

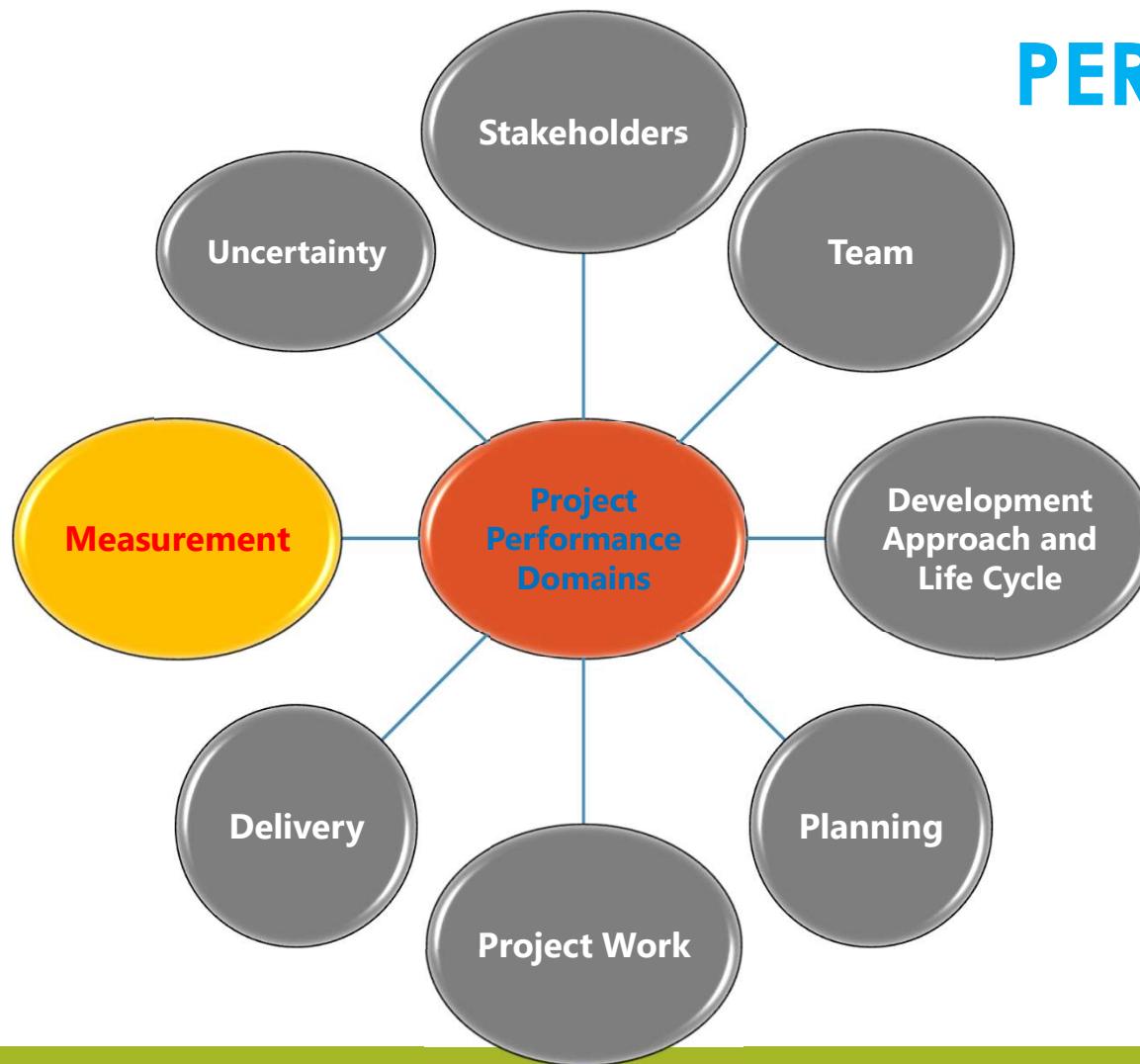


MEASUREMENT PERFORMANCE DOMAIN

PROJECT MANAGEMENT PROFESSIONAL CLASS

(PMBOK 7TH EDITION)

PROJECT PERFORMANCE DOMAINS



MEASUREMENT PERFORMANCE DOMAIN

Measurement Performance Domain

MEASUREMENT PERFORMANCE DOMAIN

The Measurement Performance Domain addresses activities and functions associated with assessing project performance and taking appropriate actions to maintain acceptable performance.

Effective execution of this performance domain results in the following desired outcomes

- A reliable understanding of the status of the project.
- Actionable data to facilitate decision making.
- Timely and appropriate actions to keep project performance on track.
- Achieving targets and generating business value by making informed and timely decision based on reliable forecasts and evaluations.

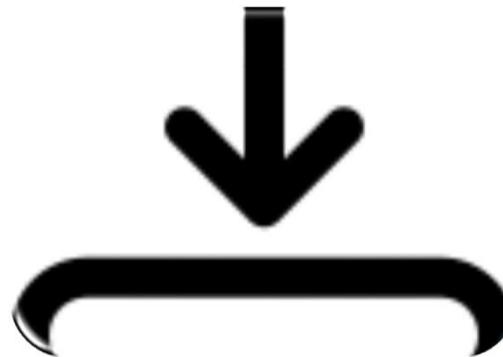
Measurement involves assessing project performance and implementing appropriate responses to maintain optimal performance

MEASUREMENT PERFORMANCE DOMAIN

The following definitions are relevant to the Measurement Performance Domain:



Metric. A description of a project attribute and how to measure it.



