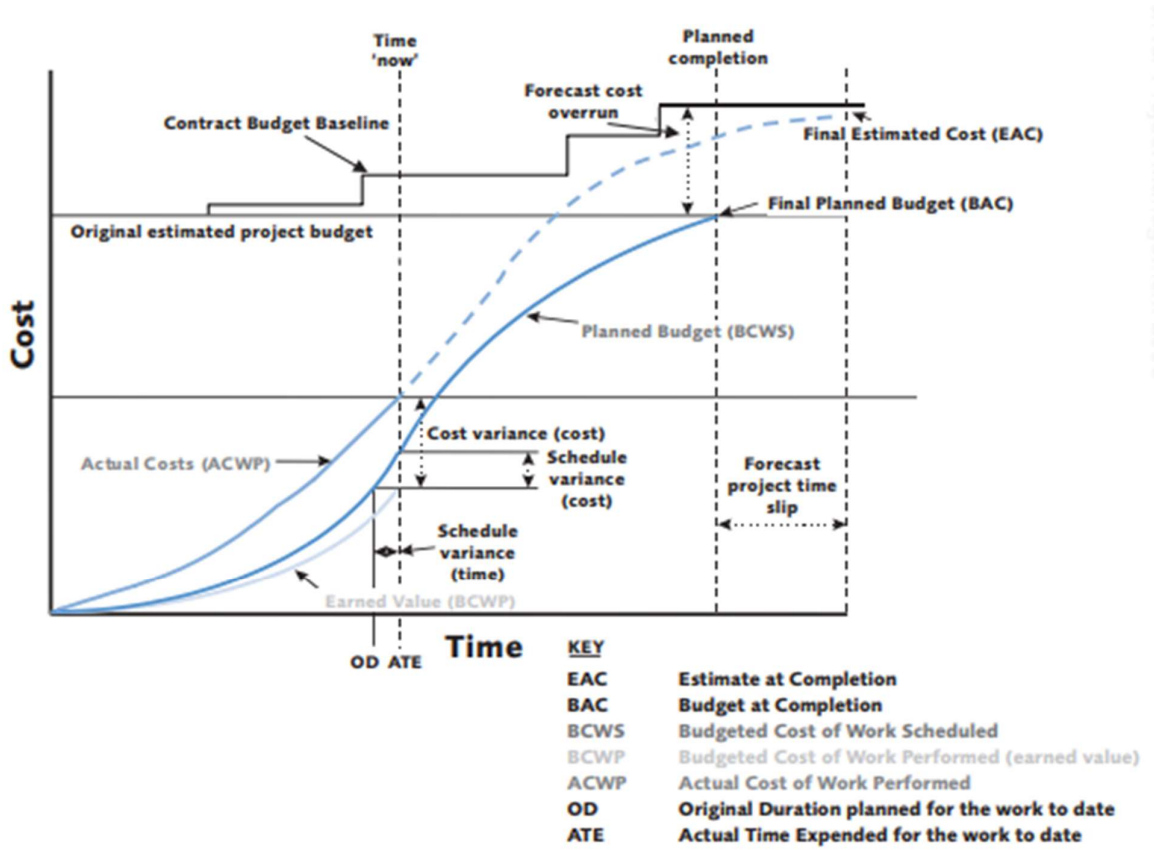
3.1.2 SME view

National Highways are required to meet an efficiency outcome for evidencing delivery of £2.1bn efficiency savings (revised from £2.3bn) within RIS2, "Outcome 6: Achieving efficient delivery". The outcome area also requires NH to report performance against two earned-value performance indicators for schemes in construction; cost performance index (**CPI**) and schedule performance index (**SPI**).

An efficiency saving target of £2.1bn would require NH to save an average of circa £420 million each year across the 5-year review period[2]. To have confidence that this level of efficiency savings within RP2 is on target would require NH to accurately monitor the forecasted cost against the established Capital Budget.

To effectively monitor this efficiency target would require NH to establish a mutually understood 'baseline'. This baseline data would require the RIS2 agreed NH commitments such as the scope, cost, and schedule to be aligned against a common Work Breakdown Structure (WBS). This would then allow NH to monitor the current forecast (also known as the EAC or Estimate at Completion) against the budget. This would ensure that NH can have confidence of their cost performance against the Capital Budget.

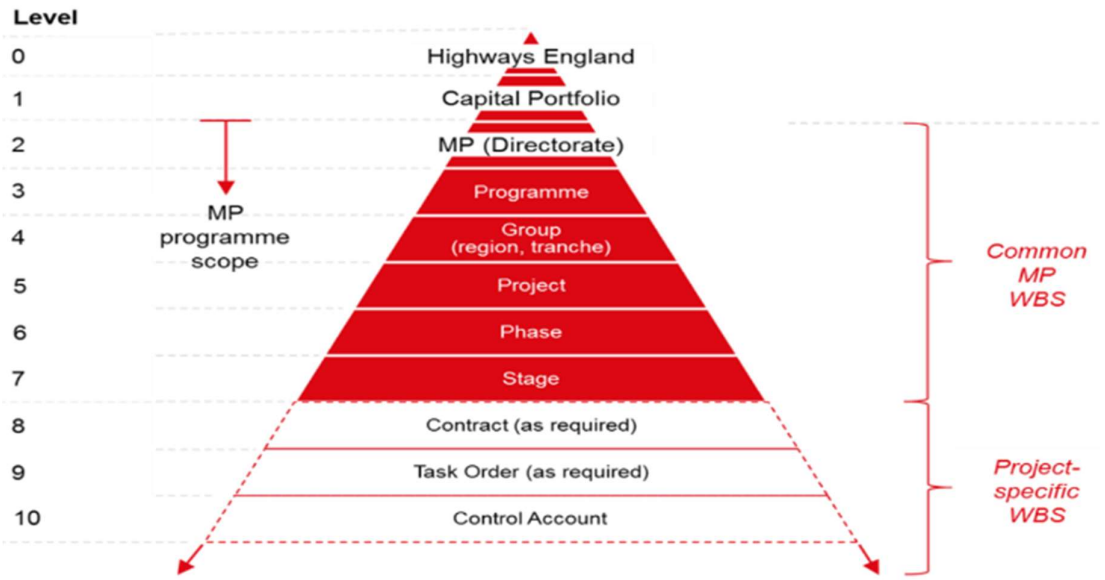
Figure 6: Earned Value Graph as explained within APM Guide on EV



The written documentation provided by NH and verified by SME interviews confirms that NH holds a robust Work Breakdown Structure (WBS) that allows the PMO team the ability to monitor NH project performance against the NH recognised baseline.

[2] NH advised that it has an annual milestone for efficiency of target delivery which it has achieved each year

Figure 7: NH Major Project WBS/CBS



Source: NH

However, we noted that the baseline being managed by NH is an "internal" NH recognised baseline which is not aligned to the capital baseline that is understood by ORR/DfT.

As part of the EV workshops with NH/ORR stakeholders, we quickly identified that there appears to be several issues impacting the stakeholders in assessing performance of a portfolio of projects. Key drivers are as follows:

- Baseline
- Effectiveness of reported EV data.

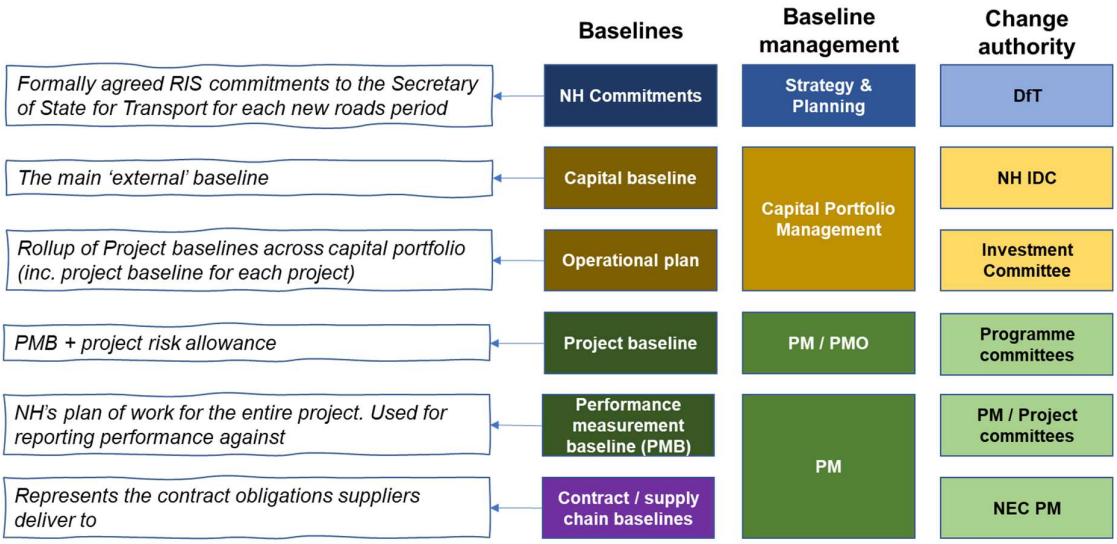
The two issues are explored in further detail below.

3.1.2.1 Baseline

As part of this review, the issue of multiple baselines and reporting misalignment has been a common issue for both NH and ORR. The use of multiple baselines has been cited as a source of confusion, with misalignment of baseline data hampering the collective understanding of performance using Earned Value metrics.

To understand this issue in full, we refer to the National Highways Baseline Management Manual (June 2023 Version 3) which outlines the NH Baseline Hierarchy.

Figure 8: NH Baseline Hierarchy



As per figure 8, there are multiple baselines being used in National Highways that relate to the different spans of control. The two baselines that are of interest to performance reporting for the purposes of this review are the Capital Baseline and the Performance Measurement Baseline (PMB). These two baselines are described within the Baseline Management Manual as follows:

- **Capital baseline:** The Capital Portfolio Management team will maintain the Capital Baseline as the main 'external' baseline. This will normally only be adjusted for Ministerial/DfT approved changes. The Capital Baseline will be updated to reflect these changes once endorsed by NH IDC through the Portfolio Change Control process and/or Delivery Plan updates (the Delivery plan provides the detail of specific funding, activities, and projects we will deliver).

- **Performance Measurement Baseline (PMB):** represents the plan of work for National Highways for the entirety of the project and includes multiple contract/supply chain baselines, as well as National Highways activities into an integrated baseline – i.e. integrating scope, schedule, cost and risk. The PMB forms the project target and measurement for performance. Any project risk allowance held within NH is separate and outside of the PMB but still within the overall project baseline.

  Project Managers will manage delivery performance against the approved Project Baseline through the PMB. The Project Manager can approve changes within the PMB if there is no impact on the overall integrity of the Project Baseline.

The purpose of this baseline data is explored in further detail within the same Baseline Management Manual with explanations provided for the "*what is it*"; "*why have it*"; "*used for*"; and "*inputs*" as shown in figure 9 below.

Figure 9: NH Baseline data

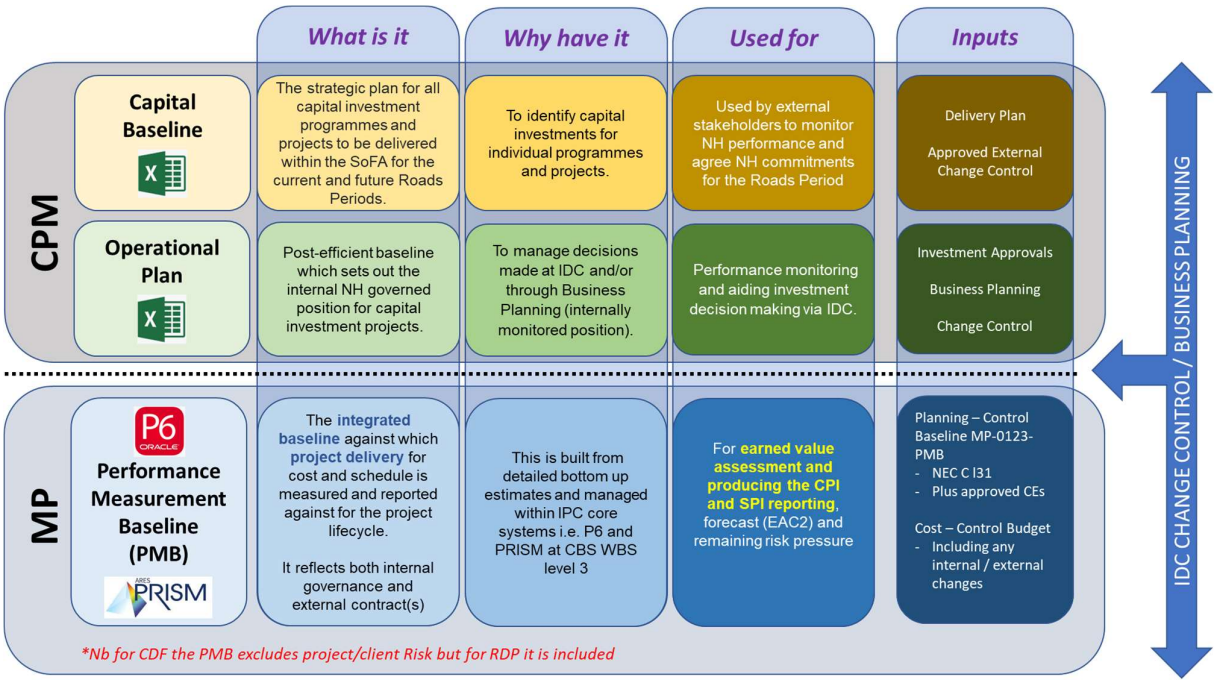


Figure 9 shows that in broad terms, NH and ORR have different priorities and requirements for the baseline data.

NH hold an internal Performance Measurement Baseline (PMB) that is informed by the supply chain "Contract Award Value" and the "Supply Chain Baseline". This baseline data is held and managed within 'Ares' which is an industry standard Cost Management System (this system is also used on other similar scale Major Programmes such as Crossrail).

The Cost Management System allows NH to monitor cost and schedule performance at an individual contract level with automated outputs of earned value data such as CPI and SPI provided. This performance data is directly aligned to the NH contractual scope, budget, and schedule data and **the PMB is considered useful to NH at project and programme level**. However, for the purposes of ORR**, the PMB baseline has very limited effectiveness in reporting performance directly against the RIS2 capital baseline**. At best, the CPI and SPI provided by NH using this data would only be 'indicative' of general performance rather than be directly aligned to the Capital Budget that is recognised by ORR/DfT. Given that the ORR/DfT recognised budgeted commitments and associated efficiency targets are valued in the £Billions for the 5-year review period, then this lack of ability to report an aligned EV metric would not be considered appropriate.

For ORR, the recognised performance measure is the RIS2 Capital Baseline. Unlike the PMB, the capital baseline data is not managed or maintained in the NH Cost Management system (Ares Prism). The Capital Baseline data is held in a separate system (Copperleaf) which is managed by another part of the NH organisation (Capital Portfolio Management team). As a result, EV metrics are not available directly from Ares Prism for the RIS2 Capital Baseline. Having the two versions of baseline data within two different cost systems means producing an aligned set of Earned Value metrics to support both the PMB and the Capital Baseline. The solution to this to support RIS3 is currently being investigated by NH.

This limits the capability of the NHMP PMO team to only being able to report NH performance against the PMB which is a different baseline to that recognised by ORR. This does limit the usefulness of the reported EV metrics for direct comparison to the RIS2 Capital Budget for assessing target performance against the ORR/DfT recognised financial and schedule commitments.

However, we would also state these issues should not be considered impossible to address prior to RIS3 if action is taken urgently (see section 3.2.2 for SME recommendations on improvement measures).

We note that the PMB is considered effective by NH as an early indicator of project difficulties and therefore to provide a prompt for intervention or closer monitoring. However, it is not used by NH to monitor project or scheme performance.

3.1.2.2 Effectiveness of the current reporting metrics and data

As stated earlier (in section 3.1.2.1), the reported CPI and SPI is currently aligned to NH PMB data rather than the Capital Baseline. The effectiveness of the performance assessment is currently considered low or compromised for ORR since the two organisations hold differing baselines. For NH as an operational tool it is considered effective, but is not used to measure project performance.

If this misalignment was addressed prior to RIS3, then it would be our SME view that EV metrics could be effective in reviewing performance, but we would strongly suggest that those EV metrics would need to be viewed alongside other complementary reporting data to provide wider performance context and a holistic view of the project and programme health.

EV metrics such as CPI and SPI when used in isolation would not be considered sufficient data to provide enough context to confidently assess effective performance for NH or ORR.

There is also concern as to the robustness of the processes employed to generate the EV metrics for PMB as a lack of written process exists on how the percentage complete is determined.

It is our SME opinion that EV can be a good early indicator of issues such as poor cost or schedule performance if used correctly. However, EV metrics such as CPI and SPI in isolation would still not provide enough context to assess effective performance. Inclusion of other supporting data would allow the "reporting audience" (which could be ORR, NH, or other stakeholders) to understand the context of EV metrics better. The provision of additional contextual data is therefore encouraged to support the overall EV metric being presented. This is discussed in more detail in section 3.2/

3.1.3 Summary findings

In conclusion we believe that EV has not been successful as a measure of scheme performance. This opinion is based on the following points:

- EV is a **good performance indicator if it is done correctly** and significantly easier than alternative approaches.
- For NH it **is effective for internal management reporting against PMB baselines** as an early indicator of potential performance issues or issues requiring intervention.
- For ORR it is **not currently effective as a performance indicator** because:
    - There is no effective reconciliation against the capital baseline (not reported against the capital baseline). This means it is impossible to know if any changes are being driven in an efficient manner, or actually being driven by inefficiency.
    - Lack of traceability between the delivery plan commitments and contractual positions
    - Insufficient contextual information provided to reconcile and interpret the current EV metrics, which may also relate to frequency of update.

3.2 Improvements in earned value metrics

In this section we have considered what improvements might be made to earned value metrics. We have reviewed stakeholder feedback, provided our SME view and set out our overall summary findings. We have considered whether the scope for leading indicators that might better provide a view to ORR about expected outturn performance. We have reviewed NH current plans for developed earned value or similar indicators for RP2 and RP3 and provide a view around these.

3.2.1 Stakeholder views

The pertinent questions from the pre-engagement survey related to these scope item were:

- Complementary or substitute measures related to EV.
- Behaviours that stakeholders would like to see incentivised.
- Supplementary measurements to be of use to the stakeholder organisations.

Figure 10: Pre-engagement survey Q8: What behaviours would you like to see incentivised by PIs?

Pre-engagement survey Q9: What supplementary measurements would be of use to your organisation?

- KPIs of whether all of the PIC data is up to date sound to take forward.
- EVM of the client organisations' commitments
- Projected CPI and SPI.
- Percent Plan Complete
- Assurances of data
- ASD

- Anything that helps ORR understand how well NH is performing against its obligations in the RIS/Delivery plan, be that at a point in time or an indicator of the direction of travel of performance or to provide early warning of slippage in performance or delivery.
- Absolute variances, e.g. the cost and schedule variances alongside the planned values etc. Something which tells the story of project performance, where it is and importantly where it is projected to go.
- The use of TCPI along with CPI and SPI to give a leading indicator as well as a lagging one.

Table 2: Summary of key findings from stakeholder workshop 1 – proposed improvements

Question	NH feedback	ORR feedback	Supply chain feedback
Is the current EVM coverage appropriate for projects?	• Targets should be based on scheme size. • Not forward looking enough. • Mainly used for construction – schemes in development have started using it. • Useful at **project** level as a management tool, not the right metric for **programme** level.	• Interest in understanding how scores could be extended to more schemes (e.g., schemes in development and large renewal schemes), but only if data quality is there.	• Application of EVM varies across NH programmes – agreement of change is an issue that skeps EVM.
What leading indicators would you propose?	• ETTC, TCPI, EV, EAC – need to be more forward looking. • Need to reflect NH commitment, not just contractual supplier level.	• Indicators that can replace or supplement efficiency evidence used in reporting against the efficiency KPI. • Indicators that reflect changes to external commitments. • Something that removes disconnect between NH and contractual commitments.	• Agree that ETC/EAC is a good alternative. • Projected CPI/SPI.
What other metrics would you like to see?	• Plan percentage complete, • Baseline management metric applied, • Data quality indicators, • More outputs from EV analysis beyond just metrics.	• Simpler metrics with a clear, easy-to-interpret message. • Need to understand what info/data is available and that gives a better idea of what is possible.	• Use of PPCs.
What behaviours would you like to see incentivised?	• Using EVM to drive project improvements. • Shared learning outcomes and knowledge. • Projects/suppliers' higher data quality and adherence to baseline management principles. • Transparency. • Overall programme performance (instead of just one contract). • Baseline maintenance to ensure robust baseline to measure EV on – more proactive than reactive.	• Transparency. • Open conversations. • Efficiency. • Control of cost during development phase or on renewals projects.	• Need to be measured against the correct baseline – suppliers are often not allowed to change so the EVM is skewed. • Proactive change management in CEMAR.

The specific Mural session is presented in Appendix B and C. From the findings above we identified the following main themes that were present.

- **Forward-looking:** Need to incorporate more forward-looking metrics (e.g., ETTC, TCPI, EV, EAC). **(Advocates: NH workshop attendees, Supply Chain)**
- **Reporting:** Should be reported more often to ORR. **(Advocates: NH workshop attendees, ORR)**
- **Training:** Need for more training around the purpose of EVMs, how they're calculated, the data used, what they do/don't do, and who owns the metrics/how they should be updated. **(Advocates: NH workshop attendees, Supply Chain, ORR)**
- **Data quality:**
    - Develop data quality as a CPF metric and develop a data quality dashboard. **(Advocates: NH workshop attendees*)**
    - Drive EV metric up agenda of key project reporting requirement. **(Advocates: NH workshop attendees*)**
- **Alternative metrics:** ETTC, TCPI, EV, EAC, PPC, Baseline Management Metric. **(Advocates: NH workshop attendees*)**
- **Extended to more schemes:** Currently used in construction schemes, should be extended to renewal schemes/schemes in development. **(Advocates: NH workshop attendees, DfT, ORR)**
- **Baselining:**
    - Need for greater clarity around which baseline (NH vs contractual) has been applied and the difference between the two. **(Advocates: NH workshop attendees*)**
    - Contractual baselines need to be regularly revised and more adaptable to individual contracts – need to be more proactive than reactive. **(Advocates: NH workshop attendees, Supply Chain)**
    - Need to remove disconnect between NH and contractual commitments. **(Advocates: NH workshop attendees *)**
- **Behaviours incentivised:**
    - **Transparency:** Need greater transparency around the data used and the calculations of the EVMs and encouragement of more open conversations and learning outcomes. **(Advocates: NH workshop attendees, Supply Chain, ORR)**

Note: An * reflects the 'thumbs up' function on mural (i.e. a comment that received a positive response from others at the workshop). This could have been by any of the stakeholders, ORR, NH or the supplier.