Baseline. The approved version of a work product used as a basis for comparison to actual results.



Dashboard. A set of charts and graphs showing progress of performance against important measures of the project.

MEASUREMENT PERFORMANCE DOMAIN



The Measurement Performance Domain evaluates the degree to which the work done in the Delivery Performance Domain is meeting the metrics identified in the Planning Performance Domain. For example, performance can be measured and evaluated using baselines identified in the Planning Performance Domain.

Having timely and accurate information about project work and performance allows the project team to learn and determine the appropriate action to take to address current or expected variances from the desired performance.

MEASUREMENT PERFORMANCE DOMAIN

Measures are used for multiple reasons including:



Evaluating performance compared to plan;



Tracking the utilization of resources, work completed, budget expended, etc;



Demonstrating accountability;



Providing information to stakeholders;



Assessing whether project deliverables are on track to deliver planned benefits;



Focusing conversations about trade-offs, threats, opportunities, and options; and



Ensuring the project deliverables will meet customer acceptance criteria.

ESTABLISHING EFFECTIVE MEASURES



Establishing effective measures helps to ensure the right things are measured and reported to stakeholders. Effective measures allow for tracking, evaluating, and reporting information that can communicate project status, help improve project performance, and reduce the likelihood of performance deterioration. These measures allow the project team to use information to make timely decisions and take effective actions.

KEY PERFORMANCE INDICATORS

Key performance indicators (KPIs) for projects are quantifiable measures used to evaluate the success of a project. There are two types of KPIs: leading indicators and lagging indicators.



Leading indicators. Leading indicators predict changes or trends in the project. If the change or trend is unfavorable, the project team evaluates the root cause of the leading indicator measurement and takes actions to reverse the trend.



Lagging indicators. Lagging indicators measure project deliverables or events. They provide information after the fact. Lagging indicators reflect past performance or conditions. Lagging indicators are easier to measure than leading indicators.

EFFECTIVE METRICS

Measuring takes times and effort, which could otherwise be spent on other productive work; therefore, project teams should only measure what is relevant and should ensure that the metrics are useful,



Specific. Measurements are specific as to what to measure. Examples include the number of defects, the defects that have been fixed, or the average time it takes to fix defects.



Meaningful. Measures should be tied to the business case, baselines, or requirements. It is not efficient to measure product attributes or project performance that do not lead to meeting objectives or improving performance.



Achievable. The target is achievable given the people, technology, and environment.



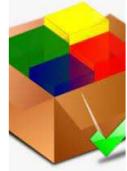
Relevant. Measures should be relevant. The information provided by the measure should provide value and allow for actionable information.



Timely. Useful measurements are timely. Information that is old is not as useful as fresh information. Forward looking information, such as emerging trends, can help project teams change direction and make better decisions.

WHAT TO MEASURE

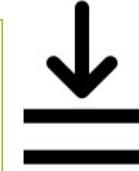
What is measured, the parameters, and the measurement method depend on the project objectives, the intended outcomes, and the environment in which the project takes place. Common categories of metrics include:



Deliverable metrics,



Delivery



Baseline performance



Resources;



Business value,



Stakeholders,
and



Forecasts.

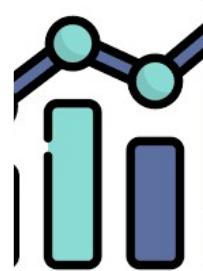
A balanced set of metrics helps to provide a holistic picture of the project, its performance, and its outcomes.

DELIVERABLE METRICS

By necessity, the products, services, or results being delivered determine the useful measures. Customary measures include:



Information on errors or defects. This measure includes the source of defects, number of defects identified, and number of defects resolved.



Measures of performance. Measures of performance characterize physical or functional attributes relating to the system operation. Examples include size, weight, capacity, accuracy, reliability, efficiency, and similar performance measures.



Technical performance measures. Quantifiable measures of technical performance are used to ensure system components meet technical requirements. They provide insight into progress in achieving the technical solution.

DELIVERY

Delivery measurements are associated with work in progress. These measures are frequently used in projects using adaptive approaches.



Work in progress. This measure indicates the number of work items that are being worked on at any given time. It is used to help the project team limit the number of items in progress to a manageable size.



Lead time. This measure indicates the amount of elapsed time from a story or chunk of work entering the backlog to the end of the iteration or the release. Lower lead time indicates a more effective process and a more productive project team.



Cycle time. Related to lead time, cycle time indicates the amount of time it takes the project team to complete a task. Shorter times indicate a more productive project team. A consistent time helps predict the possible rate of work in the future.

DELIVERY

Delivery measurements are associated with work in progress. These measures are frequently used in projects using adaptive approaches.



Queue size. This measure tracks the number of items in a queue. This metric can be compared to the work in progress limit. Little's law states that queue size is proportional to both the rate of arrival in the queue and the rate of completion of items from the queue.



Batch size. Batch size measures the estimated amount of work (level of effort, story points, etc) that is expected to be completed in an iteration.



Process efficiency. Process efficiency is a ratio used in lean systems to optimize the flow of work. This measure calculates the ratio between value adding time and non value adding activities. Tasks that are waiting increase the non value adding time. Tasks that are in development or in verification represent value adding time. Higher ratios indicate a more efficient process.

BASELINE PERFORMANCE

The most common baselines are cost and schedule. Projects that track a scope or technical baseline can use information in the deliverable measures.

Most schedule measures track actual performance to planned performance related to:



Start and finish dates. Comparing the actual start dates to the planned start dates and the actual finish dates to the planned finish dates can measure the extent to which work is accomplished as planned. Even if work is not on the longest path through the project (the critical path), late start and finish dates indicate that the project is not performing to plan.



Effort and duration. Actual effort and duration compared to planned effort and duration indicates whether estimates for the amount of work and the time the work takes are valid.

BASELINE PERFORMANCE

The most common baselines are cost and schedule. Projects that track a scope or technical baseline can use information in the deliverable measures.

Most schedule measures track actual performance to planned performance related to:



Schedule variance (SV). A simple schedule variance is determined by looking at performance on the critical path. When used with earned value management, it is the difference between the earned value and the planned value. Figure 2-24 shows an earned value graph illustrating the schedule variance.



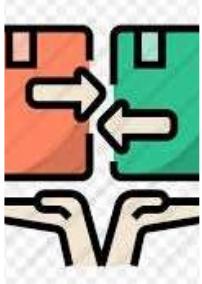
Schedule performance index (SPI). Schedule performance index is an earned value management measure that indicates how efficiently the scheduled work is being performed.



Feature completion rates. Examining the rate of feature acceptance during frequent reviews can help assess progress and estimate completion dates and costs.

BASELINE PERFORMANCE

Common cost measures include:



Actual Cost (AC) compared to Planned Cost (AC). This cost measure compares the actual cost for labor or resources to the estimated cost. This term may be referred to as the burn rate.



Cost variance (CV). A simple cost variance is determined by comparing the actual cost of a deliverable to the estimated cost. When used with earned value management, it is the difference between the earned value and the actual cost. Figure 2-24 shows an earned value graph illustrating the cost variance.



Cost Performance Index (CPI). An earned value management measure that indicates how efficiently the work is being performed with regard to the budgeted cost of the work.

BASELINE PERFORMANCE

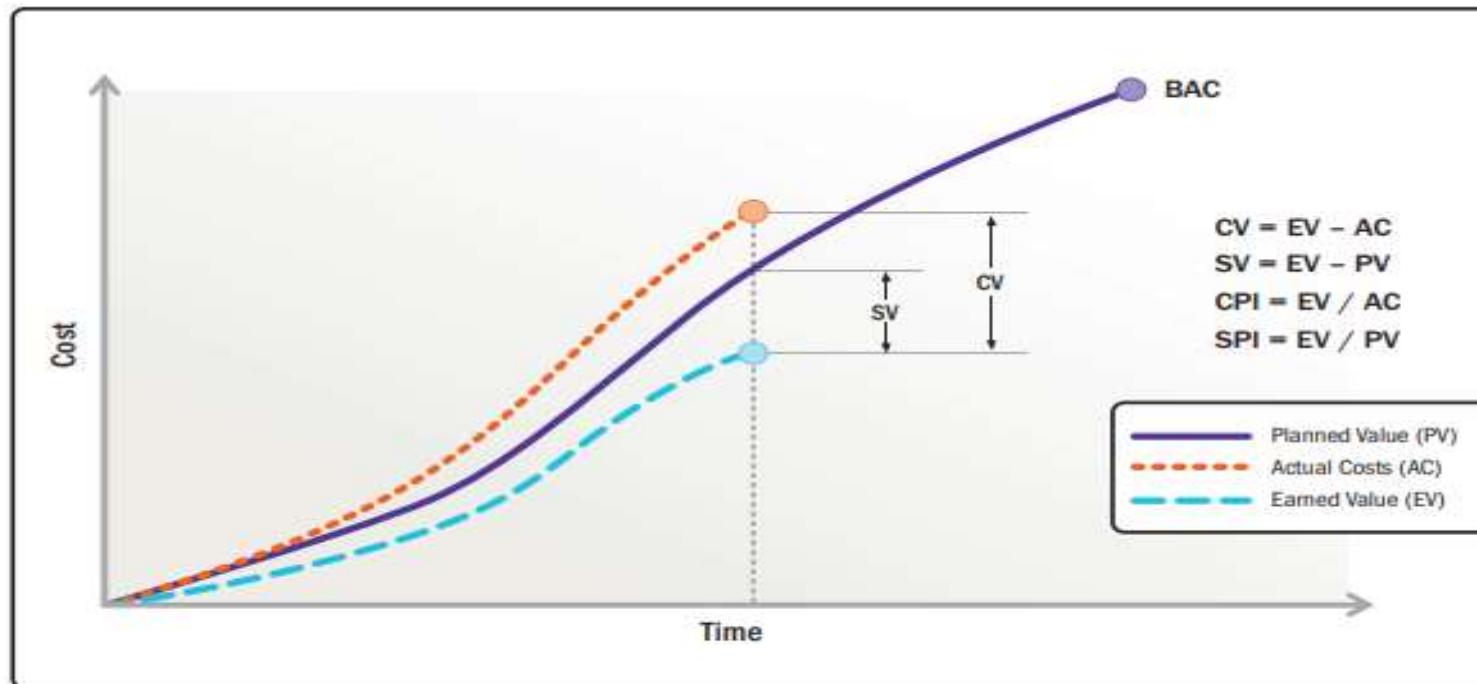


Figure 2-24. Earned Value Analysis Showing Schedule and Cost Variance

RESOURCES

Resource measurement may be a subset of cost measurements since resource variances frequently lead to cost variances. The two measures evaluate price variance and usage variance. Measures include.