3.2.2 Review National Highways' current plans for developing earned value (or similar) performance indicators in the remainder of RP2 and into RP3

NH Baseline EV investigation for RIS3

We understand from our SME interviews and discussions that the NH PMO are proactively investigating options to produce Capital Baseline aligned EV metrics for RP3. This would fulfil the requirement outlined later by our SME to support multiple Baselines. The current options being explored by NH include a hybrid calculation method where the PMO take existing cost management data into an Excel workbook and map it against Capital Baseline data to calculate revised EV metrics for Capital Budget alignment. Another alternative is to generate the Capital Baseline EV data using Power BI or similar data analytics software.

The SME view would be that these options are possible, but we do have some concerns about this being managed outside of the main cost management system. The key concern is that the complexity of data requiring alignment may prove to be too difficult to maintain which would become increasingly complex as the programme continues to implement ongoing changes to scope, contract let values, cost estimates and schedule movement over the 5-year road period (in some instances this may overlap between road periods). For a Major Programme such as NH/ORR to be reliant on PMO individuals within the team to maintain the data would leave the programme at risk in our view. It

would also be worth considering if the people being utilised for the EV alignment exercise could be more effective in spending their time on the contextual analysis of the data, both quantitative and qualitative.

We believe that the best method would be to implement system generated EV data which would also hold an assured audit trail should NH, ORR or others would require a deep dive into the information at any stage. However, all options should be explored before a final solution that is suitable for NH is established.

Predictability Measure

Another measure being actively investigated by the NH PMO is the implementation of a revised forecast predictability measure. The current measure used is the CPI x the SPI score.

- Current Predictability metric is based on average ratio for the quarter.
    - i.e. (Month 1 CPI*SPI) + (Month 2 CPI*SPI) + (Month 3 CPI*SPI) / 3

Metric	Scoring Guidance	Score	
	No Baseline in accordance with the planning handbook or no information returned.	0	
	Baseline in place and variance >15% of 1 either above or below.	2	
Performance Expectations: Assessment of predictability	Baseline in place and variance ≤15% of 1 either above or below.	4	0
	Baseline in place and variance ≤5% of 1 either above or below.	6	
	Baseline in place and variance ≤2% of 1 either above or below.	8	
	Predictability Factor is 1.	10	

The NH PMO team are looking to replace this score with something that is more holistic and more accurately reflects supply chain compliance with NH standards and delivery of submissions in line with the month end reporting "drumbeat". The expectation is for scoring to reflect performance across the whole of the IPC rather than just a reflection of the CPI SPI to ensure that it is more inclusive of the wider supply chain requirements such as Risk, Change and Baseline Management. This investigation is welcome, and we would encourage the NH PMO to continue with this review with a view for implementation prior to RIS3. Once the investigation is complete this analysis may be suitable to provide wider contextual data for EV metrics.

3.2.3 SME view

Based on our experience and on feedback obtained from our stakeholder consultations we obtained from the feedback from stakeholders the following are key elements that need to be addressed to ensure EV provides effective data and act as an appropriate performance metric:

- Effective Baselining.
- Improved contextual data, including both quantitative and qualitative data, including incorporating forward looking metrics.

Both main points are supported by the lessons learnt on similar Major Programmes as outlined by our earlier literature review of Crossrail, London 2012, and Thames Tideway Tunnel). Other components are in our view less critical to ensuring earned value remains effective to allow performance monitoring, such as training and data quality is discussed in other sections of this report. Each component is discussed separately below.

3.2.3.1 Baselining

We believe the baseline alignment issues that have been identified by all ORR/NH stakeholders for RIS2 need to be addressed for RIS3. For this baseline realignment to be effective it is recommended that some revisions need to be made before the start of RIS3 to avoid similar issues faced in RIS2.

Requirement for Multiple Baselines

We believe that at least two baselines are needed to ensure that the EV metric remains appropriate for both NH and ORR. These would be the capital baseline and the PMB. More baselines could be introduced if required for reporting / management by stakeholders.

We recommend that the NH Cost Management System is upgraded to manage more than one baseline. NH currently maintain different systems for the Capital Baseline and the PMB data. This data separation is a result of the systems and information being aligned to the NH internal organisational structure. However, as a result, the NH PMO cannot currently produce EV reporting that recognises the EV Metric reporting requirements that are required to evidence delivery of £2.1bn efficiency savings within RIS2, "Outcome 6: Achieving efficient delivery".

The requirement for accurate EV Metric reporting means that NH will need to investigate solutions to address this issue. The easiest solution in our opinion would be for Ares Prism to duplicate the Capital Budget Baseline data to support RIS3 Earned Value Metric reporting. Consideration may need to be given for schemes that overlap road periods.

The use of multiple cost baselines is already supported by the existing version of Ares Prism held by NH. As an example of this type of baseline process, we refer to Thames Tideway Tunnel where the use of multiple baselines for reporting purposes was successfully deployed (using Hexagon Ecosys) to ensure CPI, SPI as well as cost and schedule variance analysis against multiple baselines to support multiple stakeholders from the outset.

From an ORR/NH commitments and development point of view, it is understood that the RIS3 commitments (Scope, Cost, and Schedule) may still be maturing when the Capital Baseline is originally established. To address this, it is recommended that the RIS3 agreed commitments would need a consistent Work Breakdown structure (WBS) to be applied right from the outset to ensure that the scope, cost, and schedule data are available. From this point, change control can be made once the NH leadership team have a finalised version of the baseline to create the first version of the Internal PMB and the NH data begins to deviate from the Capital Budget. This data can then be incorporated into an appropriate RIS3 change and baseline processes to ensure the relationship between the internal PMB and the Capital Baseline can be maintained and the reporting of CPI and SPI against both the PMB and the Capital Baseline is automated within the cost reporting system.

As SME, we believe that the maintenance of both PMB and Capital Baseline data are equally important as both serve different purposes, one for NH to manage live projects, the other for ORR to understand how projects move from the agreed baseline and to provide context and narrative on the EV metrics. We do not believe either the Capital Baseline or the PMB should be abandoned for short term convenience due to the significant values of capital being managed. The current NH processes do not establish a relationship between the Capital Baseline and the PMB and this is something that does need addressing.

Improved contextual data, including both quantitative and qualitative data, including forward looking metrics

A key message that came from our discussion with stakeholders, and one that we agree with is that further context should be provided for the EV numbers being reported. For a Major Programme of this complexity and financial budget, the reporting of only EV metrics is considered too simplistic to reflect project and portfolio performance fully. It is recommended that additional context and "forward looking" metrics are included in overall reporting and monitoring of RIS3. These metrics can be broken into core and supplementary data for improved transparency on NH performance efficiency. We would note that this additional data [both metrics and supplementary] should not be confused with additional externally reported metrics. We recommend that a revised reporting process is incorporated providing this additional data at individual scheme level that should incorporate some or all of the following:

Core Reporting (not PI metrics)

- **Budget & EAC at scheme and project level** – This would allow the reader to drill down on high value contracts to allow increased focus on high priority contracts and scope. Understanding the EAC (Estimate to Complete value) relative to the budget would also be considered very strong contextual information and would ensure the Project PM team are holding themselves accountable to this dataset.

- **% Complete** – This would allow the reader to understand the context of the EV metrics. Often, we can find that performance metrics are misleading at the start of a project and hold a better representation of the true performance once the project has settled into its rhythm.

    - E.g., Poor EV metrics at the start of a project can sometimes be disregarded (with context provided) due to the project still getting established and yet to settle into a rhythm. However, at later stages, if we can see that a project is reporting a poor cost performance metric at +50% progress complete then this may suggest that Budget will be exceeded if remedial measures are not taken ASAP.
- **Cost & Schedule Variance Narrative** – Variance of Cost and Schedule against a mutually understood baseline (Capital Baseline). By proving wider context to understand project status, we can better understand any need for early intervention or remedial measures. This data will help leadership in understanding the Cost and Schedule performance against key variance drivers. We would recommend key variance drivers broken into following categories–- Scope Change, Schedule Change (+/-), Cost Change (+/-). Compared to capital baseline.
- **EV derived Final Forecast Estimate (based on TCPI or similar data)** – The NH Cost Management System has the facility to automatically generate a final estimated cost for each project using the EV data. In our opinion, this would provide a good challenge to the reported PM estimated forecast cost (which is also known as the Estimate to Complete or EAC). If the difference in value between the reported EAC and the EV derived EAC is significant then it could be useful to investigate the driver for this variance.
    - E.g., If the reported EAC is very low compared to the EV generated forecast cost then this may be because the Project PM team is aware of external issues that will reduce the final cost (such as the value of a Compensation Event that is close to agreement). If this is the case then the EV derived EAC calculations will not be accurate but if no such external factor is present then we might need to consider whether the PM team is being too optimistic about the final EAC cost. This could be a simple forward looking metric to minimise any "unexpected cost surprises" where project reported forecast can deviate at late stages of the programme.

Cost System generated supplementary data

Other metrics that should be considered for inclusion without any increased workload to NH would be the Cost Variance (CV) and Schedule Variance (SV). This is recommended for consideration as current NH systems already hold this capability.

- **Cost Variance** – This is simply the mathematical difference between the Earned Value (EV) and the Actual Cost (AC). This value allows us to see the context of the CPI performance score to understand the cost difference to the baseline.
- **Schedule Variance** – This is simply the mathematical difference between the Earned Value (EV) and the Planned Value (PV). This value allows us to see the context of the SPI performance score to understand the schedule difference to the baseline in financial context.

Qualitative data

As well as additional quantitative data being requested, we recommend that qualitative commentary is provided. This should describe how the performance of a scheme is progressing and set out what further risks to performance exist on the horizon. This should be short and succinct, but sufficient to give ORR confidence of overall scheme performance and a method to adequately interpret and understand the EV metrics being provided.

We are not recommending a suite of additional measures; however, we do recommend that the additional data is provided as supplementary information for each scheme to provide ORR sufficient confidence and supporting data

to understand scheme performance. Qualitative commentary should make reference to further data to provide a good overall context of scheme performance.

3.2.4 Summary findings

In summary we believe that:

- There needs to be at least two baselines. These should be the PMB and the capital baseline. The method for the baseline needs to be implemented in a way that will give ORR high confidence of the accuracy of data and maintain effective transparency between the different systems to ensure data is fully traceable back to the original capital baseline determination.
- The EV metrics should be supplemented with contextual information, both quantitative and qualitative, to provide a mini one-page summary report for each scheme that provides effective information on scheme performance in regard to reported EV.
- An Earned Value metric based on final forecast cost and final forecast schedule would provide a very useful forwarding looking indicative view of outturn cost and schedule to contract with the current CPI and SPI metrics. This would minimise any unexpected performance drops and allow ORR to more effectively support NH in ensuring effective delivery of the EV for individual projects.
- The NH proposals (see 3.2.2) would complement the above but are not fully developed yet to enable us to provide a firm view about how viable or valuable they would be. In conceptual terms we do believe these further measures would add value.

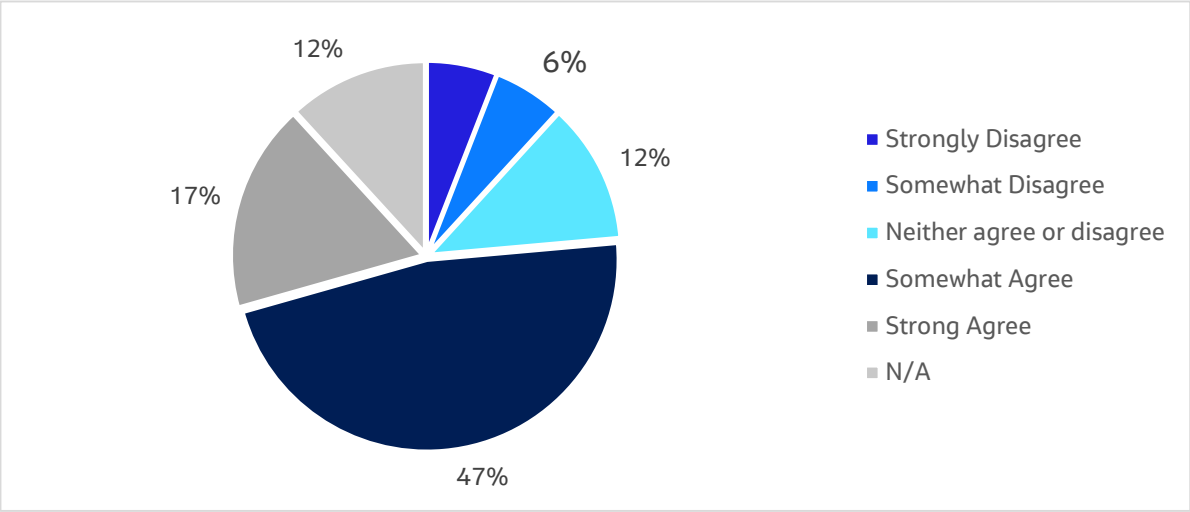
3.3 Review of data quality and process compliance for earned value measures, to assess if it is fit for purpose

The purpose of this part of our review was to determine whether the information being collated and reported is accurate. Inaccurate data might impact on making correct and timely decisions.

3.3.1 Stakeholder views

Our pre-engagement questionnaires relates to data quality and process compliance are shown below.

Figure 11: Pre-engagement survey Q4.2: "I have confidence in the accuracy of EV metrics"



The majority of people either strongly agree or somewhat agree that they have confidence in the accuracy of the EV metrics. In addition we identified that:

- The EV process is considered to be time consuming by the majority of correspondents, though the process is considered to be automated.

Figure 12: Pre-engagement survey Q4.5 "Reporting on the EC metrics is time consuming"

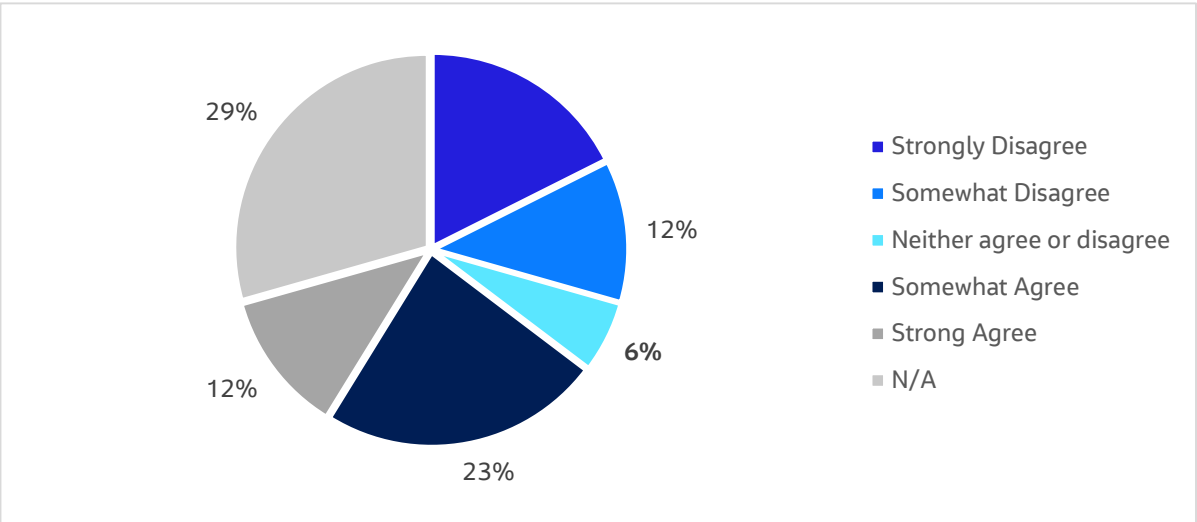
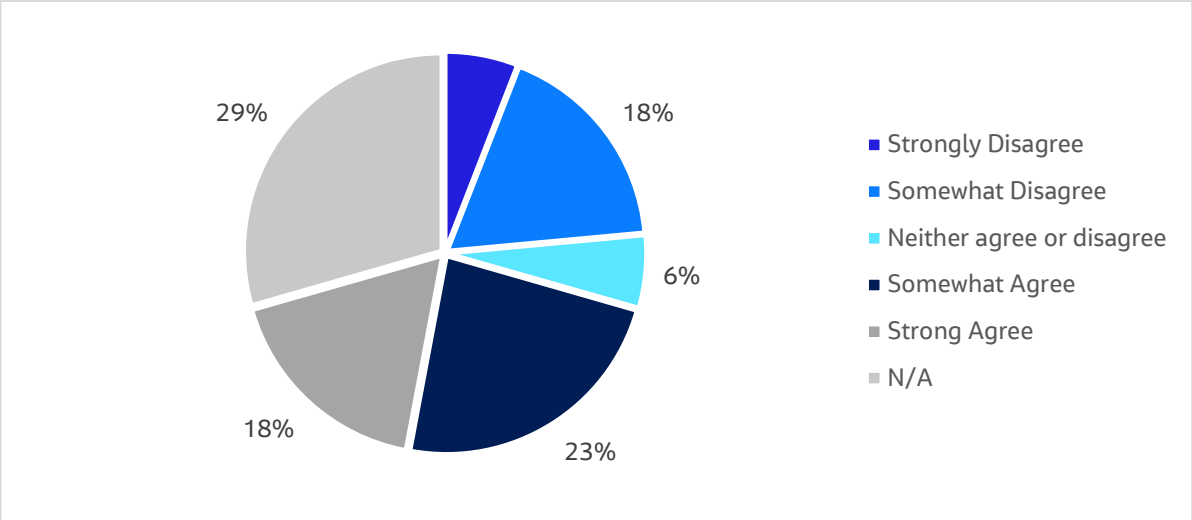


Figure 13: Pre-engagement survey Q4.6 "The process is automated"



We also received the following comments from the pre-engagement survey.

- EV metrics can present a different and sometimes contradictory picture of performance compared to external schedule and cost baselines which are used more readily in ORR audited performance monitoring statements. Therefore, I have reasonable confidence in their accuracy.
- The EV could include Schedule of Other Costs, that are not correctly forecasted which can skew the numbers. The calculation is only reliable if the system are aligned.
- In operational and business reports at project, regional, and program levels, EV EAC, CPI SPI stands as a standard metric. Baseline management has seen improvement over time, there remain challenges in maintaining baselines, which NH are actively addressing in collaboration with suppliers.
- Figures are assured, but explanation for the figures is varied. EV is used for different reason than originally intended when PI created.
- CPI and SPI are simple calculations utilising existing information that should be accurate as it's required for our business reporting needs.
- When a focus is put on data and system integration then EV metrics are reliable, but there needs to be a focus on quality to ensure accurate metrics. Accurate data only comes with data quality assurance.
- There is variation to the quality of EV dependent on a number of factors, such as accuracy of supplier information, accuracy and consistency of how the data is constructed and treated etc.
- Current NH data is generated by the supply chain, with little or no assurance. Supply chain may manipulate the data to suit their situation.
- EV metrics are very useful and if automated and data is accurate are very easy to use. The level of internal assurance is high.

The findings from the pre-engagement questionnaire were supplemented with findings from the workshop and related Mural sessions. Key messages from that session are set out below in table 3.

Table 3: Summary of key findings from stakeholder workshop 1 – data quality and assurance

Question	NH feedback	ORR feedback	Supply chain feedback
How might we improve the accuracy of the data reported?	• Drive EV metric up agenda of key project reporting – needs education piece internally and clear accountability. • Integrated P6 database – not all imported each month. • Develop data quality as a CPF metric; what gets measured, what gets improved? Develop data quality dashboard. • Data quality is split into 2. 1 is NH data management, 2 is supplier submission quality. Data management quality is possible if business buy into importance, supplier submission quality is more difficult to embed to common environment.	• NH need process to assure quality of data submitted by supply chain, risk of manipulation.	• Use correct data – PRISM sometimes contains out of date data. • Take into consideration mitigation around EVM values if skewed by circumstances out of the supplier's control.
Are deadlines and data requests manageable?	• NH month-end calendar is based on industry best practices - if there are challenges, they can be discussed with NH representatives. • Need to understand what data is requested and for what reason – will be different for ORR and NH project teams.	• Data reported to ORR quarterly at scheme level and published annual in Performance Monitoring Statements.	• Deadlines are reasonable.
Concerns or not on baseline consistency (between suppliers and NH) and updates of baseline from regulatory budgets?	• Baseline maintenance has been a challenge – transformation exercise within NH is looking at how this can be improved across the supply chain. • Need clarity on difference between governance and contractual baselines. • Clarity of what is being reported and for what purpose is important to all.	• There being two sets of baselines (NH vs contractual) isn't a problem on its own, but there is a need to clarify which set of baselines EVs are measured against, which one is more appropriate and that they are regularly revised.	• Need for accurate baselines. • Poor/inconsistent contractual change management is affecting the baseline.
Is there an assurance process for the data and is it routinely followed?	• Yes, at both project and programme level. • Cost reviews held monthly to review metrics. • Data quality is measured through review and built-in automated checks within PRISM.		• Data is validated prior to being entered by PRISM.
Is there clarity on who owns the metrics and how they should be updated (written processes)?	• Conflicting responses: some say it is clear within the business, others say it is not clear across the wider business and that there is a need for an education piece around this.		• Project controls team in place to manage.

In our summary we believe that the overarching sentiment from stakeholders is that:

- There is a reasonable overall confidence in the EV calculations being undertake;
- There is a reasonable level of internal assurance being carried out on the EV calculations.
- There is less confidence in input data and data from external sources that is used to calculate the EV metrics. Similarly, the level of assurance and validation of this data is unclear.
- Having inconsistent baselines does impact on the overall accuracy of the EV being reported, though this is more an issue of baseline management rather than data consistency / accuracy / assurance.
- There seemed to be some ambiguity in response on who owns the metrics and how they should be updated.

3.3.2 Review of methodology applied to assessing earned value metrics

EV fundamentally needs a representative BCWS, timely and consistent Time-phasing and Change Control, accurate % complete set off good earning rules, and a systemised data handling approach using say PRISM to generate data in conjunction with automated data checks and reporting. Without these provisions, it will generate inconsistent and spurious information. To deliver this, you will need knowledgeable and committed delivery teams, backed up by proper process, and assurance and audit capabilities.