Planned Resource utilization compared to Actual Resource utilization. This measurement compares the actual usage of resources to the estimated usage. A usage variance is calculated by subtracting the planned usage from the actual usage.



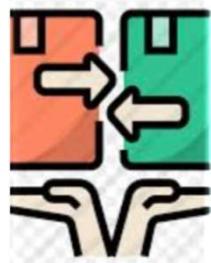
Planned Resource Cost compared to Actual Resource Cost. This measurement compares the actual cost of resources to the estimated cost. Price variance is calculated by subtracting the estimated cost from the actual cost.

BUSINESS VALUE

Business value measurements are used to ensure the project deliverable stays aligned to the business case and the benefits realization plans. Business value has many aspects both financial and nonfinancial. Metrics that measure financial business value include;



Cost benefit ratio. This is a measure of the expected present value of an investment with the initial cost. The cost benefit ratio is used to determine if the cost of a project outweigh its benefits. If the costs are greater than the benefits, the result will be greater than 1.0. in this case, the project should not be considered unless there are regulatory, social good, or other reasons to do the project.



Planned Benefits Delivery compared to Actual Benefits Delivery. As part of a business case, organizations may identify value as the benefit that will be delivered as a result of doing the project.

BUSINESS VALUE

Business value measurements are used to ensure the project deliverable stays aligned to the business case and the benefits realization plans. Business value has many aspects both financial and nonfinancial. Metrics that measure financial business value include;



Return on Investment (ROI). A measure of the amount of financial return compared to the cost, ROI is generally developed as an input to the decision to undertake a project. There may be estimates of ROI at different points in time across the project life cycle.



Net Present Value (NPV). The difference between the present value of inflows of capital and the present value of outflows of capital over a period of time, NPV is generally developed when deciding to undertake a project. By measuring the NPV throughout the project, the project team can determine if it makes sense to continue the investment of organizational resources.

STAKEHOLDER

Stakeholder satisfaction can be measured with surveys or by inferring satisfaction, or lack therefore, and by looking at related metrics, such as:



Net Promoter Score (NPS). A Net Promoter Score measures the degree to which a stakeholder (usually the customer) is willing to recommend a product or service to others. It measures a range from -100 to +100. A high Net Promoter Score not only measures satisfaction with a brand, product, or service, it is also an indicator of customer loyalty.



Mood Chart. A mood chart can track the mood or reactions of a group of very important stakeholders – the project team. At the end of each day, project team members can use colors, numbers, or emojis to indicate their frame of mind. Figure 2-25 shows a mood chart using emojis. Tracking the project team's mood or individual project team member's moods can help to identify potential issues and areas for improvement.

STAKEHOLDER – Mood Chart

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Tom							
Lucy							

Figure 2-25. Mood Board

STAKEHOLDER

Stakeholder satisfaction can be measured with surveys or by inferring satisfaction, or lack therefore, and by looking at related metrics, such as:



Morale. Since mood boards can be subjective, another option is to measure project team morale. This can be done by surveys, asking project team members to rate their agreement on a scale of 1 to 5 to statements such as:

- * I feel my work contributes to the overall outcomes.
- * I feel appreciated.
- * I am satisfied with the way my project team works together.



Turnover. Another way to track morale is by looking at unplanned project team turnover. High rates of unplanned turnover may indicate low morale.

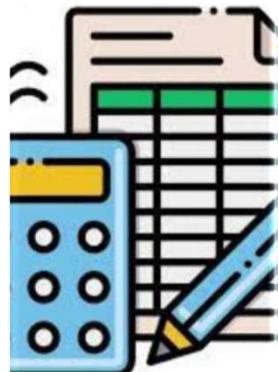
FORECAST



Project teams use forecasts to consider what might happen in the future so they can consider and discuss whether to adapt plans and project work accordingly. Forecasts can be qualitative, such as using expert judgment about what the future will hold. They can also be casual when seeking to understand the impact a specific event or condition will have on future events. Quantitative forecasts seek to use past information to estimate what will happen in the future. Quantitative forecasts include:

- **Estimate to Complete (ETC)**
- **Estimate at Completion (EAC)**

FORECAST



Estimate to Complete (ETC). An earned value management measure that forecasts the expected cost to finish all the remaining project work. There are many different ways to calculate the estimate to complete. Assuming past performance is indicative of future performance, a common measurement is calculation of the budget at completion minus the earned value, then divided by the cost performance index.



Estimated at Completion (EAC). This earned value management measure forecasts the expected total cost of completing all work. There are many different ways to calculate the estimate at completion. Assuming past performance is indicative of future performance, a common measurement is the budget at completion divided by the cost performance index.

FORECAST

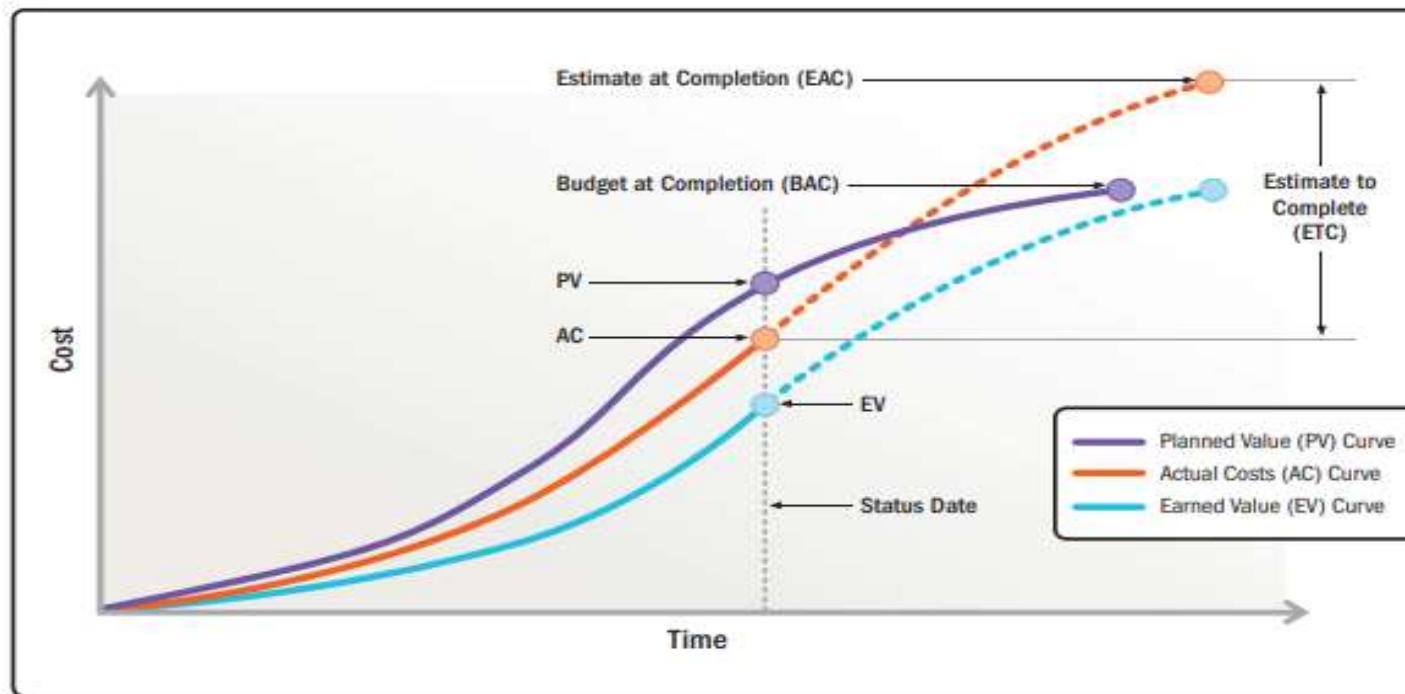


Figure 2-26. Forecast of Estimate at Completion and Estimate to Complete

FORECAST

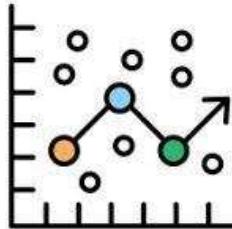


Variance at Completion (VAC). An earned value management measure that forecasts the amount of budget deficit or surplus. It is expressed as the difference between the budget at completion (BAC) and the estimate at completion (EAC).



To-Complete Performance Index (TCPI). An earned value management measure that estimates the cost performance required to meet a specified management goal. TCPI is expressed as the ratio of the cost to finish the outstanding work to the remaining budget.

FORECAST



Regression Analysis

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Regression Analysis. An analytical method where a series of input variables are examined in relation to their corresponding output results in order to develop a mathematical or statistical relationship. The relationship can be used to infer future performance.



Throughput Analysis. This analytical method assesses the number of items being completed in a fixed time frame. Project teams that use adaptive practices use throughput metrics such as features complete vs. features remaining, velocity, and story points to evaluate their progress and estimate likely completion dates. Using duration estimates and burn rates of stable project teams can help verify and update cost estimates.

PRESENTATION INFORMATION



The measures being collected are important, but what is done with the measures is just as important. For information to be useful, it has to be timely, accessible, easy to absorb and digest, and presented so that it correctly conveys the degree of uncertainty associated with the information. Visual displays with graphics can help stakeholders absorb and make sense of information.

DASHBOARDS

A common way of showing large quantities of information on metrics is a dashboard. Dashboards generally collect information electronically and generate charts that depict status. Often dashboards offer high level summaries of data and allow drill down analysis into contributing data.

Dashboards often include information displayed as stoplight charts (also known as RAG charts where RAG is an abbreviation for red-amber-green), bar charts, pie charts, and control charts. A text explanation can be used for any measures that are outside the established thresholds.

DDASHBOARD

Organization Project Name								
Project Name and High-Level Description								
Exec Sponsor:			PM:					
Start Date:	Start Date:	End Date:			Report Period:			
Status:	Schedule	Resources	Budget					
Key Activities	Recent Accomplishments	Upcoming Key Deliverables		Status				
Activity #1				Concern				
Activity #2				On Track				
Activity #3				Issue				
On Track	Complete	Concern	Issue	In Hold	Canceled	Not Started		
Current Key Risks – Threats and opportunities; Mitigation	Current Key Issues – Description							

Figure 2-27. Dashboard Example.

INFORMATION RADIATORS



Information radiators, also known as big visible charts (BVCs), are visible, physical displays that provide information to the rest of the organization, enabling timely knowledge sharing. They are posted in a place where people can see the information easily, rather than having information in a scheduling or reporting tool. BVCs should be easy to update, and they should be updated frequently. They are often "low tech and high touch" in that they are manually maintained rather than electronically generated.