NH provided the review with a copy of the Major Projects Directorate Cost Management Manual as well as Training material on the use of Ares Prism. This was also supplemented with veracious other presentations and training files to support the ongoing continuous improvement of the functional team on EVM and cost management.

3.3.2.1 Documentation reviewed

We received various documentation from NH around the calculation and reporting of the EV metrics. A summary of the documents that we have reviewed is shown in table 4 Below.

Table 4: Key documentation reviewed

Title	Abstract
Highways England PRISM G2 Cost Management Video based Training Supplement	PowerPoint that outlines the process and purpose for Cost Checks within PRISM. Provides details on the different sets of checks, how to run 'Cost Checks 3' and how to identify and resolve individual checks within Set 3.
Highways England PRISM G2 Cost Management Video based Training Supplement	PowerPoint that provides updates to 'Cost Checks 3' for checks 51-57. Provides details on what the different sets of checks are, and how to identify and resolve individual checks within Set 3.
Introducing new Data Checks - Launched 11 Aug 2021	PowerPoint that provides details on the Data Checks 39, 60, 61 and 62 within PRISM, and how to resolve the checks.
PRISM Data Checks	Excel file containing a table providing details of the various data checks within PRISM. Includes the following: Error reference Error description Priority level Error category Active Drumbeat Threshold EV

Title	Abstract
Quick Reference Guide PRISM Data Checks	PowerPoint presentation, acting as a data check guide. Checks are categorised under 'Generic - Control Account Integrity', 'Cost', 'Schedule', 'Risk', 'Scope', and 'Change'. This presentation provides details on data checks categorised as 'Generic - Control Account Integrity' and 'Change'.
Quick Reference Guide Time Phased Data (TPD) vs Point Data	PowerPoint presentation providing comparison of Time Phased Data (TPD) and Point Data in PRISMG2, their common issues, and the resolution to those issues.
COST MANAGEMENT TRAINING Interface and Reporting	The purpose of this document is to provide step by step guidance for Highways England users of the PRISMG2 Cost Management module as configured for Highways England. This document is intended to be viewed alongside the training presentation materials, which provide further context around Project Controls best practice, PRISM configuration / functionality and Highways England processes. This training focuses on how to operate PRISM as a software package (how to open the PRISM G2 application, how to open a project within it, how to navigate the software) and reporting of variance analysis, Out-of-the-box reports and batch reporting.
COST MANAGEMENT TRAINING Cost Engineers	The purpose of this document is to provide step by step guidance for Highways England users of the PRISMG2 Cost Management module as configured for Highways England. This document is intended to be viewed alongside the training presentation materials, which provide further context around Project Controls best practice, PRISM configuration / functionality and Highways England processes. This training focuses on establishing the performance measurement baseline, periodic monitoring and maintenance, and performance, variance analysis and its reporting.
PRISM G2 Month End User Guide	The purpose of this document is to provide step by step guidance to Highways England users in the use of the PRISMG2 Cost Management module as configured for Highways England. The training within this document focuses on: Opening the PRISM application Opening a Project in PRISM Archiving a Project ACWP and Invoices Change Management Process Update Progress and Time Phased Data Importing Time Phased Data from Excel Updating Progress and Time Phased Data Batch reporting and the dynamic reporting system Period End Close
PRISM G2 Month End Desktop Instructions	An updated version of above.

Title	Abstract
Cost and Schedule Integration	PowerPoint that provides a brief of cost and schedule integration, Master Data processes, baselining and forecasting, mapping between P6 and PRISM, PRISM's interface and processes, the Master Data change control process, other PRISM percentage complete methods, extensions to the P6 PRISM data assurance process, PRISM's calendar, PRISM data checks and an interface training video.
Major Projects Directorate Cost management manual	The purpose of this manual is to describe the Major Projects Directorate's (MPD's) approach to cost management. It provides further detail to support the MPD cost management principles and is a source of reference for programme and project teams and the broader Major Projects community.
Earned Value RIP Learning Module	PowerPoint presentation delivering Earned Value training. Focuses on why EVM is important and why it is important to NH and their delivery integration partners, what EV is, how it is calculated, how it is reported at month end, the breakdown of structure levels, project portfolio performance report, and benefits of earned value.
Key IPC Data Quality and Process Compliance Metrics	PowerPoint that proposes some key metrics for consideration related to 'league tables' to track comparative programme and regional performance against data and process compliance, with particular focus on Integrated Project Controls (IPC).
Regional - Cost Review Sessions V0.2	PowerPoint outlining 'Cost Review Sessions'. Includes details related to session agendas, attendees for sessions, preparation for sessions and their schedule.
National Highways Assurance, Road Investment Strategy Monitoring, Reporting procedure for KPI 6.2 Cost Performance Index and Schedule Performance Index	Document that presents the process for data collection, and the analysis and reporting of the CPI and SPI which informs Performance Indicator 6.2. Outlines how NH collects, stores, processes, analyses and reports commitment performance from source data, evidence collection and reported figures for all schemes in construction between the SoWs and milestones.
EVM Update	PowerPoint presentation that provides a summary of what HE had achieved since their last update, ongoing activities at the time and a summary of their Action Plan.
CPMS (Commercial and Project Management Services Framework) Performance Management via CPF (Collaborative Performance Framework) v0.3	PowerPoint presentation that outlines the current process of performance management, its scoring principles and their shortcomings. Outlines the proposed criteria for cost management as a solution to these shortcomings.
Collaborative Performance Framework – Predictability (Draft for Discussion) v0.1	PowerPoint that outlines the current challenges facing CPF reporting, the calculation of the 'current Predictability metric' and a proposed future metric.
Earned Value Development	A very brief document, summarising the existing CPI/SPI reporting process, possible extensions to CPI/SPI reporting, and possible alternative metrics.
EV Improvement Plan and future metric development (CLC)	PowerPoint presentation summarising the drivers for EV, why the organisation stopped reporting EV, the relationship between IPC and RIS1 change, focus areas and a plan to improve, and EV next steps.

3.3.2.2 Appropriateness of methods used to accurately report earned value metrics

Cost Management System

NH use an industry standard Cost Management System (Ares Prism). Finding include the following:

- Cost data once inputted into the system will generate automated EV calculations including CPI, SPI and Cost Variance (CV) and Schedule Variance (SV).
- Cost data is subject to system generated "data checks" to ensure the outputs have a sanity check which is monitored by PMO team.
- PMO hold a data quality and compliance process to ensure any errors or concerns are picked up and addressed by the next quarter.

The Contractor EAC and the reported PM assured EAC (inclusive of commercial adjustments) as well as % complete and all EV derived calculations are available from Ares Prism.

- Multiple automated Data Checks provided by system.
- Small amount of data flagged for further investigation, but this is ongoing. - % complete looks odd in places and reported EAC2 data vs the EV EAC.

Data consistency

Earned Value is derived from calculation of "*Percentage Complete x Baseline Budget*". It was noted that a methodology for percentage complete is not currently prescribed in NH literature or supply chain guidance. It was also noted that the NH supply chain is considered very experienced in EVM but from a process viewpoint this is reliant on all parts of the supply chain applying progress consistently using this experience.

A strong recommendation would be to establish a "consistent unit of measure" for percentage complete on all types of scope that is expected to support earned value. This would need to be discussed and written up into NH processes and incorporated into the supply chain tender documentation as part of the "Work Instructions" before RIS3 to ensure it is part of tender documentation. This would ensure:

- Consistent understanding of how EV data is used across all stakeholders.
- Consistency of EV data application across all stakeholders.

3.3.2.3 Appropriateness of quality assurance approach to reporting metrics

NH use an industry standard Cost Management System (Ares Prism). Findings include the following:

- Cost data once inputted into the system will generate automated EV calculations including CPI, SPI, and Cost Variance (CV) and Schedule Variance (SV) and an EV derived Forecast cost (also known as an Estimate to Complete or EAC).
- Cost data is subject to system generated "data checks" to ensure the outputs have a sanity check which is monitored by PMO team.
- PMO team hold a data quality and compliance process to ensure any errors or concerns are picked up and addressed by the next quarter.

3.3.3 Review of calculations related to earned value metrics

Earned Value is derived from the calculation of "*Percentage Complete x Baseline Budget*". It was noted that a methodology for percentage complete is not currently prescribed in NH literature or supply chain guidance.

The supply chain percentage complete will be included in the NEC Clause 32 monthly programme submission (in line with contractual schedule submission obligations) and will also form part of the monthly MWC Earned Value. However, the concern would be that the assessment of percentage complete could be subjective without earning rules and a clear definition of how progress should be assessed. This would mean that two different Main Work Contractors could assess similar types of work and achieve a different assessment of the same progress.

Progress can be measured using a variety of methods. To ensure consistency between the different delivery teams they should use standard EV techniques and methodology to give an accurate measurement of progress.

Our review from our interviews and discussions with NH showed that:

- The methodology described in the process documentation has been followed to calculate the EV Metrics relative to the internal NH PMB baseline data.
- We did not find any errors in calculations from the sample data we reviewed.

3.3.4 Summary findings

In summary our analysis shows that:

- There is a reasonable overall confidence in the EV calculations being undertaken. This is supported by a strong industry standard cost management system and a good level of confidence around use of that data. The underlying data is generally of a good quality where the data is owned by NH.
- Our sample checks did not identify any errors in the calculations.
- There is a reasonable level of internal assurance being carried out on the EV calculations.
- There is less confidence in input data and data from external sources that is used to calculate the EV metrics. Similarly, the level of assurance and validation of this data is unclear.
- There seemed to be some ambiguity in response to who owns the metrics and how they should be updated.
- There are some issues we identified with the overall methodology including:
    - a lack of a clear methodology on some components of the EV metrics (e.g. percent complete is not prescribed).
    - Methodology not being consolidated and this is needed for effective data quality management and process compliance. This should be undertaken and shared with ORR to ensure transparency of process for EV calculation.
    - Insufficient description in documentation around why certain data collected.
- To drive consistency we believe it is necessary to establish a “consistent unit of measure” for percentage complete on all types of scope that is expected to support earned value.

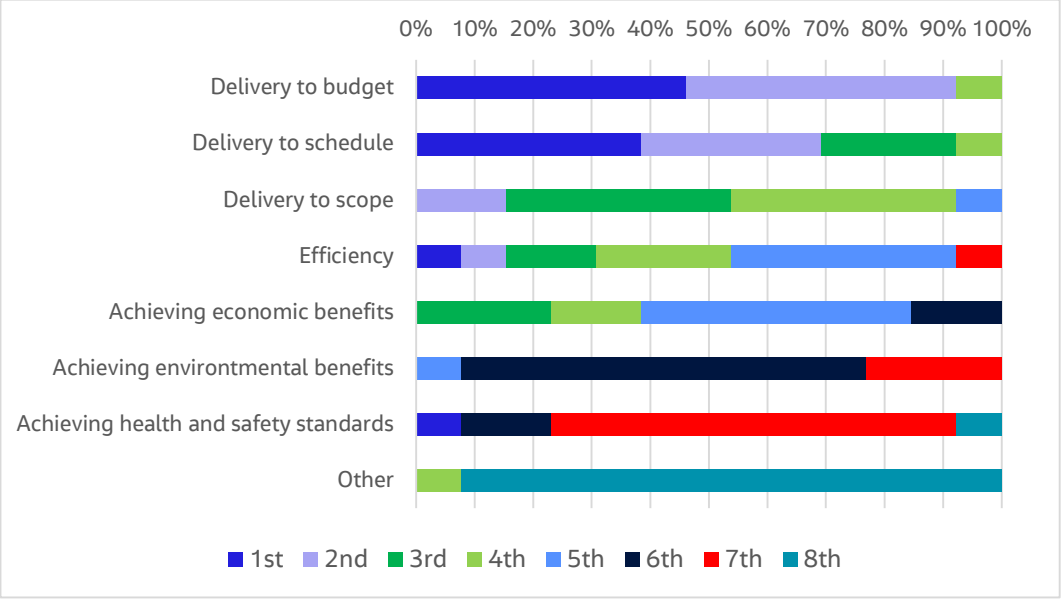
3.4 Relationship between earned value metrics and efficient delivery outcome

This section of the report summarising the findings relating to the relationship between earned value metrics and outcomes, specifically efficiency. (Further discussion around the relationship to other metrics is found in section 3.6). As with other sections, our approach is based on the analysis from stakeholder engagement (pre-engagement surveys, workshops, interviews) and Jacobs' own experience to determine how earned value metrics may have added, hindered, or had a neutral impact on the efficient delivery outcome area and wider performance outcomes.

3.4.1 Stakeholder views on relationship between earned value metrics and outcomes

In the 2nd pre-engagement survey, stakeholders were asked to rank their view for the broad question of what outcomes and objectives do you want to measure or achieve (Figure 14). The responses put delivery to budget and schedule at the top, followed by delivery to scope and efficiency in the middle. Outcomes such as achieving economic, environmental benefits and health and safety were ranked lower down. Other proposed outcomes included early warnings and intervention management and planning. These survey results likely reflect the specific audience and are in line with the subject matter relating to earned value management.

Figure 14: Pre-engagement survey 2, Q4: What do you want to measure or achieve? (Ranked outcomes)

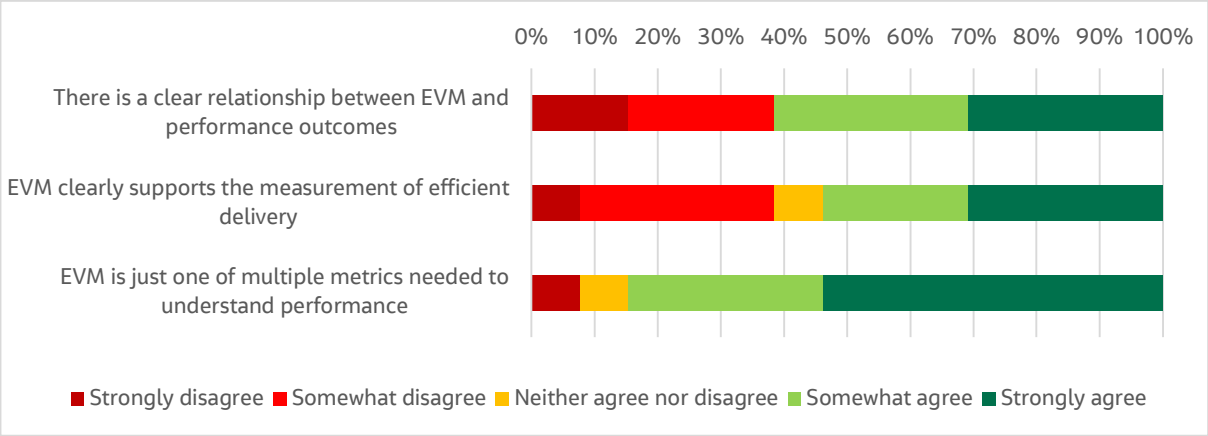


Ave Score
1.7
2.0
3.4
4.1
4.5
6.2
6.5
7.7

Some comments received from the pre-engagement survey included: achieving "efficient delivery by the company across its delivery programmes is important". Several survey participants identified that earned value metrics "provide early warning for project delivery", "as part of the process, NH uses EV reports at project and programme level to trigger an Intervention Plan with the supplier with an objective to achieve the above", and "the outcome of EVM is used as a leading indicator for Intervention Management".

A more specific pre-engagement question focused on the role of EV metrics and the relationship with performance and achieving efficient delivery (Figure 15). There was a broadly neutral view on the relationship between EVM and performance outcomes and whether EVM supports the measurement of efficient delivery, with relatively split opinions both in favour and opposed for each of these questions. For the third question, there was strong agreement that EVM is just one of multiple metrics needed to understand performance.

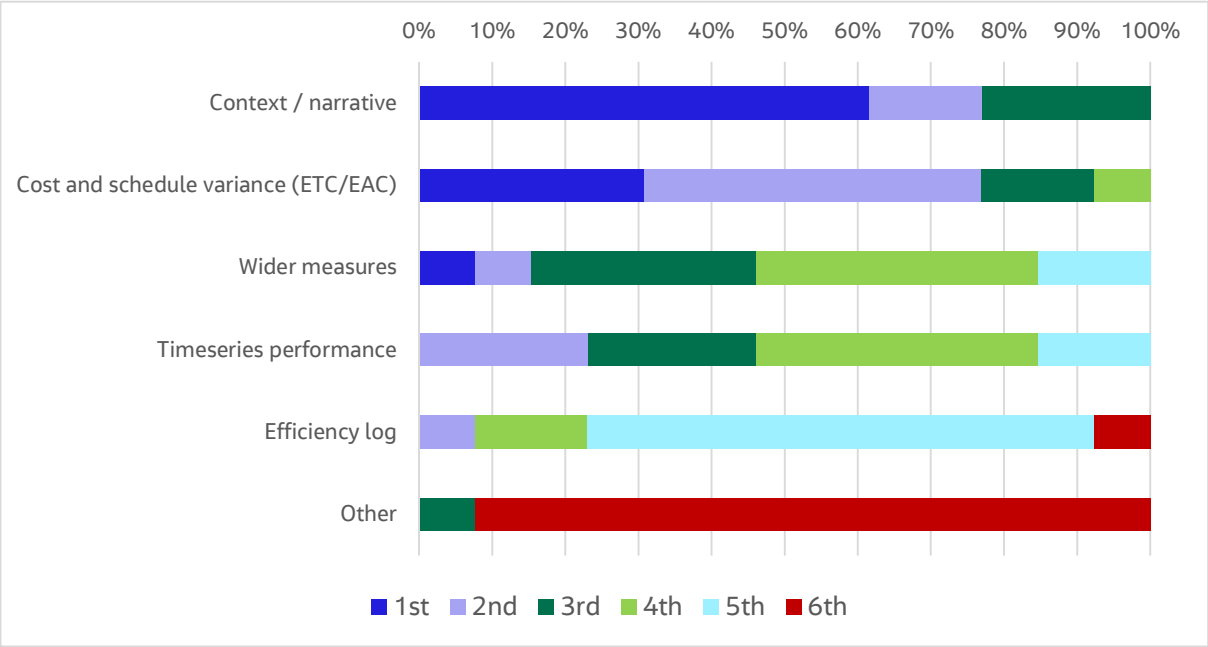
Figure 15: Pre-engagement survey 2, Q6: Do you agree or disagree with the following statements?



A further question asked what information supports understanding the relationship between EVM and efficiency, where participants were asked to rank their responses (Figure 16). The most selected information topic was the need to provide context and narrative to support the relationship between EVM and efficiency. Cost and schedule variance (ETC/EAC) was identified as being the second most important aspect. This suggest that majority of stakeholders are primary interested in the top-level figures and narrative.

Other notes included the importance for teams to understand how to use EVM and other wider metrics to drive the right performance and conversations to improve efficiency and the need to understand the cost of establishing and reporting EVM. Other measures that NH uses to assess performance include LEI, BEI, PPC.

Figure 16: Pre-engagement survey 2, Q7: What information supports understanding the relationship between EVM and efficiency? (ranked)



Comments received included: in addition to the basic EV metrics, NH uses TCPI based on EAC and budget, EV based EAC, required saving on remaining value, forecasted saving on remaining value (vPMB)", "if it's not in the wider

narrative or variance analysis, would have to consider use of central risk funding" and the supporting narrative "could include factors outside the suppliers' sphere of influence that affect EVM".

The main themes discussed at the second stakeholder workshop summarised the following points:

- **Purpose of EVMs:** Used primarily for management and as an early-warning indicator for intervention requirement, not as a measure of true performance. EVM is generally considered to work well as a project management tool and early-warning indicator **if used correctly.**
- There is **no direct relationship with EVM and efficiency KPI target**. Instead, EVM is a management tool primarily used by NH MP to track delivery to cost and schedule as planned.
- **Supporting narrative/alternative indicators:** agreement that EVM should be used alongside other indicators (e.g., LEI, BEI, PPC, productivity, TCPI) and supporting narrative.
- **Data quality and implications:** Any EVM/PI measure is subject to poor data quality, therefore there should be a focus on process improvements as well as simply replacing the types of measures.

Table 5: Summary of key findings from stakeholder workshop 2 – metrics and performance

Question	NH feedback	ORR feedback
How well does EVM help you achieve your performance measures? What else can complement EVM in terms of performance?	• Used as tool for project management but not necessary for regulatory measure. • Good early indicator if used correctly – brings schedule and cost together, forecasts outcome on funds and time in a Do Nothing scenario, used as the first predictor of the need to intervene and focus on mitigation. • Should be considered as a cumulative measure to date over a long period to smooth any large variances. • Should be tested alongside other metrics, such as LEI, BEI, PPC, productivity, and TCPI. • Compromised by sustainability costs which tend to be higher unless linked to a Do Nothing option. • Important to measure against different baselines for different outputs.	• Different baselines limit usefulness in understanding efficiency (target) performance. • Unreliable data – could work better if the process of collecting or reporting is regulated well. • Needs to be supported by appropriate context/narrative and conversation to understand how the values show performance – should encourage a conversation. • Used to raise risk/interventions with suppliers, as it's a RIS performance metric should presumably do the same for RIS-related performance.
Is EVM a good measure for efficient delivery? And what else could complement EVM in terms of efficient delivery?	• Good PM tool for delivery as long as other delivery baseline data points are given equal weighting (i.e., Information Specification and Risk). • NH currently reports on internal baselines – should switch to baselines agreed with DfT. • Any measure will need to be reliable and robust. All measures are subject to poor data quality. Therefore, there needs to be a focus on process improvements as well as simply replacing the type of measure.	• Not clear how EVM measures efficient delivery as it's not linked to delivery plan commitment but to contractual commitments. It's a measure of the minimal expectation, not efficiency. • Significant lag in report schedule/cost performance externally – EVM should be a useful forward-looking indicator in terms of cost efficiency but there may be better alternative measures.
Are there any tensions between EVM and other performance measures, and if so what are they?	• Data quality process and compliance (baseline and change management/control)	• Link between EVM and other performance measures is unclear. • There is tension with external reporting of performance against schedule and cost baselines. • Cost-cutting on scope/quality instead of driving efficiency • Conservative managers reluctant to declare success too early.

In addition, during our unstructured interviews with NH we were advised of the following:

- *It's unclear what costs are managed against SPI/CPI but if the SPI/CPI is against the 'whole cost' as opposed to the 'defined cost' of a project, then the SPI/CPI can be gamed by profiling the value of time related spend (management labour etc.) to cover up the deficiencies in defined cost performance (which in truth is what you are trying to measure to get a view of performance). This can be measured through assurance and defined rules, I don't know if either is in place.*
- *Ultimately, I would say that CPI/SPI have a definite use in the management information of a project, as an overview of performance. It needs to be guided by clear rules and assured in some way to ensure compliance, but it is a useful leading indicator of where problems are occurring and based on statistical evidence the likely outcome of a project. it is not a measure of 'efficient' delivery. EV essentially measures, 'are we doing what we said we would' …..not 'are we delivering well'.*

3.4.2 SME view

There are two components to how EV might drive efficient outcomes. These are as follows:

- Project baselines are set at efficient levels, i.e. have an in-built efficiency target. Providing those efficiency targets are achieved during project delivery to the same quality as expected, then EV will help ensure overall efficient delivery, i.e. projects are delivered to an efficient cost and as expected for the schedule

- The EV provides effective incentives to ensure that the delivery remains dynamic and during the delivery phase, there is sufficient scope to adjust to new innovations, more effective solutions to provide a dynamic efficiency incentive.

It is unclear how the current EV provides incentives for the second component, dynamic efficient delivery. From stakeholder feedback it seems that there is limited incentives to drive this component. Some feedback does suggest there may be incentives to cost / cut or descope projects to meet targets, which might load costs to the business later down the line. Similarly there were some comments around whether to declare outperformance due to a perception that future budgets might be cut. These comments suggest that there may be a need for further ex-post checks on schemes by ORR to ensure that the original scope and envisaged outputs are delivered for individual schemes.

In regard to the capital baseline being set at an efficient level, then EV being used to check delivery to an efficient outcome, it is clear that NH do not use the capital baseline to manage EV related performance. It is unclear how the PMB baseline relates to the capital baseline or reflects any changes to the capital baseline agreed with DfT/ORR. This means that the actual costs may not reflect an efficient cost of delivery and hence an outperformance in CPI and SPI might not necessarily reflect an efficient project delivery.

3.4.3 Summary findings

In summary our analysis shows that:

- EV metrics seem to be working effectively for NH as an internal management tool to provide an early warning of issues arising and to develop appropriate intervention plans with specific suppliers. In this sense, the EV metrics do help to support achieving efficient delivery of project to cost and schedule.

- To maintain an appropriate relationship between EV and efficient delivery, it is necessary that any revised capital baselines being worked towards reflect a capital baseline target (with efficiency targets included) and is worked towards by NH.

- It is clear the current EV metrics reported to ORR do not provide sufficient confidence and clarity to be used in isolation as performance metrics for achieving efficient delivery. Differences between the capital baseline and the PMB is clearly a major factor limiting their usefulness. It also does not allow ORR to practically combine the EV data with other NH lines of reporting such as CPM in a timely and forward-looking manner

to enable effective monitoring of delivery plan performance. There are several options to overcome this, which should be further explored by NH and ORR.

- It is also apparent that stakeholders do not identify a clear direct relationship between the EV metrics and the efficiency KPI target. It is recommended that NH and ORR work together to close this gap with supporting project and programme evidence and further clarity between the capital and delivery plan baselines so the relevance of the EV metrics can be better understood by both parties.
- Stakeholders advised that in more constrained (budget or time) projects, there has been greater emphasis on realising innovation and other efficiency opportunities. Some stakeholders felt these might not have been identified if schedule and cost performance had been more favourable, but these activities should ideally be the focus of every project. This has not been possible for every project and ORR shared their concern about a culture where bad news was withheld by NH, hoping that turnarounds could be achieved.
- We understand in some instances, there may be incentives to cost / cut or descope projects to meet targets, which might load costs onto the business later down the line. Similarly there were some comments around whether to declare outperformance due to a perception that future budgets might be cut. These comments suggest that there may be a need for further ex-post checks on schemes by ORR to ensure that the original scope and quality is delivered for individual schemes.

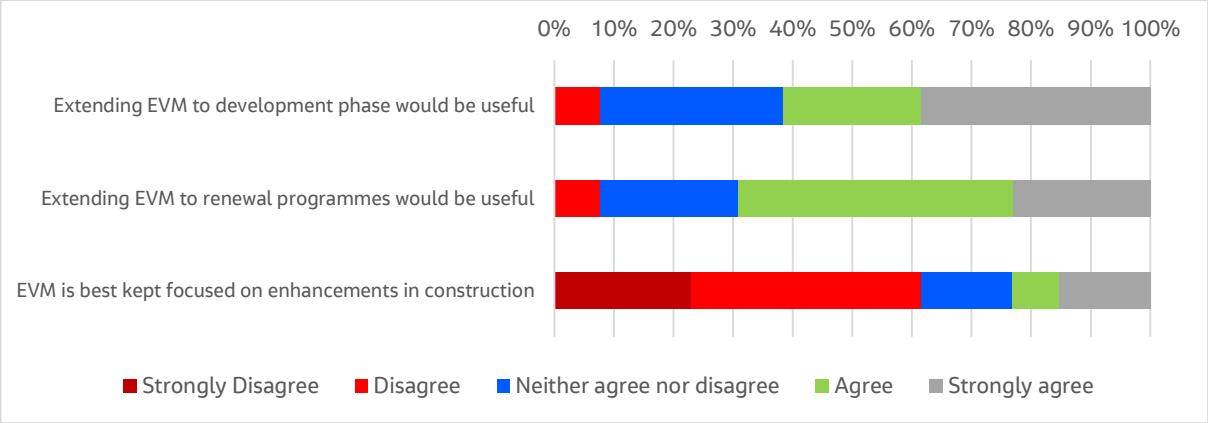
3.5 Extending the earned value metrics to development, renewals, and other programmes

This section of the report summarising the findings relating to extending the use of earned value currently used in major project enhancements to include development, renewals, and other programmes. It draws upon the analysis from the pre-engagement surveys, workshops, interviews, and Jacobs' own experience.

3.5.1.1 Overview

In the 2nd pre-engagement survey, stakeholders were asked their views on the usefulness of extending the earned value metrics to the development phase and renewal programmes (Figure 17). There was a majority consensus that it would be useful to extend EVM to both the development phase and renewal programmes, with both potential extensions almost equally supported. On the contrary, the majority disagreed that EVM was best kept focused on enhancements in construction, although a minority agreed with the statement.

Figure 17: Pre-engagement survey 2, Q10: Do you agree or disagree with the following statements? N=13



This topic was further elaborated within the survey comments and discussed at the 2nd stakeholder workshop (Table 6). Specific comments received included that "EV is valuable on all forms of projects, however if assessment of EV requires additional resource, then its cost to implement versus the value provided would need to be assessed." There was a view that "construction, development and larger renewal projects were the three key areas to focus on". Most participants felt that reporting of EV during construction should be prioritised and there was a "need to gain a stronger understanding of what baseline data points performance should be based on at construction phase before extending to development/renewal programmes".

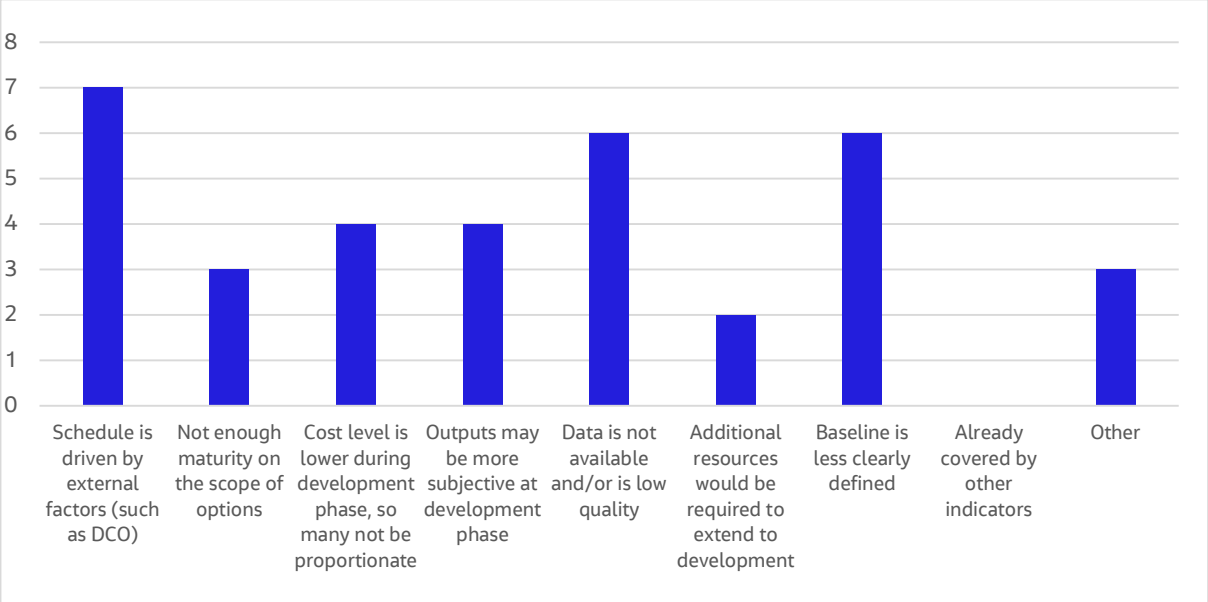
Table 6: Summary of key findings from stakeholder workshop 2 – extension prioritisation

Question	NH feedback	ORR feedback
How would you prioritise the choice of extensions and are there any other areas you would like to extend EV to?	• Relative prioritisation: Construction – Development – Renewal. • Need to assess if EV needs to be reported against contract values and dates or funding/delivery plan commitment as agreed in the Capital Baseline with DfT.	• Should prioritise alignment to construction phase first. • In terms of widening coverage of EV, should first consider what's actually needed (for NH to manage projects and RIS reporting separately) and if EV can do that, rather than assuming expanding EV coverage is the answer.

3.5.1.2 Extension to development phase

In the 2nd pre-engagement survey, stakeholders were asked about the potential barriers to extending EVM to the development phase (Figure 18). The top barrier identified by participants was that the schedule is driven by external factors. There was also significant concern about the quality and availability of data and that the baseline is less clearly defined, followed by questions around proportionality, subjectivity, and maturity.

Figure 18: Pre-engagement survey 2, Q11: What barriers do you see to extend EVM to development phase?



This topic was further elaborated within the survey comments and discussed at the 2nd stakeholder workshop. Specific comments received included that "EV should be applicable to all NH portfolios in all PCF phases" and that "EV is used in development stage for cost control and project reporting". However, concerns that "EV does not contribute as much to the initial stage of the project, as it is influenced by external factors".

Overall, there seemed to be agreement about the potential feasibility of extending EV metrics into the development phase, but also concern that external factors may act as a barrier to the usefulness of extending EVM to development phase, as NH may have less control over the schedule and cost in the development phase due to external factors significantly impacting cost and schedule (such as due to DCOs and JRs). On comment stated, "the aim of extending EV to development would be to report more clearly on progress".

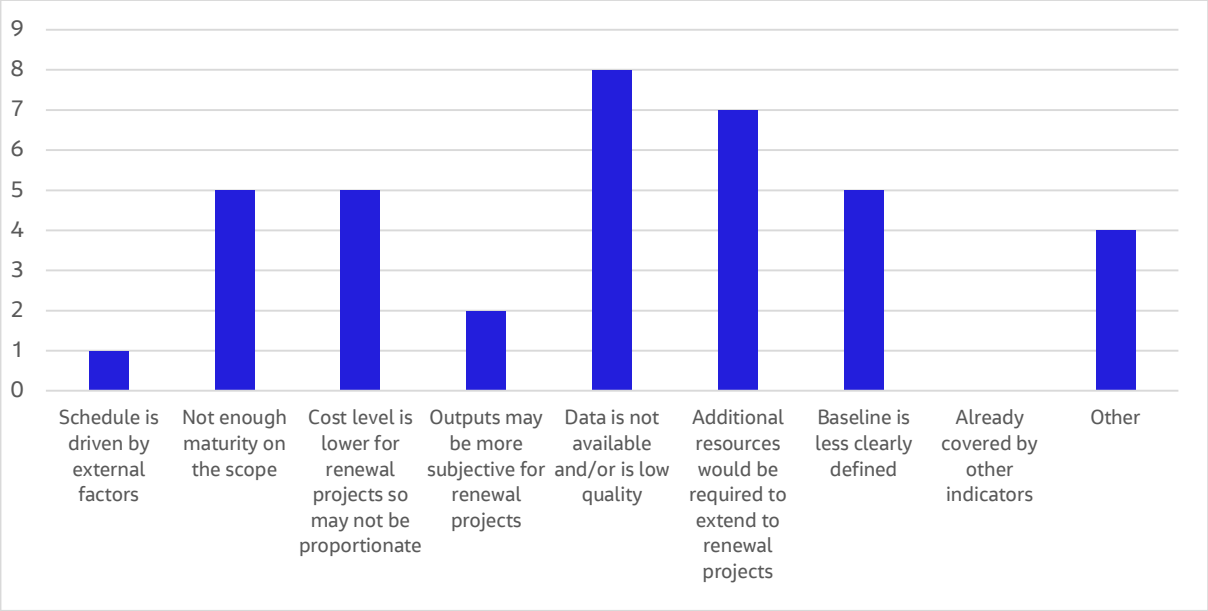
Table 7: Summary of key findings from stakeholder workshop 2 – extension development

Question	NH feedback	ORR feedback
What barriers do you foresee to the extension of EV to the development phase and how can they be overcome?	• External factors (e.g., DCO JRs) • Timing: EVs in development need to be close to the final option – difficult to implement on multiple options • Design teams try to hide away from under-performance that EVM would shine a light on. • None – process and systems are in place already, so there would be minimal barriers to implementation. • EV should be measures against contract values, not funding.	• NH may have less control over schedule and cost in this phase due to external factors impacting cost and schedule. Other metrics may be more appropriate at this stage. • Impact of development phase spend/activity on total cost is probably of more interest that progress through the dev phase – could be other ways to report flag risks around progress towards SoW.

3.5.1.3 Extension to renewals

In the 2nd pre-engagement survey, stakeholders were asked about the potential issues do you foresee extending to renewal programmes (Figure 19). There was large concern for renewals about the availability and quality of data, the additional resources required to extend EVM and whether this would be proportionate.

Figure 19: Pre-engagement survey 2, Q12: What issues do you foresee extending to renewal programmes?



This topic was further elaborated within the survey comments and discussed at the 2nd stakeholder workshop. Specific comments received included that "this is something worth exploring in RIS3 rather than introducing", "there could be value extending EV to renewals given the increasing size of the renewals programme in RIS3", "the greatest potential is in large scale renewal schemes which in some cases are larger than major schemes", "extending to renewals need not mean all renewals – focus on projects most like enhancements in scale".

The workshop concluded that there is a need to be proportionate – the expense and resources required to calculate EVMs for smaller renewal projects may not be worthwhile nor may it add sufficient value in all cases (Table 8). It was felt that where data exists and is robust then there could be value in extending further if EVM is considered to be the most appropriate solution, but there is also a need for the education of personnel and data quality to be driven up and a consideration on whether realistically NH has the capacity to extend EVM.

Table 8: Summary of key findings from stakeholder workshop 2 – extension renewals

Question	NH feedback	ORR feedback
What issues do you foresee to the extension of EV to renewal programmes? How can they be overcome?	• Education of personnel and data quality would need to be driven up. • Substantial effort (cost) required to onboard and implement – need to consider the cost of implementation and value add. Huge change to embed. • Not applicable to all projects at programme and portfolio level.	• Needs to be proportionate. • Availability of data/resource /appetite to undertake this work.

3.5.2 SME view

Jacobs manages large programmes and often uses a basket of indicators related to earned value in addition to cost and schedule monitoring. We have leveraged our expertise in this area to provide an SME expert view:

- It seems to be, in principle feasible to extend EVM to development and larger renewals, but whether it is desirable and add sufficient value relative to the costs to implement should be explored further.
- Extension to development phase:
    - Progress/decisions made during the development phase can have a significant impact on the outturn cost and schedule of a project, although several of these are attributable to external factors such as stakeholder engagement, development consent orders and judicial review.
    - There is more uncertainty and less maturity on the scope of a project during the development phase, which greatly influences the accuracy of cost and schedule forecasts, particularly before PCF3 concludes and a preferred option is selected to be progressed.
    - The level of cost spent during development is an order of magnitude lower than during construction, so it may make more sense to focus on SPI rather than CPI during development.
    - There are also other approaches and metrics that could be tracked alongside or in preference to EVM during the development phase. One common metric used by both DfT and HMT is reference class forecasting, which analyses the movement in a project's base cost and schedule over a project's evolution through to completion versus sector wide benchmarks.
    - Overall, it makes sense to have metrics that track project's estimated forecast cost and start of works date during the development phase, but these do not necessarily need to be EVM.
- Extension to renewals programme:
    - It is clear there is a shift in the RIS3 portfolio mix away from new major project enhancement schemes (noting some RIS1/2 major project legacy schemes will continue their construction) towards an increasing number, scale of expenditure and complexity of capital renewal projects. Some of these capital renewal projects have forecast costs exceeding £100m and are therefore of a similar scale to many current major project enhancement schemes.
    - There is some similarity in governance and contractual arrangements are in place for these largest capital renewal projects as for major project enhancement schemes, so in principle it should be feasible and proportionate to extend EVM to the largest capital renewal projects for RIS3. We further note that an advantage of integrating EVM would be to provide a consistency in metrics for similar programmes. We therefore recommend that EV metrics are extended which would include but not be limited to, any named renewals schemes or any schemes greater than a £m threshold as agreed between NH and ORR . The detail and timeline should be discussed and agreed between ORR and NH.
    - However, additional resources, training and capacity building may need to be put in place at NH in advance of RIS3 to enable its effective implementation, learning appropriate lessons from the existing use and proposed improvements of EVM on major project enhancements.
    - There are also other approaches and metrics that could be tracked alongside EVM for the renewals programme, such as productivity-based metrics and other parts of the operational performance scorecard such as delays from roadworks and information timeliness/accuracy.

3.5.3 Summary findings

In summary our analysis shows that:

- It is feasible to extend EV to development and larger renewals – the system infrastructure already exists.
- The contracts already allow it for development phase and major project led renewal projects.
- A more detailed study is needed to assess the additional value provided versus the resources required to deliver the additional measures.
- We would recommend that larger renewals are more likely to provided added value for EV. Specifically, that EV metrics are extended which would include but not be limited to, any named renewals schemes or any schemes greater than a £m threshold as agreed between NH and ORR.
- Other barriers, such as those set out in the data quality section would also need to be addressed.

3.6 Relationship between Earned Value and other metrics

In this section we sought to determine whether there was any relationship between earned value and other scheme level metrics. In particular we considered whether EV can be correlated with scheme performance against other RIS delivery/finance commitments. The only data available at scheme was:

- Capital baseline data;
- Variations from the capital baseline;
- CPI (based on the PMB);
- SPI (based on the PMB);

Using this data we sought to review:

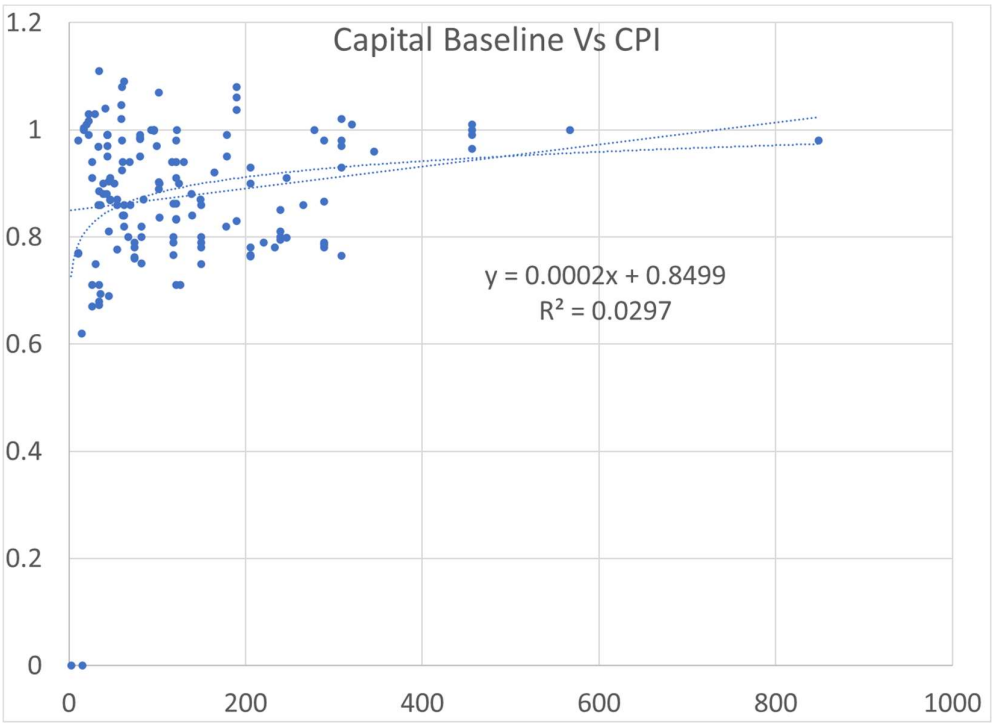
- Whether any correlation was present between capital baselines and CPI and SPI respectively in RIS2
- Whether any correlation was present between variation on scheme capital baseline and CPI and SPI respectively.

In addition we undertook an analysis of the distribution of both CPI and SPI at scheme level.

3.7 Key findings from analysis

In order to complete our work we undertook some simple regression analysis. The following figures present the key outputs. The figure below sets out the relationship between CPI and the capital baselines at scheme level..