INFORMATION RADIATORS – Burn Up Chart

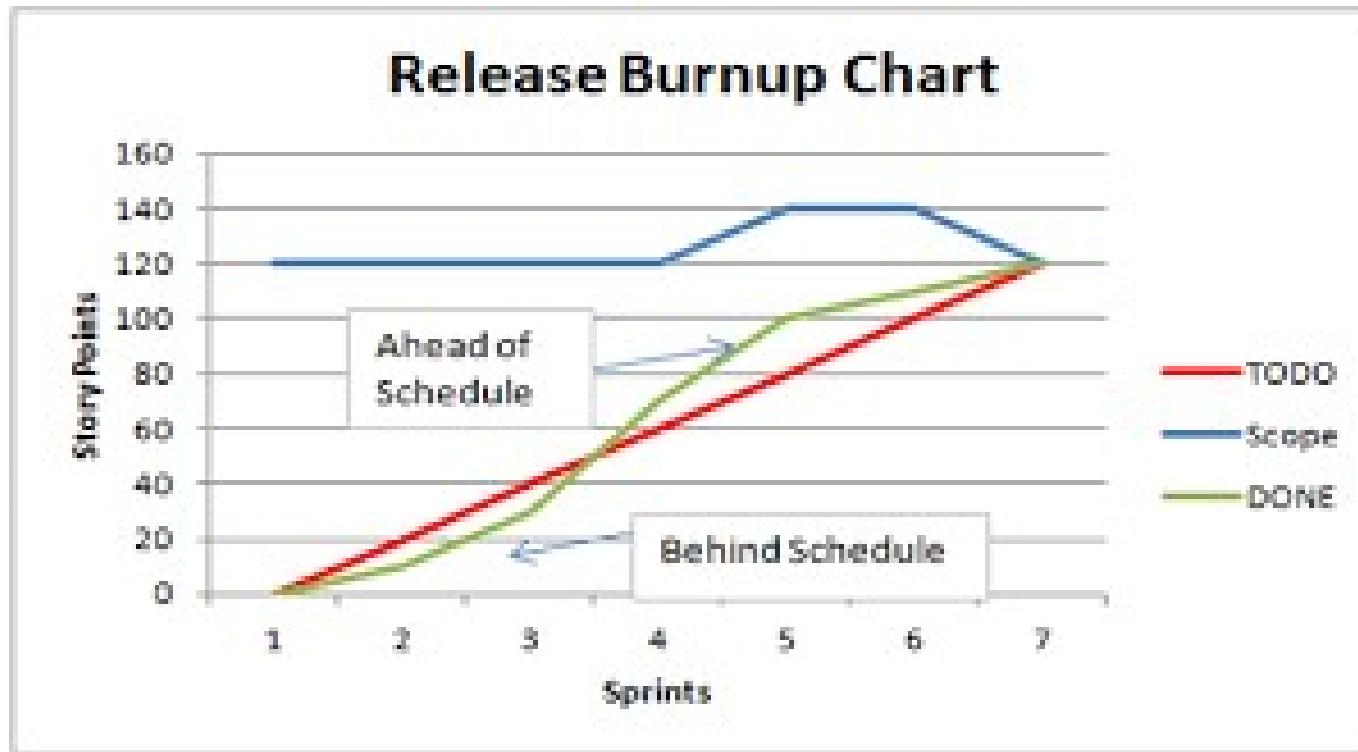


A burn up chart is **a visual diagram commonly used on Agile projects to help measure progress**. Agile burn up charts allow project managers and teams to quickly see how their workload is progressing and whether project completion is on schedule.

It shows how much work has been completed

Burn Up chart is used it **to identify how far off you are from completing a project**. Remember, a project is complete when your work completed line meets your total work line. You can also use it to chart how much work your team completed during each sprint (iteration). This is an easy way to identify when your team was most productive