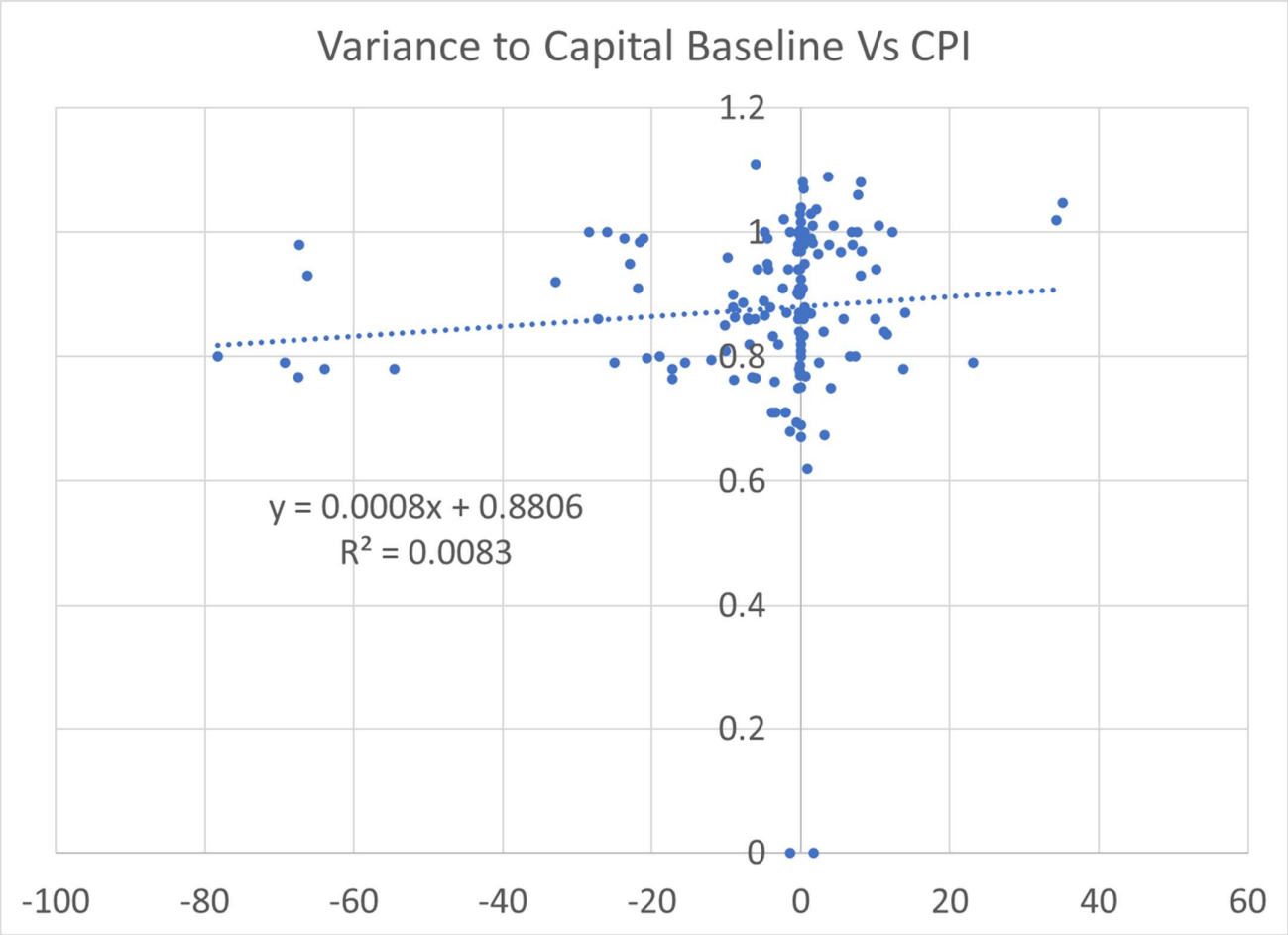
Figure 20: Regression of Capital Baseline and CPI



The data for CPI against the capital baseline shows a very low R2 suggesting the absence of any strong relationship between the two values. It can be observed that the line of best fit does show an upward trend, which seems to suggest that the larger the scheme the closer the CPI value is to 1. This might be expected if you consider larger schemes might have a greater focus on risk management.

The relationship between the variance of the capital baseline and CPI is shown below.

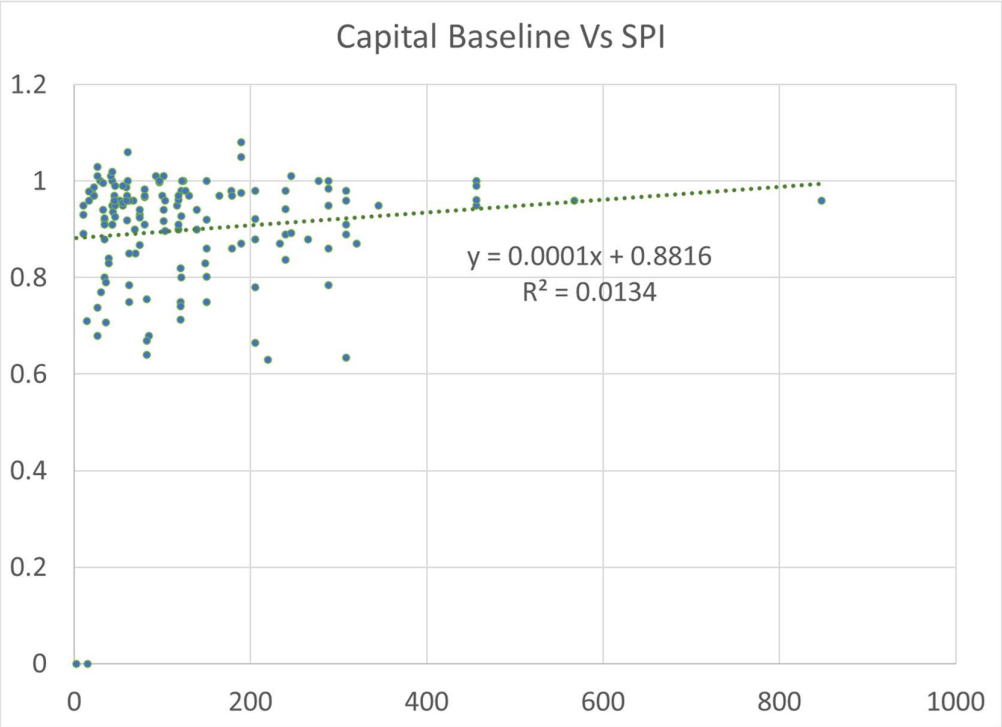
Figure 21: Regression of variance of Capital Baseline and CPI



This again shows a similar relationship with a weak R2 and a slightly upward sloping curve. However it is difficult to assess any discernible relationship.

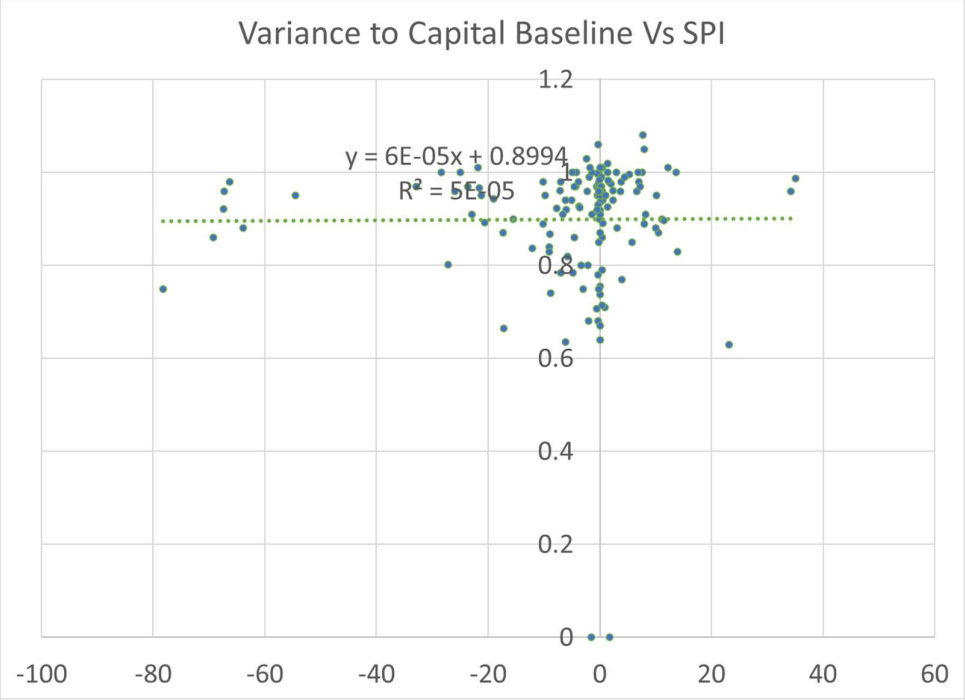
The charts below show equivalent comparisons between the SPI and the capital baseline values. In this case the capital baseline versus the SPI is upward sloping, though again shows a very low R2 value. The data does suggest that the larger the scheme the more likely it is to for the SPI to be closer to 1. This again does make intuitive sense, as the larger schemes might have greater allowance and contingency to allow for slippage as well as additional resources around risk management.

Figure 22: Regression of Capital Baseline and SPI



When considering the relation between SPI and variance on the capital baseline cost, see figure below, there is no discernible relationship.

Figure 23: Regression of variance to the Capital Baseline and SPI



It should be noted that both the CPI and SPI are calculated against the PMB baseline. This might be one reason for why the correlation with the capital baseline is not stronger. In effect the CPI and SPI do not directly reflect the original baseline calculations.

In addition we considered how schemes are distributed against the CPI and SPI thresholds. The charts below illustrate this. In this case the frequency is the number of times a scheme performs within individual thresholds. The figures below shows that for CPI and SPI most schemes underperformed.

Figure 24: Distribution of scheme performance CPI

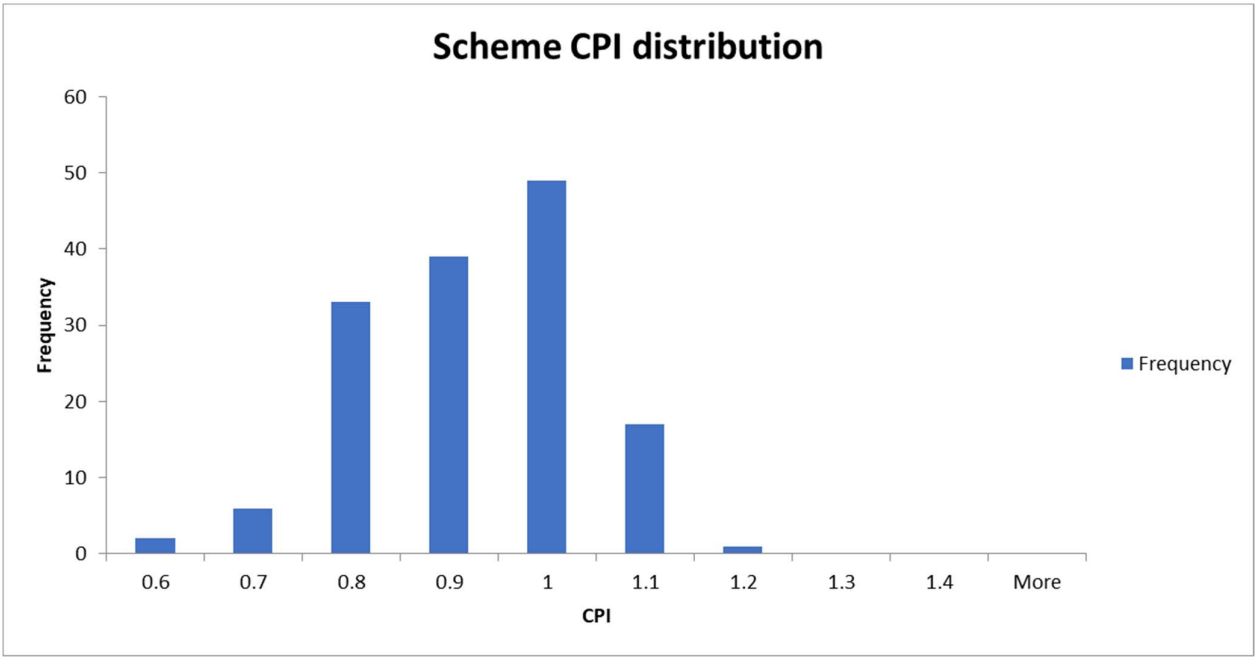
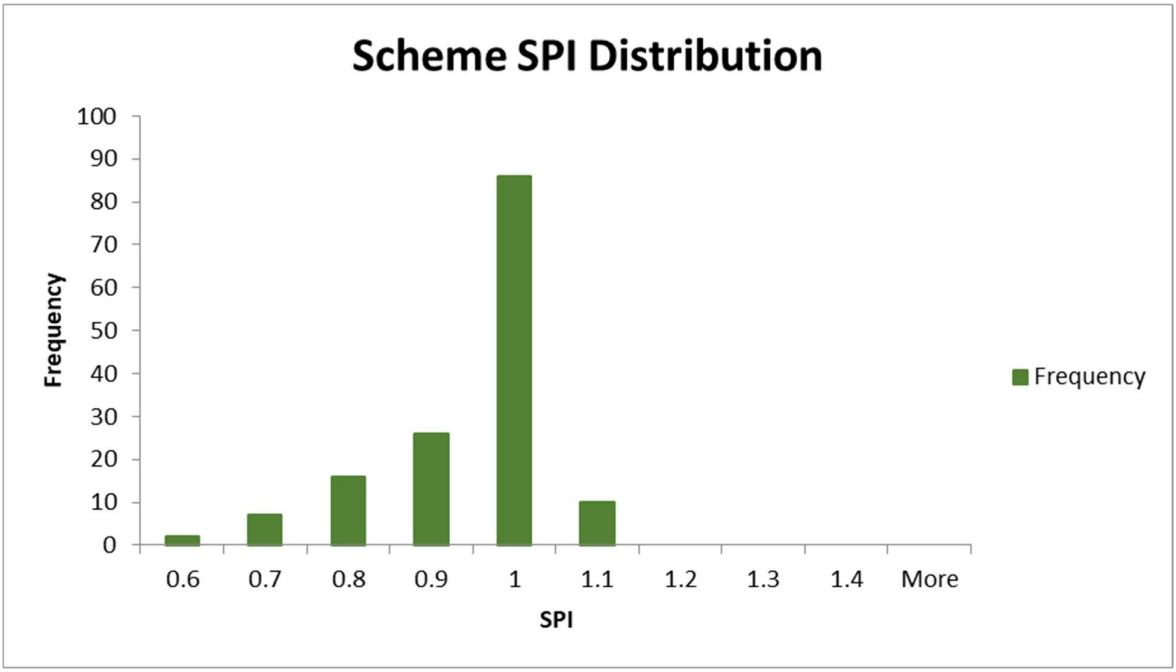


Figure 25: Distribution of scheme performance SPI



Both chart suggests that there is a bias for scheme underperformance, though schemes are more likely to maintain schedule than budget.

3.7.1 Summary findings

In summary we conclude that:

- Based on the available data we were unable to find a strong correlation between EV and scheme financial data
- This may be because CPI and SPI use a different baseline to the capital baseline against which we conducted our regression analysis.
- The data points did suggest that larger schemes are more likely to have a more accurate SPI and CPI, which we would expect.
- We noted that the distribution of schemes for both CPI and SPI had a downward bias, and that the schemes were more likely to maintain schedule than cost.

4. Conclusions

4.1.1 Conclusions

We undertook our review against seven theme components. Our overall summary under each of these themes is shown below.

Critically evaluate earned value metrics effectiveness as a performance indicator in RP2

- This is a good performance indicator if it is done correctly and significantly easier than alternative approaches.
- For NH it is effective for internal management reporting against operational baselines as an early indicator of potential performance issues / requiring intervention, however it is not used to assess effectiveness of performance.
- For ORR it is not currently effective as a performance indicator because:
    - There is no effective reconciliation against the capital baseline (not reported against the capital baseline)
    - Lack of transparency between the delivery plan commitments and contractual positions
    - Insufficient contextual information provided to reconcile and interpret the current EV metrics.

Therefore EV is not an indicator of effective performance indicator for ORR in its current format for RP2.

Review National Highways' current plans for developing earned value (or similar) performance indicators in the remainder of RP2 and into RP3

- The NH current investigations complement our approach above
- The two measures being considered, which we understand NH are working with ORR on, are:
    - Produce capital baseline aligned EV metrics. This is a key recommendation from our study.
    - Predictability measure, which is still in development[3].

We support this in principle but would need to review the final structure prior to providing a definitive view.

Propose improvements to earned value metrics for RIS3 reporting and monitoring

Although a number of improvements could be proposed, we believe that the key improvements should relate to:

- Supplementing EV with contextual information including quantitative data and qualitative quarterly commentary on scheme performance. The specific frequency should be agreed with ORR to ensure that it is adding value.
- There needs to be at least two baselines. This ensures that NH continues to make use of baseline data for operational purposes, whilst providing ORR with appropriate metrics based on the capital baseline. The method for the baseline needs to be implemented in a way that will give ORR high confidence of the accuracy of data and maintain effective transparency between the different systems to ensure data is fully traceable back to the original determination capital baseline.

[3] We note that NH do not consider this to be for the purposes of regulatory reporting, rather for contract performance management.

- An Earned Value metric based on final forecast cost and final forecast schedule would provide a forwarding looking (leading) indicator view of outturn cost and schedule.

Evaluate underlying data quality, process compliance and if it is fit for purpose

The following summarises our views:

- There is a strong industry standard cost management system and a good level of data around use of that data.
- The underlying data quality and data assurance is generally good where it is managed / generated internally.
- We found no issues found in our sample check of calculations.
- There is a lack of a clear methodology on some components of the EV metrics (e.g. percent complete is not prescribed).
- The methodology is not consolidated and this is needed for effective data quality management and process compliance. A copy should be shared with ORR to ensure there is transparency and clarity on the process being followed between stakeholders.
- There is less confidence in both data and process compliance from external partners. This is a critical risk to the accuracy of data being reported and should be addressed[4].

Review the extent to which the earned value metrics performance indicators contribute to the Achieving Efficient Delivery outcome area;

We make the following key observations:

- Stakeholders do not identify a clear direct relationship between EV metrics and with efficiency KPI target.
- The contribution to Efficient Delivery of the earned value metrics is unclear.
- If efficient delivery means delivery against cost and schedule then EV is an appropriate metric.
- The misalignment of the capital baseline and the operational baseline means the EV metric is less useful to assessing performance against cost and schedule. This is because:
    - There is less traceability around how the operational baseline has changed from the capital baseline and whether this movements represents an efficient cost and schedule position.
- It is currently unclear how EV provide incentives to drive efficiency in-programme, and might not be providing the correct incentives.

Present an independent view of whether earned value metrics performance can be correlated with scheme performance against other RIS delivery/finance commitments

We make the following summary observations:

- We were unable to identify a strong correlation between the financial metrics we reviewed.
- The schemes seem to be performing with a downward bias for both CPI and SPI, though schemes are more likely to maintain SPI than CPI.

[4] Though we note NH have a data quality assurance process in place

Consider the feasibility of using earned value measures for enhancements in development and for the renewals programme

We make the following summary observations:

- It is feasible to extend to development and renewals – the system infrastructure already exists.
- The contracts already allow it for development phase and major project led renewal projects.
- A more detailed study is needed to assess the additional value provided versus the resources required to deliver the additional measures.
- We would recommend that larger renewals are more likely to provided added value for EV and the consistency of reporting metrics makes this case stronger. We therefore recommend that EV is extended to larger renewal schemes as a minimum (named committed renewal schemes in the RIS). We recommend that NH agree with ORR what an appropriate timeline / timescale would be for the implementation of this. This is to ensure effective performance monitoring.
- Other barriers, such as those set out in the data quality section would need to be addressed.

4.1.2 Recommendations

- **Improvement in EV metrics for RIS 3 and monitoring:**
    - **Requirement for more Baselines:** At least two baselines are required, the capital baseline and the PMB. This is to ensure that both ORR and NH can effectively use the EV metrics for their purposes.
    - Contextual information: We recommend addition contextual information provided to ORR as part of the EV reporting, that includes:
        - ***Budget & EAC at scheme and project level % Complete***
        - ***EV derived Final Forecast Estimate (based on TCPI or similar data)***
        - ***Cost Variance*** – Difference between the Earned Value (EV) and the Actual Cost (AC).
        - ***Schedule Variance*** –difference between the Earned Value (EV) and the Planned Value (PV).
        - Incorporating NH proposals, still in development, see section 3.2.2.
        - ***Qualitative data*** - As well as additional quantitative data being requested, we recommend that qualitative commentary is provided. This should describe how the performance of a scheme is progressing and set out what further risks to performance exist on the horizon.
        - ***An Earned value metric based on final forecast cost and final forecast schedule*** to provide a forwarding looking (leading) indicator view of outturn cost and schedule.
- **Data quality and process compliance:**
    - **Establish a "consistent unit of measure" for percentage complete on all types of scope that is expected to support earned value:** The absence of this provides room for interpretation and raises concerns around consistency of data that might be reported
    - **Consolidation and formalisation of approach:** We believe that this is required to ensure consistent provision of EV data. This should include:
        - a clear methodology on the main components of the EV metrics (e.g. percent complete is not prescribed).
        - Methodology should be consolidated in one document to ensure effective data quality management and process compliance.
        - The methodology should cover external assurance and validation of data

- **EV and contribution to efficiency delivery outcome:**
    - **To maintain appropriate relationship between EV and Efficient Delivery, it is necessary that any revised baselines being developed reflect an efficient baseline target and this drives NH behaviour.**
    - **Review relevance of the EV metric to ensure it is driving the correct incentives:** In light of stakeholders not identifying a clear direct relationship between the EV metrics and with efficiency KPI target.
    - **Review whether schemes delivered are consistent with expectations at the capital baseline and scheme setting stage**, which may involve some ex-post reviews.
- **Enhancement of EV to renewals and development programme:**
    - **We would recommend that EV metrics are extended** which would include but not be limited to, any named renewals schemes or any schemes greater than a £m threshold as agreed between NH and ORR.

Appendix A. Summary findings from pre-engagement questionnaire

Pre-engagement questionnaire

Our pre-engagement questionnaire was carried out on MS Teams. The pre-engagement questionnaire was circulated to key staff at both ORR and NH. In addition, we invited wider stakeholders to complete the pre-engagement questionnaires. These included individuals from DFT and from suppliers (Jacobs).). The analysis of the pre-engagement questionnaire is presented in appropriate sections of this report.

Pre engagement questionnaire 1

The pre-engagement questionnaire for Workshop 1 comprised of 11 questions split into four sections:

- **Section 1 -** *'You and your role'*,
- **Section 2 -** *'Understanding the use of the EV metrics'*,
- **Section 3 -** *'Looking to the future of PI metrics'*, and
- **Section 4 -** *'Final thoughts'*.