INFORMATION RADIATORS – Burn Up Chart



INFORMATION RADIATORS – Burn Down Chart

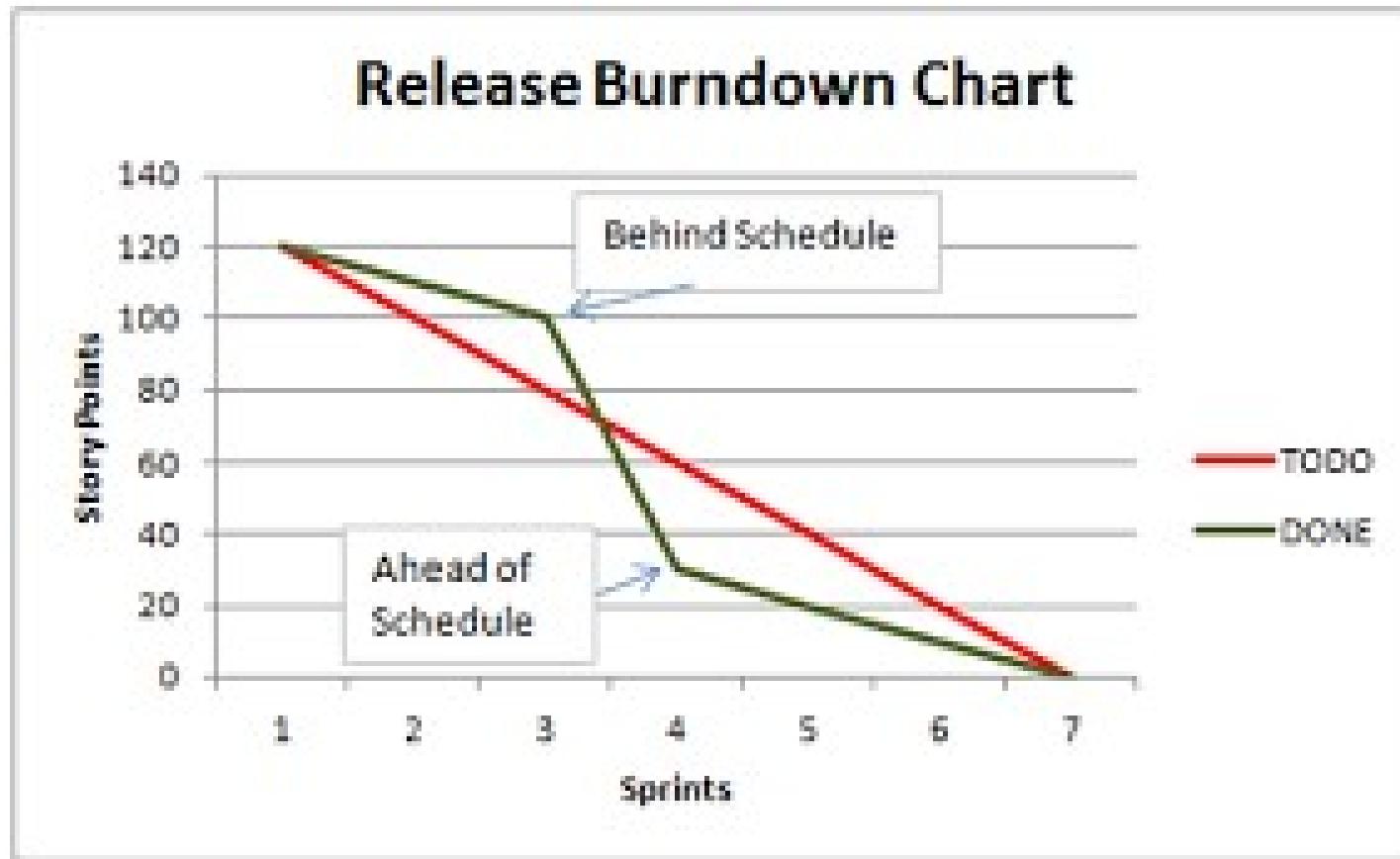


A burn-down chart **shows the amount of work that has been completed in an epic or sprint, and the total work remaining**. Burn-down charts are used to predict your team's likelihood of completing their work in the time available.

It shows how much work yet to be completed.

The burn-down chart provides a day-by-day measure of the work that remains in a given sprint or release. The slope of the graph, or burn-down velocity, is calculated by **comparing the number of hours worked to the original project estimation** and shows the average rate of productivity for each day.