Overall, 18 responses to the questionnaire were received, 6 of which were from ORR, 7 from NH, 1 from DfT, 3 from the supply chain and 1 from 'Other'. The subsections below provide greater detail of the questions within each section.

Section 1 - 'You and your role'

The purpose of Section 1 was to ascertain the organisation that respondents work for, their role within their organisation and whether their role uses EV metrics. As such, this section comprised of three questions (Question 1 to Question 3). Responses to all questions within this section were required, meaning 18 responses were received for each question.

Question 1: *'Please provide the organisation that you work for'.*

Respondents were asked to specify the organisation that they work for.

Question 2: *'What is your main role within the organisation'.*

Respondents were asked to specify their role within the organisation.

Question 3: *'Do you use EV metrics in your role?'.*

Respondents were asked to specify if they use EV metrics in their role.

Figure 26: Pre-engagement Survey 1 Q1 – What organisation do you work for? – Sample Size N=17

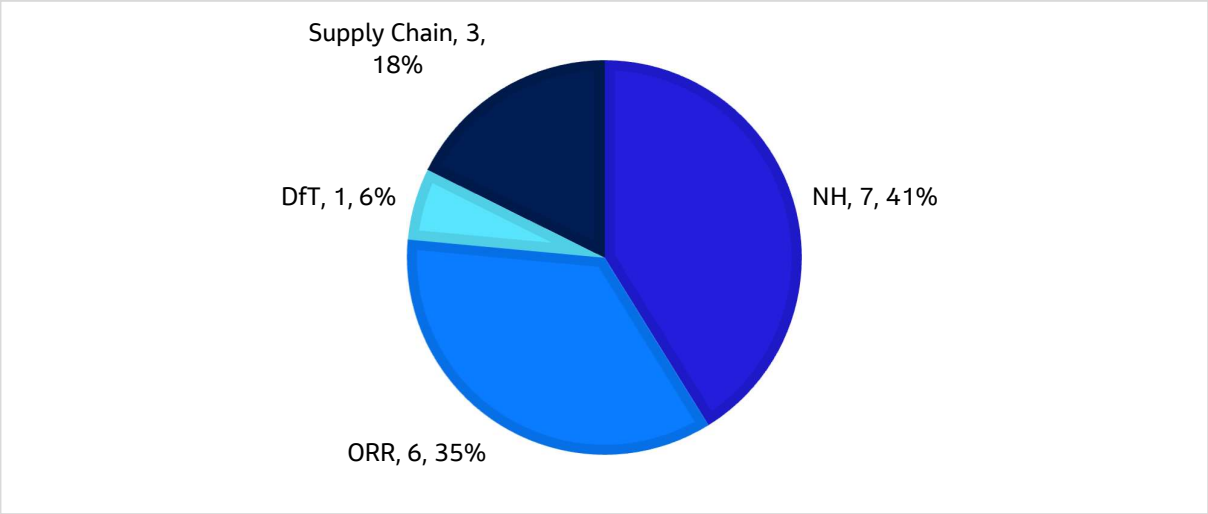
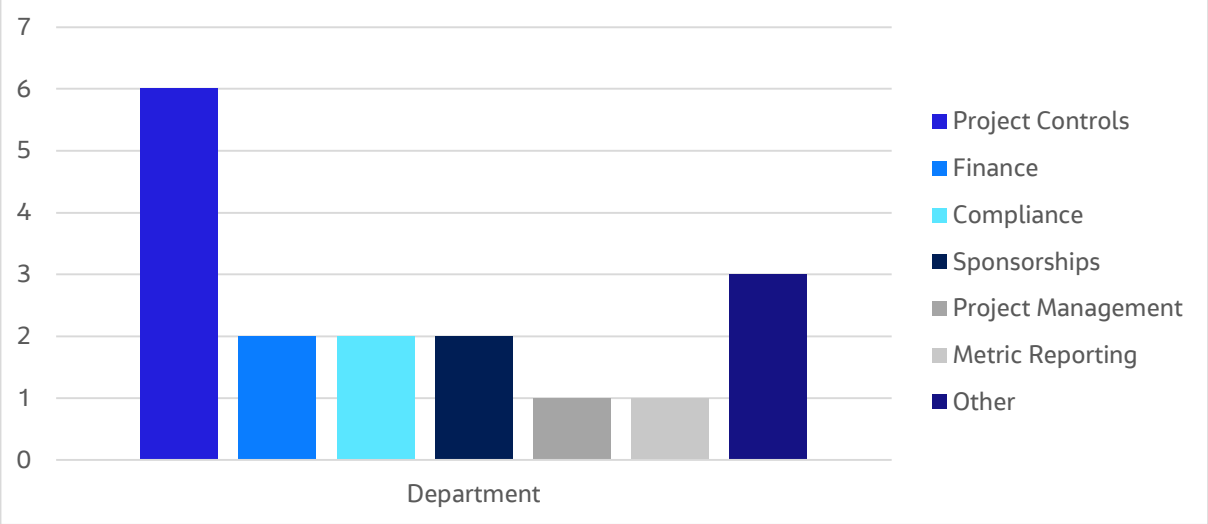


Figure 27: Pre-engagement Survey 1 Q2 - What is your main role within the organisation?



Section 2 – 'Understanding the use of the EV metrics'

The purpose of Section 2 was to gain an understanding of aspects of EV measuring and reporting that stakeholders perceive positively, aspects that stakeholders feel need to be improved, the scale of internal assurance undertaken in measuring/reporting of EV metrics, and how the current EV metrics influence stakeholder organisations' decision making. As such, this section comprised of four questions (Question 4 to Question 7).

Question 4: *'Do you agree or disagree with the following statements?'*

In this question, respondents were asked to state if they strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, strongly agree, of if the following statements were not applicable to their role within their organisation:

- 'I find EV metrics useful in forecasting project performance',

- 'I have confidence in the accuracy of EV metrics',
- 'I feel EV metrics are well understood across my organisation',
- 'The EV metrics are easy to report on',
- 'Reporting on the EV metrics is time consuming',
- 'The process is automated', and
- 'Accurate data is easy to obtain'.

Responses to this question were required. As such, 18 responses to this question were received.

Question 5: ***'Please provide justification for your response to Question 4, including the level of internal assurance on the accuracy of the EV metrics.'***

In this question, respondents were asked to provide justification for their responses to Question 4. Responses to this question were not required. Therefore, 15 responses were received.

Question 6: ***'How does your organisation use the EV metrics for decision making?'.***

In this question, respondents were asked to specify the types of decision informed by EV metrics and how EV metrics influence their decision making. The following response options were provided:

- 'Supplier decisions',
- 'Management decisions',
- 'Understanding progress',
- 'Driving efficiency',
- 'Understanding risks',
- 'I do not know',
- 'Other' (respondents were able to provide free-flowing text as an alternative response).

Responses to this question were required. As such, 18 responses to this question were received.

Question 7: ***'What, if any, issues do you currently find with the Earned Value measurements?'.***

Finally, respondents were asked to identify and provide detail on any issues they currently have with EV measurements, with the following response options provided:

- 'They provide retrospective indication (lagging PI),
- 'They are too aggregated at portfolio level',
- 'They are not accurate/robust enough',
- 'There is discrepancy between baseline and contract positions',
- 'They do not provide a clear picture in isolation',
- 'They are not used as part of a wider set of indicators',
- 'There are not issues and they work as intended to measure project performance', and
- 'Other' (respondents were able to provide free-flowing text as an alternative response).

Responses to this question were required. Therefore, 18 responses to this question were received.

Section 3 - 'Looking to the future of PI metrics'

The purpose of this section was to ascertain the behaviours that stakeholders want EV metrics to drive within their organisations, the supplementary measures stakeholder organisations would like to see introduced, and how stakeholders feel EV measurements need to be changed or improved for performance measurement in RP2 and RP3. As such, this section comprised of three questions (Question 8 to Question 10).

Question 8: '*What behaviours would you like to see incentivised by such PIs? (Please add single words separated by commas)'.*

In this question, respondents were asked to state the behaviours they want potential PIs to incentivise within their organisation. Responses to this question were not required. Therefore, 14 responses to this question were received.

Question 9: '*What supplementary measurements would be of use to your organisations?'.*

In this question, respondents were asked to provide details of the supplementary measurements that would be of use to their organisation. Responses to this were in long-form free text, meaning respondents were able to provide as much detail as they saw fit.

Responses to this question were not required. Therefore, 13 responses to this question were received.

Question 10: *'What do you feel needs to be changed or improved for performance measurement in RP2 and RP3?'*

In this question, respondents were asked to provide details of changes or improvements to PI metrics in RP2 and RP3. Responses to this were in long-form free text, meaning respondents were able to provide as much detail as they saw fit.

Responses to this question were not required. Therefore, 17 responses to this question were received.

Section 4 – 'Final thoughts'

The purpose of this section was to provide respondents with an opportunity to provide any further insights into the current form of EV metric measuring and reporting, and any suggestions/considerations for improvements to them in the future. As such, this section comprised of one question (Question 11).

Question 11: *'Please provide any further comments, suggestions and considerations'.*

In this question, respondents were asked to provide any further comments, suggestion and considerations related to EV metrics that may, or may not, have been covered in the previous sections.

Responses to this question were not required. Therefore, 6 responses were received.

Pre engagement questionnaire 2

The pre-engagement questionnaire for Workshop 2 comprised of 14 questions split into three sections:

- **Section 1 -** *'You and your role'*,
- **Section 2 -** *'The relationship between EVM and outcomes, in particular efficient delivery'*, and
- **Section 3 -** *'Looking to the future of PI metrics'*.

Overall, 13 responses to the questionnaire were received, 6 of which were from ORR, 5 from NH, 1 from DfT, and 1 from the supply chain. The subsections below provide greater detail of the questions within each section.

Section 1 - 'You and your role'

The purpose of Section 1 was to ascertain the organisation that respondents work for, their role within their organisation and whether their role uses EV metrics. As such, this section comprised of three questions (Question 1 to Question 3). Responses to all questions within this section were required, meaning 18 responses were received for each question.

Question 1: *'Please provide the organisation that you work for'*.

Respondents were asked to specify the organisation that they work for.

Question 2: *'What is your main role within the organisation'*.

Respondents were asked to specify their role within the organisation.

Question 3: *'Do you use EV metrics in your role?'*.

Respondents were asked to specify if they use EV metrics in their role.

Figure 28: Pre-engagement Survey 2 Q1 – What organisation do you work for? Sample Size N=13

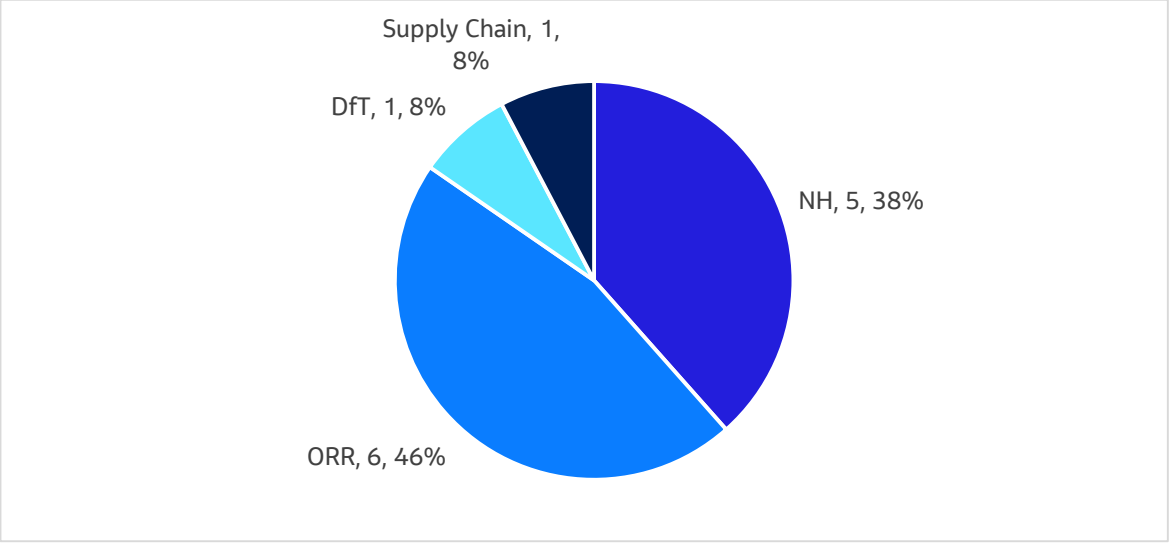
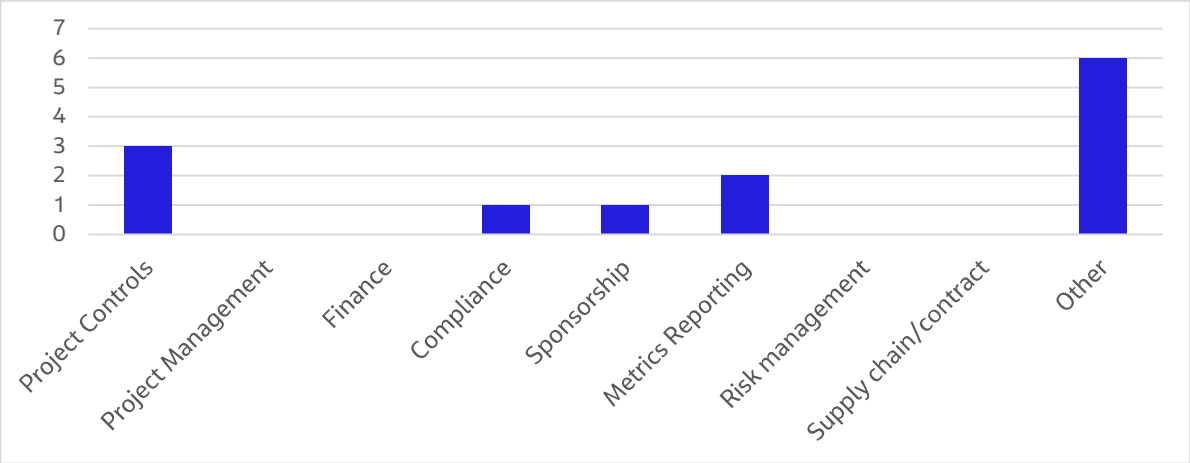
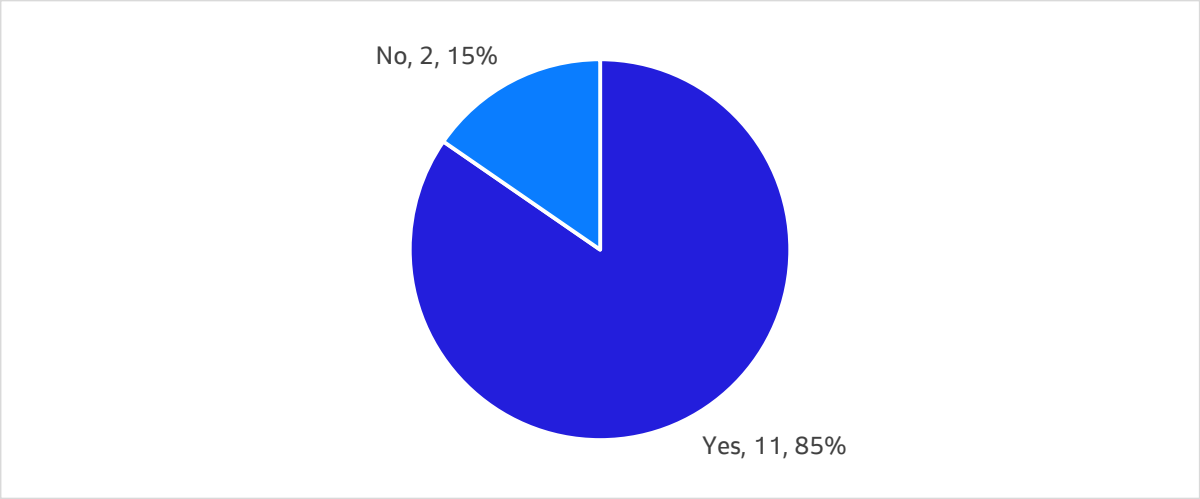


Figure 29: Pre-engagement Survey 2 Q2 – What is your main role within the organisation?



Other: Cost management, Engineer, Monitoring NH at programme/ portfolio / strategic level, Asset management, Performance monitoring, Monitoring

Figure 30: Pre-engagement Survey 2 Q3 – Do you use EV metrics in your role?



Section 2 - 'The relationship between EVM and outcomes, in particular efficient delivery'

The purpose of Section 2 was to determine the outcomes and objectives that stakeholders want to measure, incentivise and achieve, to establish the relationship between EVM and outcomes (with a focus on their relationship with efficient delivery), and to determine information/data that aids in understanding the relationship between EVM and efficiency. As such, this section comprised of six questions (Question 4 to Question 9).

Question 4: *'Please rank the following outcomes and objectives in terms of what you want to measure and achieve'*.

Respondents were asked to rank the following outcomes and objectives in terms of what they want to measure or achieve:

- Delivery to budget,

- Delivery to schedule,
- Delivery to scope,
- Efficiency,
- Achieving economic benefits,
- Achieving environmental benefits,
- Achieving health and safety standards,
- Other

Responses to this question were required. Therefore, 13 responses to this question were received.

Question 5: ***'If there is an 'Other' outcome or objective you would like to measure or achieve, please specify.'***

Respondents were asked to specify the 'Other' outcome or objective they would like to measure in their response to the previous question.

Responses to this question were not required. As such, 5 responses to this question were received.

Question 6: ***'Do you agree or disagree with the following statements?'***

Respondents were asked if they strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, or strongly agree with the following three statements:

- 'There is a clear relationship between EVM and performance outcomes',
- EVM clearly supports the measurement of efficient delivery', and
- EVM is just one of multiple metrics needed to understand performance.

Responses to this question were required. As such, 13 responses to this question were received.

Question 7: ***'What information supports understanding the relationship between EVM and efficiency? Please rank the following:'***

Respondents were asked to rank to the following six sources of information that aid in understanding the relationship between EVM and efficiency:

- Context/narrative,
- Cost and schedule variance (ETC/EAC),
- Wider measures,
- Timeseries performance,
- Efficiency log, and
- Other.

Responses to this question were required. As such, 13 responses were received.

Question 8: ***'If there is an 'Other' source of information that support understanding the relationship between EVM and efficiency, please specify.'***

Respondents were asked to specify the 'Other' source of information that helps support their understanding of the relationship between EVM and efficiency.

Responses to this question were not required. As such, 4 responses were received.

Question 9: *'Please provide any further comments or justifications.'*

In this question, respondents were asked to provide any further comments or justifications related to their responses to Questions 4 to 9, or any wider comments related to Section 2.

Responses to this question were not required. As such, 4 responses were received.

Section 3 - 'Looking to the future of PI metrics'

The purpose of Section 3 was to establish stakeholders' desire to extend EV metrics to development and renewal programmes, and to ascertain any challenges faced in the process. As such, Section 3 comprised of 5 questions (Question 10 to Question 14).

Question 10: *'Do you agree or disagree with the following statements?'*

Respondents were asked if they strongly disagree, disagree, neither agree nor disagree, agree or strongly agree with the following three statements:

- 'Extending EVM to development phase would be useful.',
- 'Extending EVM to renewal programmes would be useful.', and
- 'EVM is best kept focused on enhancements in construction.'.

Responses to this question were required. As such, 13 responses were received.

Question 11: *'What barriers do you see to extending EVM to development phase?'*

Respondents were asked to specify what barriers they foresee in extending EVM to development phase, and given the following options:

- Schedule is driven by external factors (such as DCO),
- Not enough maturity on the scope of options,
- Cost level is lower during development phase, so may not be proportionate,
- Outputs may be more subjective at development phase,
- Data is not available and/or is low quality,
- Additional resources would be required to extend to development,
- Baseline is less clearly defined,
- Already covered by other indicators, and
- Other (free text response).

Responses to this question were required. As such, 13 responses were received.

Question 12: *'What issues do you foresee for extending to renewal programmes?'*

Respondents were asked to specify what barriers they foresee in extending EVM to renewal programmes, and given the following options:

- Schedule is driven by external factors,
- Not enough maturity on the scope,

- Cost level is lower for renewal projects so may not be proportionate,
- Outputs may be more subjective for renewal projects,
- Data is not available and/or is low quality,
- Additional resources would be required to extend to renewal projects,
- Baseline is less clearly defined,
- Already covered by other indicators, and
- Other (free-text response).

Responses to this question were required. As such, 13 responses were received.

Question 13: ***'Is there value in extending EV to other areas of the portfolio, and where should EV be extended to?'***

Respondents were asked to clarify if there is value in extending EVM throughout the portfolio, and where they should be extended to.

Responses to this question were required. As such, 13 responses were received.

Question 14: ***'Please provide any further comments or justifications'***

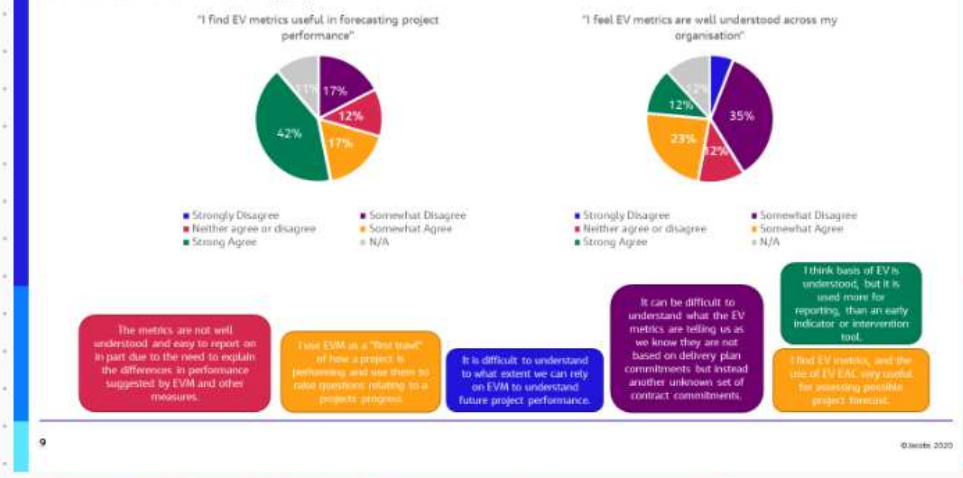
In this question, respondents were asked to provide any further comments or justifications related to their responses to Questions 10 to 13, or any wider comments related to Section 3.

Responses to this question were not required. As such, 5 responses were received.

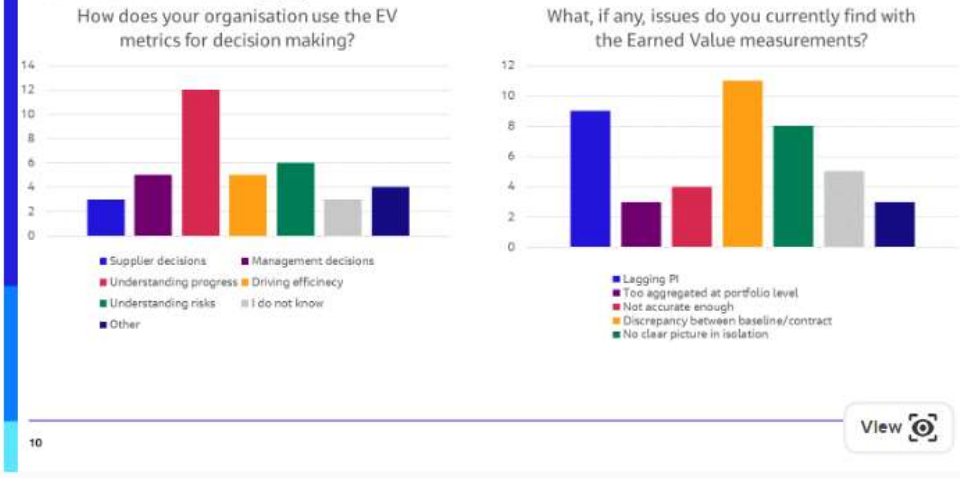
Appendix B. Raw data from workshop 1

Usefulness of EV metrics

Stakeholder Survey Results
Usefulness of EV metrics (1/2)



Stakeholder Survey Results
Usefulness of EV metrics (2/2)

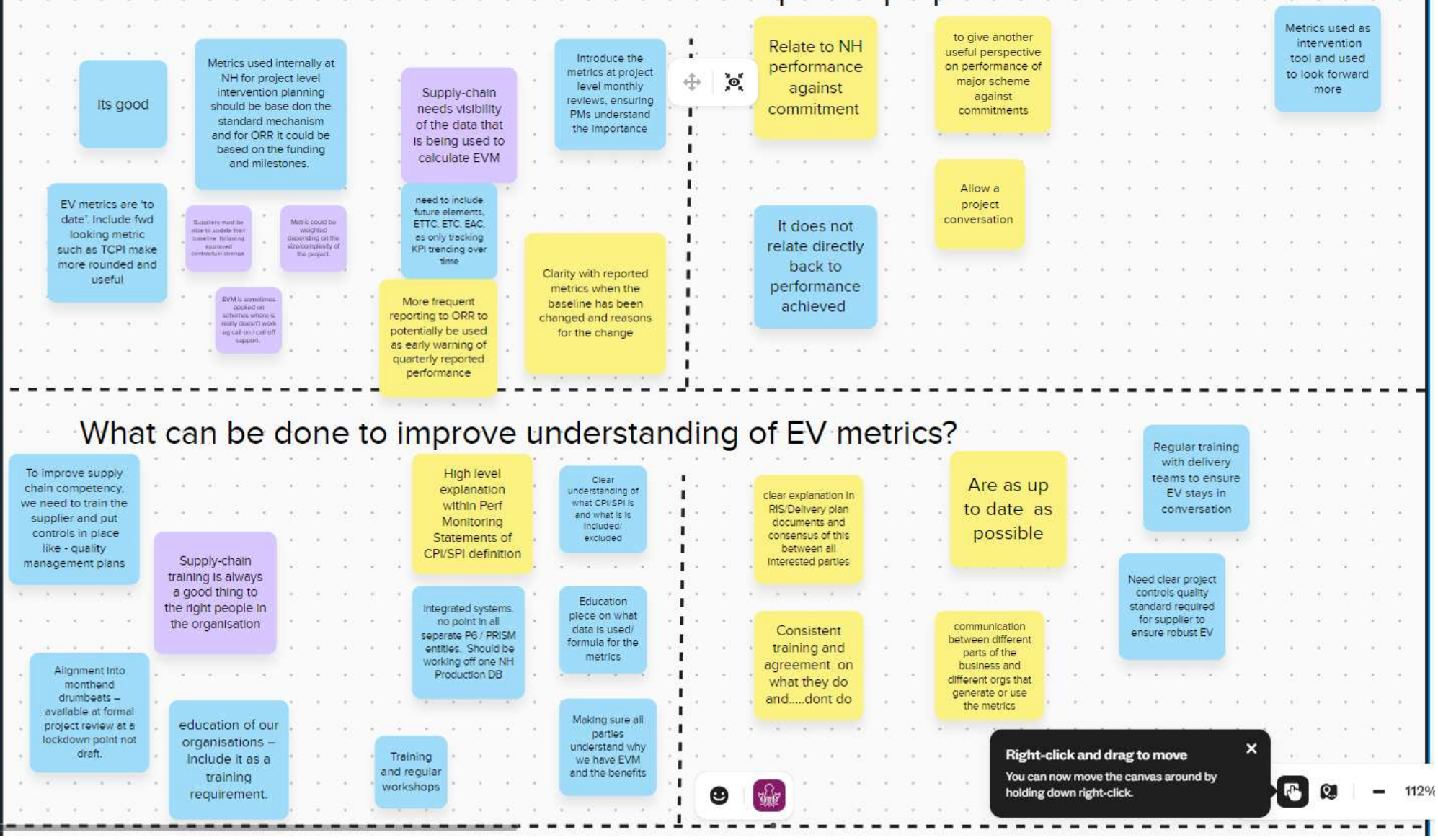


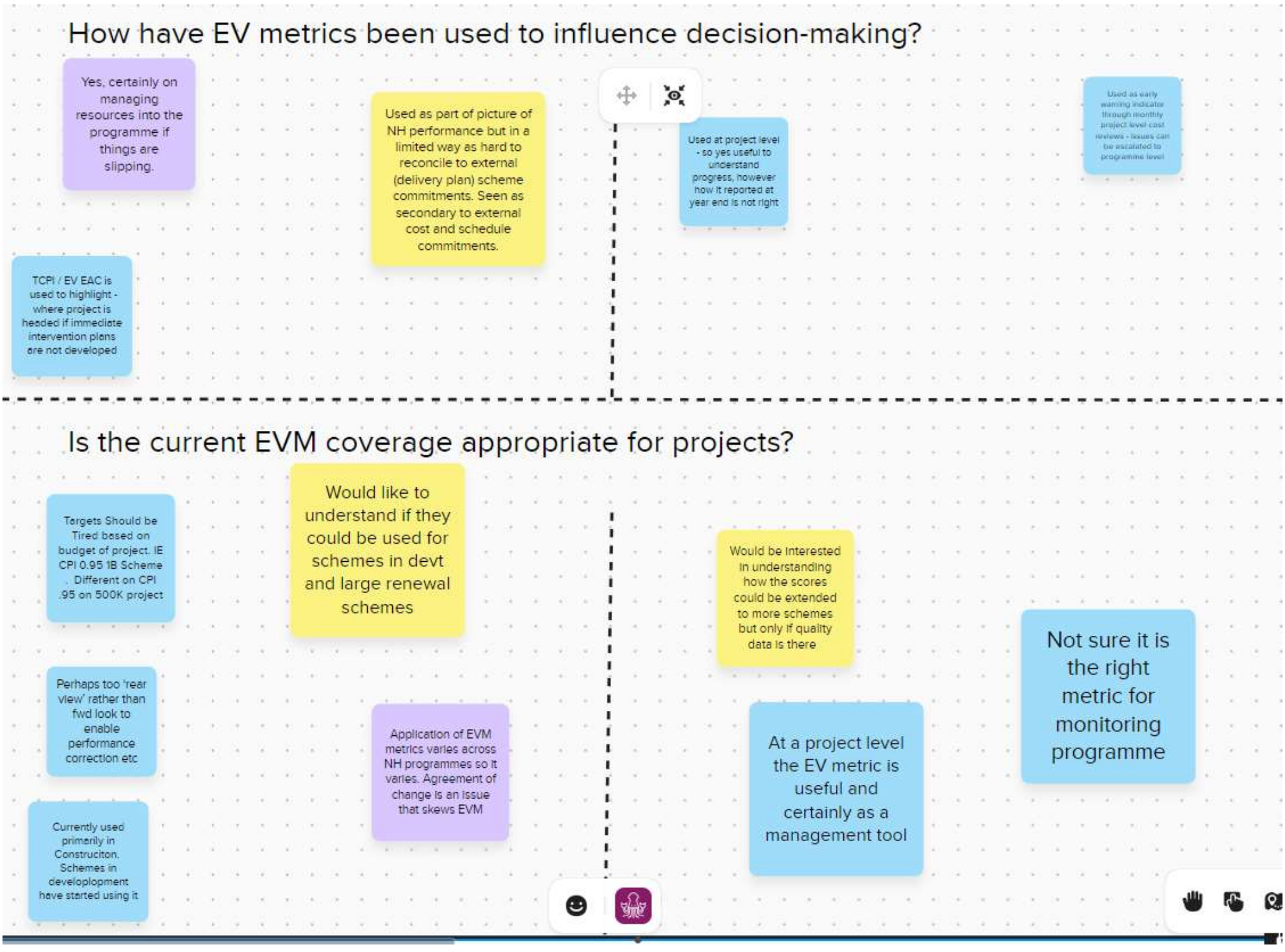
Stakeholder Survey Results - Changes and Improvements

- An understanding of what it means and what use it plays to projects and upwards. Use of prospective metrics to understand positions based on current trends. Alignment of systems to rely on the data coming out
- Better alignment of the suppliers EVM measures and those of the client organisation. e.g EVM measures progress against RP2/3 commitments
- A need for clarity over alignment with other reporting measures and in particular the impact on EVM of formal change to external cost and schedule baselines.
- Clear reporting requirements, potentially requiring reporting over a wider set of schemes (at this point with it only being schemes in construction it can a very small subset)
- A performance measurement should be used to drive a certain type of behaviour and not just to measure progress to date. A metric should seek the root cause of any "good" or "poor" results in order to either improve or replicate best practice elsewhere
- RP2 - re- assessing the baseline RP3 - add in EV in to all contracts and more training rolled out for monitoring and managing

Right-click and drag to move

How can the metrics be made more useful for specific purposes?




How have EV metrics been used to influence decision-making?
Yes, certainly on managing resources into the programme if things are slipping.
Used as part of picture of NH performance but in a limited way as hard to reconcile to external (delivery plan) scheme commitments. Seen as secondary to external cost and schedule commitments.
Used at project level - so yes useful to understand progress, however how it reported at year end is not right
Used as early warning indicator through monthly project level cost reviews - issues can be escalated to programme level
TCPI / EV EAC is used to highlight - where project is headed if immediate intervention plans are not developed
Is the current EVM coverage appropriate for projects?
Targets Should be Tired based on budget of project. IE CPI 0.95 1B Scheme . Different on CPI .95 on 500K project
Would like to understand if they could be used for schemes in devt and large renewal schemes
Would be interested in understanding how the scores could be extended to more schemes but only if quality data is there
Not sure it is the right metric for monitoring programme
Perhaps too 'rear view' rather than fwd look to enable performance correction etc
Application of EVM metrics varies across NH programmes so it varies. Agreement of change is an issue that skews EVM
At a project level the EV metric is useful and certainly as a management tool
Currently used primarily in Construciton. Schemes in developlopment have started using it

Complementary or substitute measures for EV

Stakeholder Survey Results:

Complementary or substitute measures for EV

What behaviours would you like to see incentivised by PIs?

What supplementary measurements would be of use to your organisation?

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Stakeholder Survey Results - Changes and Improvements

- In RP3, there's a desire for supplementary metrics that offer a more objectively measurable assessment.
- Forecasted performance.
- The measure need to change.
- Using forecast EVM metrics such as ETTC (Estimate time to Complete) to show where the project will complete

What leading indicators would you propose?

ETTC, TCPI, EV EAC possibly as Interim monitoring tool

ETTC and EAC

Indicators that can be used to replace or supplement efficiency evidence used in reporting against the efficiency KPI

EV Metrics which reflect NH committments, not just contractual supplier level

Use EV to lookforward more instead of to date position.

something that removes the disconnect from NH commitments and contractual commitments

What is on the menu?

Agree ETC / EAC is an alternative.

Projected CPI / SPI could work.

Indicators that reflect and change with changes to external commitments (delivery plan)

What other metrics would you like to see?

supplement with the absolute values as well? Indexes are fine, but dilutes the focus

Baseline Management Metric applied

Data quality indicators

need to understand what information/data is available and that gives a better idea of what is possible

More outputs from EV analysis beyond just metrics

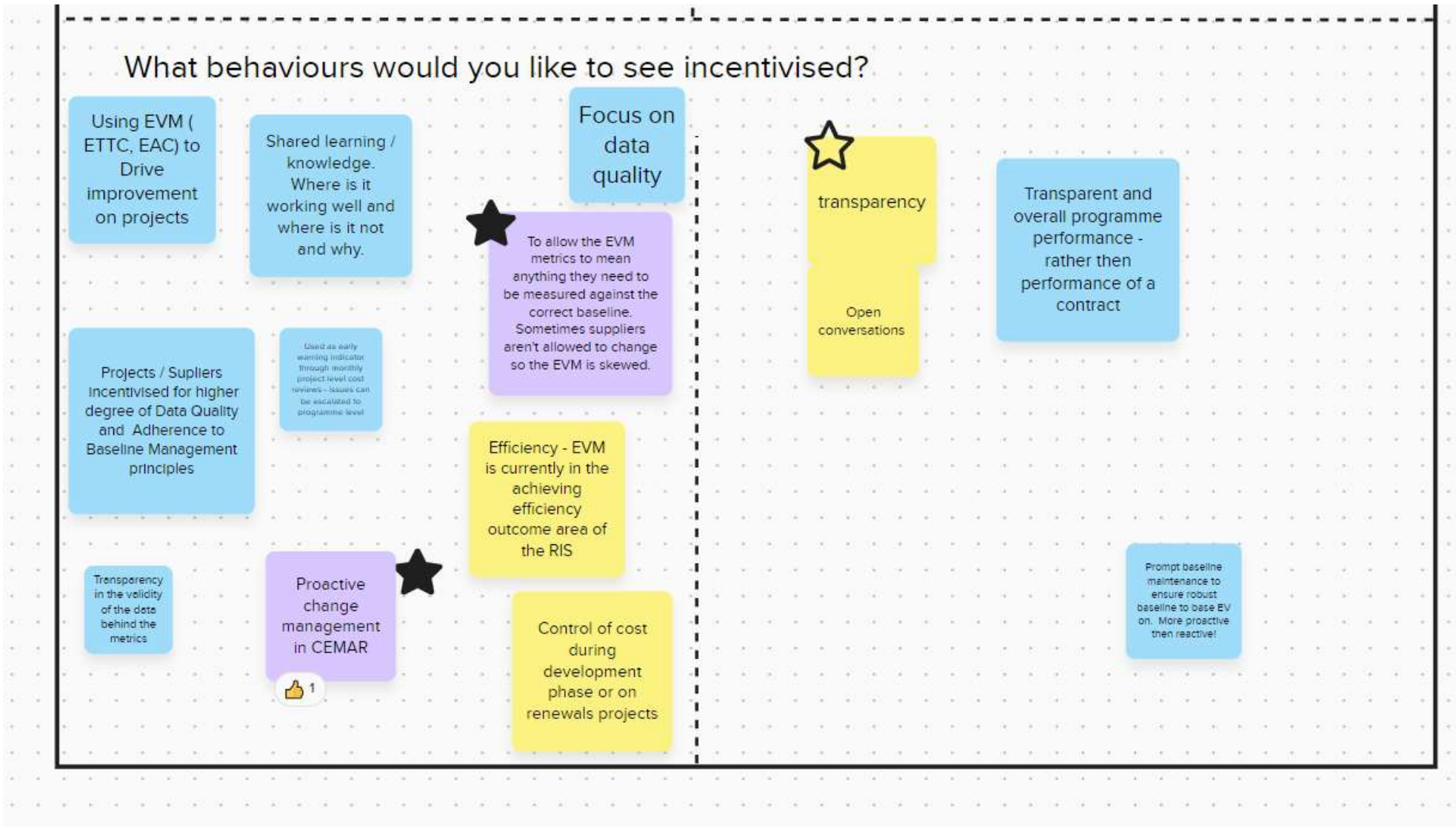
Supply Chain

unsure but need to have a perf metric that provides info of NH perf

Plan Percentage Complete

Use of PPC's like we use in collaborative planning

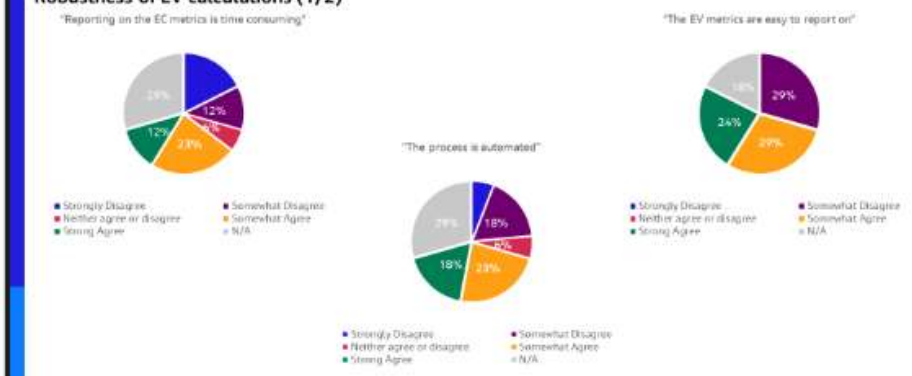
Prefer simpler metrics that are easy to absorb message


What behaviours would you like to see incentivised?
Using EVM (ETTC, EAC) to Drive improvement on projects
Shared learning / knowledge. Where is it working well and where is it not and why.
Focus on data quality
To allow the EVM metrics to mean anything they need to be measured against the correct baseline. Sometimes suppliers aren't allowed to change so the EVM is skewed.
transparency
Transparent and overall programme performance - rather then performance of a contract
Open conversations
Projects / Supliers Incentivised for higher degree of Data Quality and Adherence to Baseline Management principles
Used as early warning indicator through monthly project level cost reviews - issues can be escalated to programme level
Efficiency - EVM is currently in the achieving efficiency outcome area of the RIS
Transparency in the velicity of the data behind the metrics
Proactive change management in CEMAR
1
Control of cost during development phase or on renewals projects
Prompt baseline maintenance to ensure robust baseline to base EV on. More proactive then reactive!

Robustness of the calculations

Stakeholder Survey Results:

Robustness of EV calculations (1/2)



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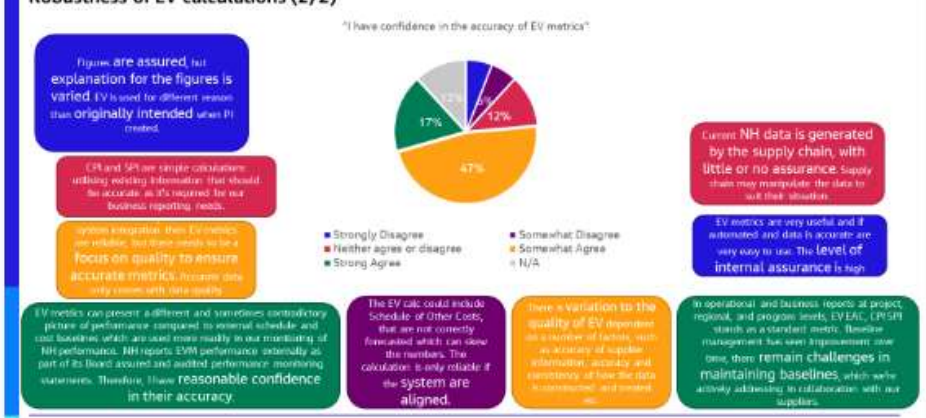
Stakeholder Survey Results:

Robustness of EV calculations (2/2)



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Stakeholder Survey Results - Changes and Improvements

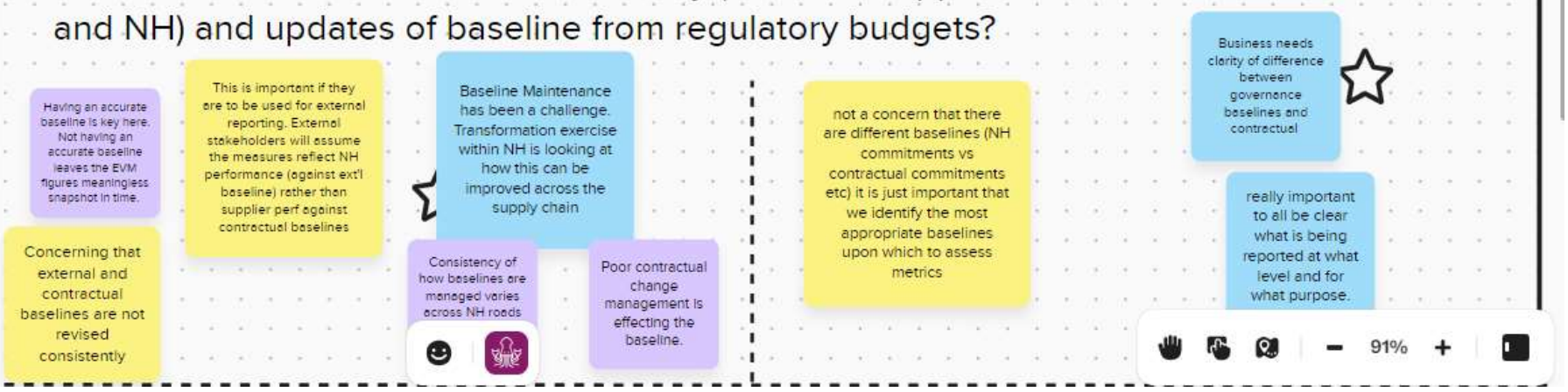
- Clarifications of baselines we measure against - communicated through the business. Greater impacts to supplier to do performance issues
- Clear links between EVM metrics and other reporting milestones, baselines etc
- NH to own the data and add assurances on the suppliers data.
- Allow for an accurate baseline & allow for contractual change throughout the project lifecycle.

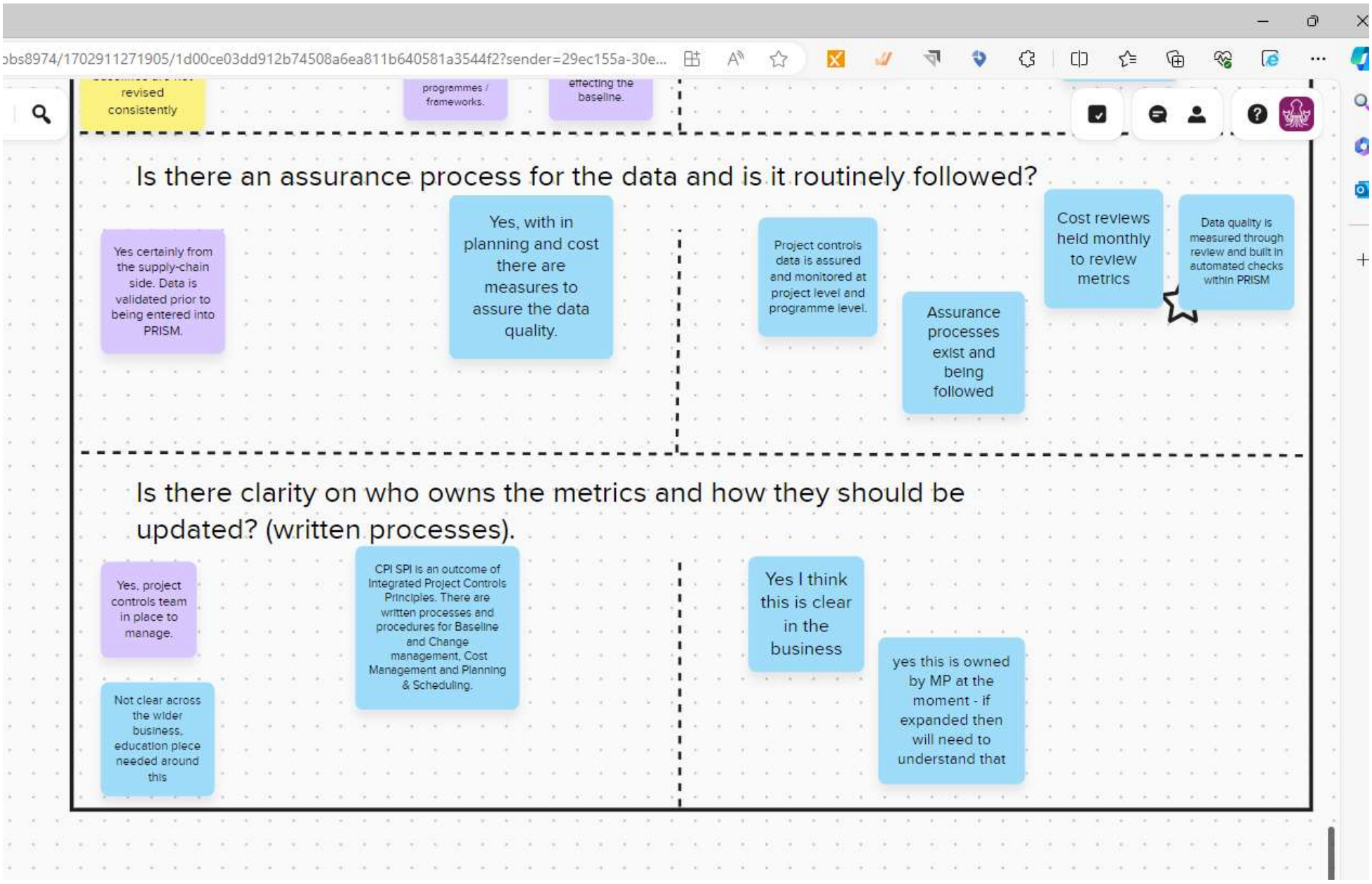
•NH to own the data and add assurances on the suppliers data.
•Allow for an accurate baseline & allow for contractual change throughout the project lifecycle.

How might we improve the accuracy of the data reported?

Are deadlines and data requests manageable?

Concerns or not on baseline consistency (between suppliers and NH) and updates of baseline from regulatory budgets?




revised consistently
programmes / frameworks.
effecting the baseline.
Is there an assurance process for the data and is it routinely followed?
Yes certainly from the supply-chain side. Data is validated prior to being entered into PRISM.
Yes, with in planning and cost there are measures to assure the data quality.
Project controls data is assured and monitored at project level and programme level.
Assurance processes exist and being followed
Cost reviews held monthly to review metrics
Data quality is measured through review and built in automated checks within PRISM
Is there clarity on who owns the metrics and how they should be updated? (written processes).
Yes, project controls team in place to manage.
Not clear across the wider business, education piece needed around this
CPI SPI is an outcome of Integrated Project Controls Principles. There are written processes and procedures for Baseline and Change management, Cost Management and Planning & Scheduling.
Yes I think this is clear in the business
yes this is owned by MP at the moment - if expanded then will need to understand that

Appendix C. Raw data from workshop 2

Relationship between earned value metrics and outcomes - in particular efficient delivery

The Relationship between EVM and Outcomes (1/2)

- Strong agreement that the primary objectives include:
  - Delivery to budget and schedule
- Mid-tier objectives include:
  - Scope and Efficiency
  - Achieving economic benefits
- Other recommended outcomes include early warnings and intervention management and planning.

Efficient delivery by company across its delivery programmes is important

Provide early warning for project delivery

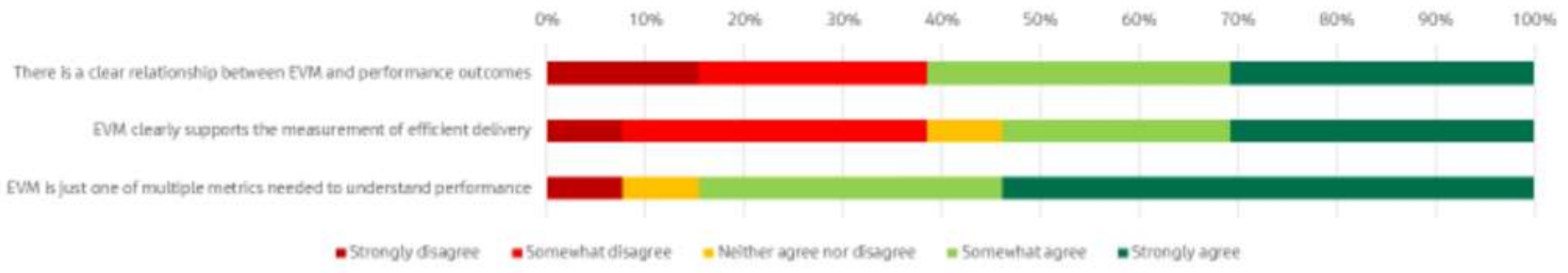
As part of the process NH uses EV reports at project and programme level to trigger Intervention Plan with the supplier with an objective to achieve the above.

Outcome - EVM is used as a leading indicator for Intervention Management

4

Right-click and drag to move
You can now move the canvas around by holding down right-click.

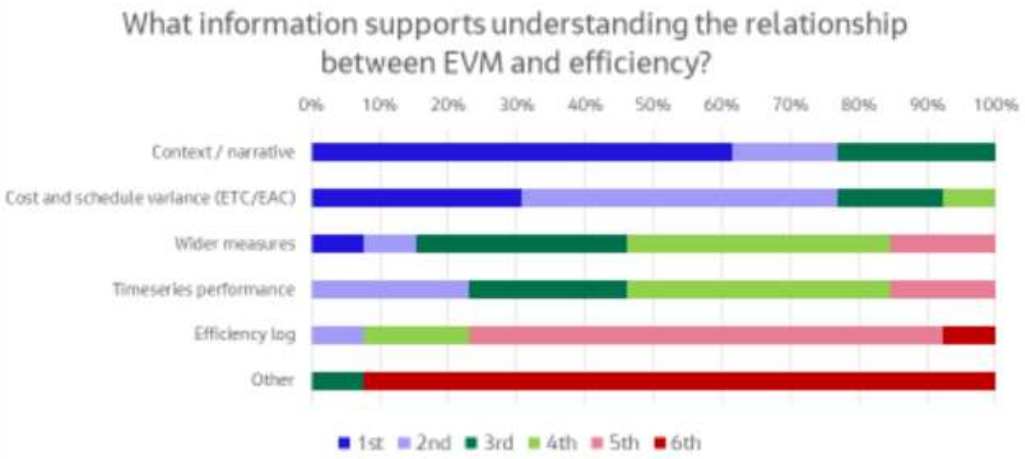
The Relationship between EVM and Outcomes (2/3)



- Neutral view on the relationship between EVM and performance outcomes
- Neutral view on if EVM supports the measurement of efficient delivery
- Strong agreement that EVM is just one of multiple metrics needed to understand performance

5

The Relationship between EVM and Outcomes (3/3)



- Main information to support the relationship between EVM and efficiency is is context and narrative.
- Cost and schedule variance (ETC/EAC) is 2nd most important.
- Suggest that majority of individuals are interesting in the top-level figures and narrative.
- Other notes include:
  - Importance for teams to understand how to use EVM & other metrics to drive the right performance and conversations to improve efficiency.
  - The need to understand the cost of establishing and reporting EVM

In addition to the basic EV metrics , we use TCPI based on EAC and Budget, EV based EAC, Required saving on remaining value, Forecasted saving on remaining value (vPMB)

If it's not in the wider narrative or variance analysis, would have to consider use of central risk funding too

Could include factors outside the suppliers sphere of influence that affect EVM

there is no direct relationship with EVM and efficiency target. EVM is a management tool used by MP to track delivery to cost and schedule as planned.

Under 'Wider Measures' - National Highways also use LEI, BEI & PPC Metrics.

How well does EVM help you achieve your performance measures? What else can complement EVM in terms of performance?

tool for project mgt but not necessary for regulatory measure

improvement in use, but is it really the right perf indicator

EVM is often first predictor of the need to intervent and focus on mitigation

unreliable data

Not very well at the moment. But it could be useful if the process of collecting and reporting is regulated well, i.e. consistency of collecting and reporting

LEI,BEI, PPC & Performance Outputs i.e. Productivity

EVM being a cumulative measure to date should be considered alongside other measures. Tested alongside metrics from other disciplines, LEIs, BEIs, financial performance metrics etc. TCPI and a hold look is also useful

Understanding the importance of measuring against different baselines for different outputs

Due to the difference to external schedule/ baseline it can cause unclear picture of performance

Part of the outcome and to be used with programme and oft commitment, it should encourage a conversation

Early Indicator if used correctly

very well, brings schedule and cost together. forecasts outcome on funds and time in a do nothing scenario

needs to be supported by appropriate context, narrative and conversation to understand how the values show performance

EVM works well at Programme and Project Level. Portfolio level is limited because of the range of other KPI's that apply.

Compromised by Sustainability costs which tend to be higher unless linked to a do nothing option

Instructive that EVM is used to raise risk / interventions with suppliers - as it's a RIS performance metric should presumably do the same for RIS-related performance (ie against delivery milestones and efficiency targets)

If it is to be applied at Programme or Portfolio level it needs to be viewed alongside a number other performance indicators and over a longer period to "smooth any large variances"

Think it's already been discussed before but different baselines limit usefulness in understanding efficiency (target) performance

Whilst lagging, it can provide an indication of early trends and as a result help to resolve any issues

Is EVM a good measure for efficient delivery? And what else could complement EVM in terms of efficient delivery?

Very good PM tool for delivery as long as other delivery baseline data points (i.e. Information Specification & Risk) are given equal weighting

Any measure will need to be reliable and robust. All measures are subject to poor data quality, therefore we should focus on process improvements as well as simply replacing type of measure.

There is a significant lag in reporting schedule/ cost performance externally. So EVM reporting can be used to give early warning but there may be better alternative measures

In its current format, PiPi is reporting on interim baselines. If we need to continue reporting EV we would need to switch to baselines agreed with DfT

link is not clear to me how EVM measures efficient delivery especially as not linked to delivery plan commitments out to contractual commitments

Narrative, and other Performance Metrics, LEI, PPC etc.

For major projects (where EVM is used) the main way of reporting efficiency (against target) is cost against an efficient cost baseline. EVM should be a useful forward indicator for that.

I don't think it's a good measure of efficient delivery. It's a measure of the minimal expectation...

Are there any tensions between EVM and other performance measures, and if so what are they?

Timely Change Management is Key to ensure Robust EV Outputs

not really sure EVM is linked with other KPI/PI. the issue is what baseline is EVM being reported

its really important that people are on same page when us on renewals are discussed

Not tensions with other PI/KPIs but tension with external reporting of performance against schedule and cost baselines

not currently clear on link between EVM and other performance measures so couldn't comment on tensions that exist/do not exist

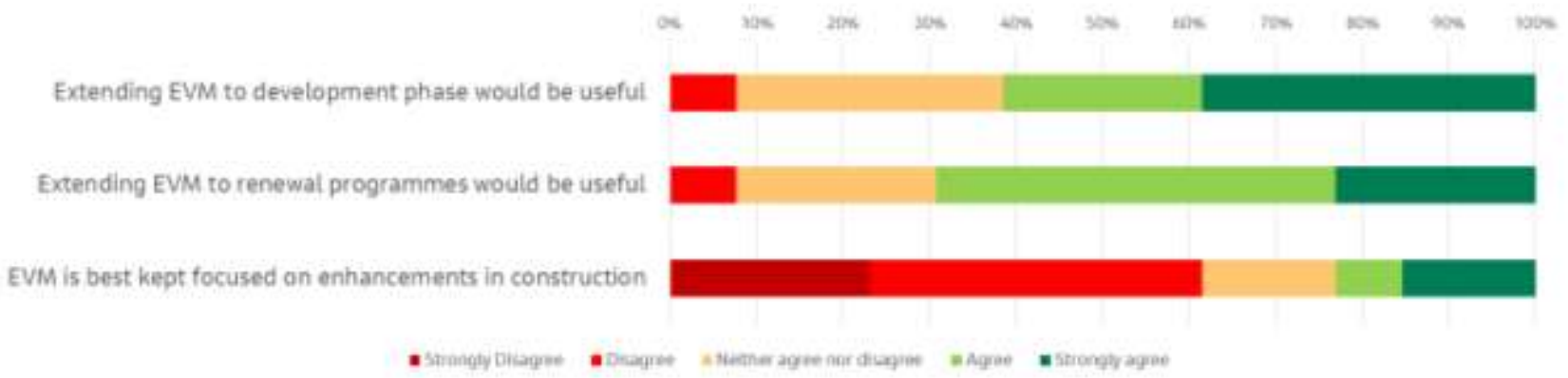
Data Quality, Process compliance (Baseline and Change Control)

Cost-cutting on scope / quality instead of driving "actual" efficiency?

Conservative project managers are unlikely to declare successes too early...i.e. keeping everything at "1.0"

Extending the earned value to development and renewal programmes

Extending the EV metrics to development and renewal programmes (1/4)



- There is a majority consensus that it would be useful to extended EVM to both renewal programmes and development phase.
- On the contrary majority disagree that EVM is best kept focused on enhancements in construction.

EV is valuable on all forms of projects, however if assessment of EV requires additional resource then cost to value would need to be assessed. Many projects in MP work on lump sum contracts where EV is less valuable as no mitigation impacts cost.

I believe Construction, Development and larger renewal projects are the 3 Key areas to focus on for now.

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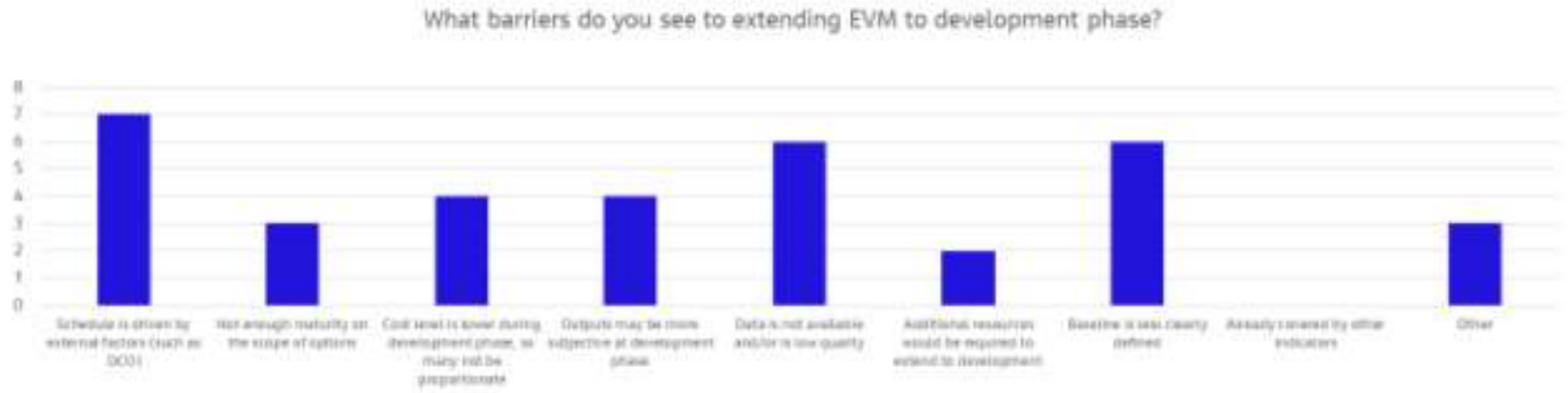
Extending the EV metrics to development and renewal programmes (2/3)



- Main barrier identified is that the schedule is driven by external factors
- There is also a large concern about the quality and availability of data, as well as if the baseline is clearly defined or not

EV is used in development stage for cost control and project reporting. However, EV does not contribute much in the initial stage of the project, as it is influenced by external factors.

EV should be applicable to all NH portfolios in all PCF phases.

8

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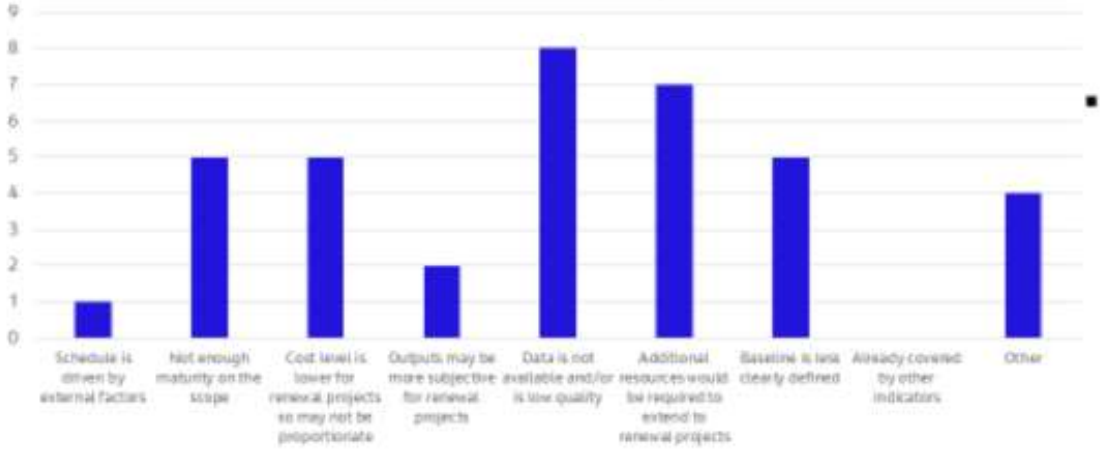
Extending the EV metrics to development and renewal programmes (3/3)



- Large concern for both renewals and development programmes is the availability and quality of data
- Concern about the additional resources required to extend EVM and whether there is value add in all cases

This is something worth exploring in RIS3 rather than introducing.

I think there could be value extending EV to renewals given the increasing size of the renewals programme in RIS3

If data exists and is robust then there would be value in extending further, however it is unclear what data NH has and what capacity it realistically has to extend EV

The greatest potential is in large scale renewal schemes which in some case are larger than major schemes

Extending to renewals need not mean all renewals - could focus on projects that are most like enhancements in their scale. The main aim of extending EV to earlier stages of development would be to report more clearly on progress (ie rather than just the SoW milestone date). Should consider how that could best be achieved rather than assuming the answer is EV metrics (which it might be!)

9


Workshop Session Part 2
what barriers do you foresee to the extension of EV to the development phase and how can they be overcome.
none
External Factors DCO JRs
Processes and systems are in place already so minimal barriers to implementation.
Timing of when to apply "EV in Development is key - Need to be close to final Option
design teams try to hide away from underperformance that EVM would shine a light on
Difficulty in measuring progress to get accurate SPI
Difficult to implement on multiple options
NH may have less control over schedule and cost in this phase due to external factors impacting cost and schedule. Other metrics may handle this better?
What do the supply chain use use to measure performance in relation to turnover earned from projects % complete. If they can make a profit from this surely this is worth considering.
EV needs to be measured against contract values not funding
Impact of development phase spend / activity on total cost is probably of more interest than progress through the dev phase (at least from an efficiency perspective) - could be other ways to report / flag risks around progress towards SoW
What issues do you foresee to the extension of EV to renewal programmes? How can they be overcome?
Education of personnel & data quality would need to be driven up
Renewals currently does not use EV. There is a substantial effort required to establish and implement, we need to consider the cost of implementation and value add
Additional resource, but could arguely be offset from outputs of EV
Renewals currently does not use EV in any form and would be huge change to roll out and embed
availability of data/resource/ appetite to undertake this work
Resources and Change Control during Option selection
where to draw the line - which renewals to extend reporting to based on size/ scope?
Could be resource hungry on small renewal projects
Needs to. Be proportionate
Not applicable to all PI's at Programme and Portfolio level
Need to be proportionate - focus on "big" renewals
In my experience, the "work" to calculate EVM for projects is primarily (if not completely) done based on PM software such as Oracle, etc. So, rolling it out to renewals projects shouldn't be a major issue
How would you prioritise the choice of extensions and are there any other areas you would like to extend EV to?
1st Construction 2nd Development 3rd Renewal
From external reporting purposes, We need to assess if EV needs to be reported against Contracted values and dates (as it is currently) or Funding / Delivery Plan commitments as agreed in the Capital Baseline with DfT
Need to understand what baseline data points need to be measured before deciding whether EV is the right thing to use
(from RIS reporting perspective) would prioritise alignment for construction phase first
and then in terms of widening the coverage of EV - think first about what's needed (for NH to manage projects and RIS reporting separately) and if EV can o that. Rather than uming expanding EV erage is the answer