INFORMATION RADIATORS – Burn Down Chart



INFORMATION RADIATORS

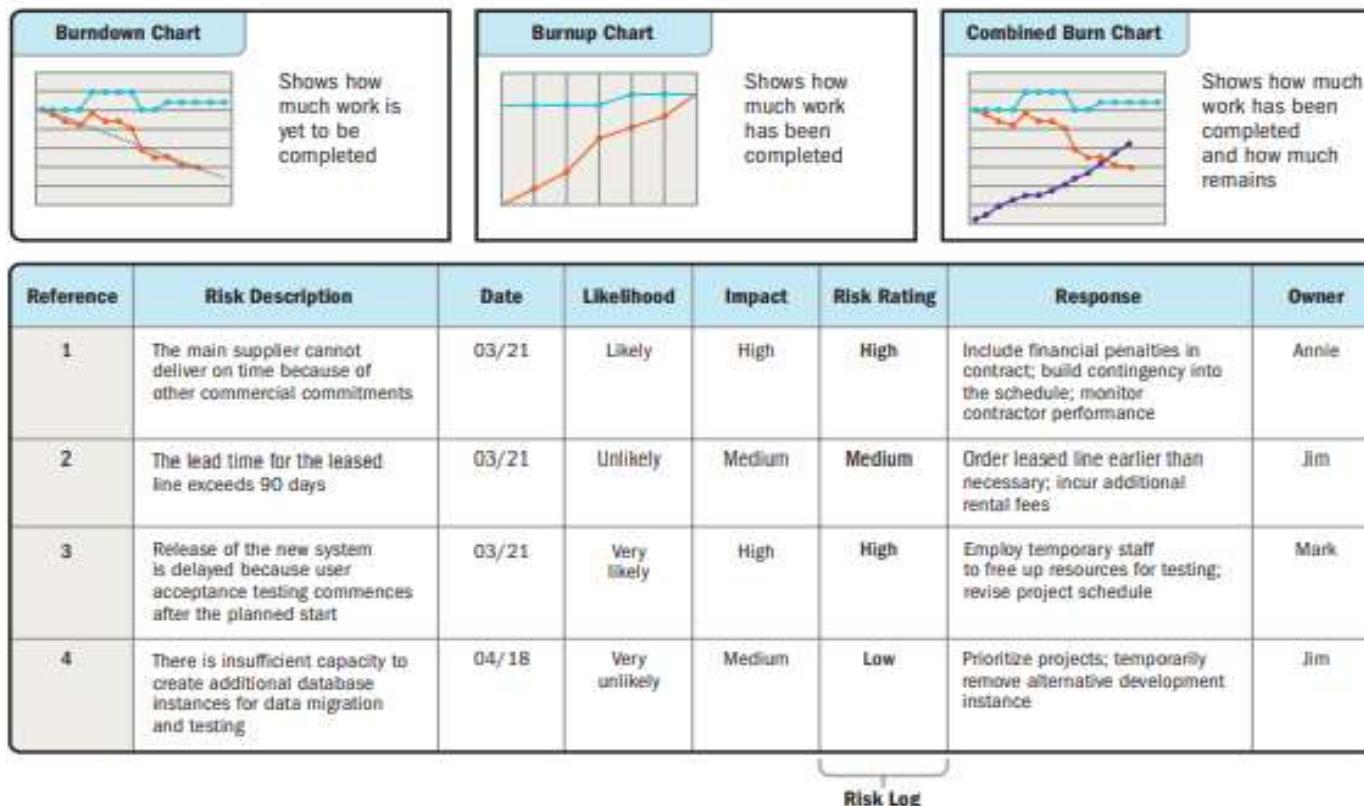


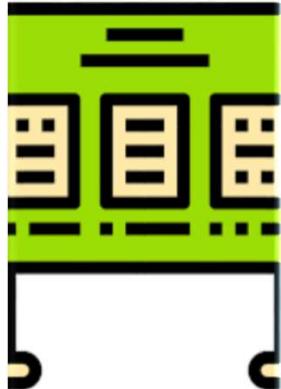
Figure 2-28. Information Radiator

VISUAL CONTROLS

In lean environments, information radiators are known as visual controls. Visual control illustrate processes to easily compare actual against expected performance. Visual controls show a process using visual cues. Visual controls can be present for all levels of information from business value delivered to tasks that have started. They should be highly visible for anyone to see.

Other types of charts. Visual charts can also include information such as an impediment list that shows a description of the impediment to getting work done, the severity, and the actions being taken to resolve the impediment.

VISUAL CONTROLS



Task Boards. A task board is a visual representation of the planned work that allows everyone to see the status of the tasks. A task board can show work that is ready to be started (to do), work in progress, and work that is completed. A task board allows anyone to see at a glance the status of a particular task or the number of tasks in each stage of work.



Burn Charts. Burn charts, such as a burn up or burn down charts, can show project team velocity. Velocity measures the productivity rate at which the deliverables are produced, validated, and accepted within a predefined interval. A burn up chart can track the amount of work done compared to the expected work that should be done. A burn down chart can show the number of story points remaining or the amount of risk exposure that has been remaining

VISUAL CONTROLS – Other type of charts

I. KANBAN

- Used to design, managed and improved the flow of systems
- Organizations can visualize their flow of work in progress (usually displayed on a board and visible to all); what need to be done, what is in progress, what's next to be done, who is doing what?

When Applicable?

- Where work arrives in unpredictable fashion
- To deploy work immediately without waiting for other work items.

VISUAL CONTROLS – Other type of charts

I. STORY POINT

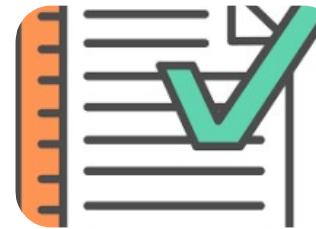
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When Applicable?

- Where work arrives in unpredictable fashion
- To deploy work immediately without waiting for other work items.

VISUAL CONTROLS – Other type of charts

I. KANBAN

TO-DO	ON-GOING	DONE
 To-do	 ongoing	 Done

VISUAL CONTROLS – Other type of charts

2. USER STORIES



Agile software development Project management tool that provides users with simple, natural language explanation of one or more features written from the end user's/customer's perspective.

User stories are not written in detail

- Its just to mentions how a certain type of work/feature will bring value to the end-user. The role of the end user and the transaction involved
- End user could be Internal or External
- Explain the interface very brief, this help in visualizing the interface to be provided and its uses.

MEASUREMENT PITFALLS

Project measures help the project team meet the project objectives. However, there are some pitfalls associated with measurement. Awareness of these pitfalls can help minimize their negative effect.



Hawthorne Effect. The Hawthorne effect states that the very act of measuring something influences behavior. Therefore, take care in establishing metrics. For example, measuring only a project team's output of deliverables can encourage the project team to focus on creating a large volume of deliverables rather than focusing on deliverables that would provide higher customer satisfaction.



Vanity Metric. A vanity metric is a measure that shows data but does not provide useful information for making decisions. Measuring page views of a website is not as result as measuring the number of new viewers.



Demoralization. If measures and goals are set that are not achievable, project team morale may fall as they continuously fail to meet targets. Setting stretch goals and aspirational measures is acceptable, but people also want to see their hard work recognized. Unrealistic or unachievable goals can be counterproductive.

MEASUREMENT PITFALLS

Project measures help the project team meet the project objectives. However, there are some pitfalls associated with measurement. Awareness of these pitfalls can help minimize their negative effect.



Misusing the Metrics. Regardless of the metrics used to measure performance, there is the opportunity for people to distort the measurements or focus on the wrong thing. Examples include:

- Focusing on less important metrics rather than the metrics that matter most,
- Focusing on performing well for the short term measures at the expense of long term metrics, and
- Working on out sequence activities that are easy to accomplish in order to improve performance indicators.



Confirmation Bias. As human beings, we tend to look for and see information that supports our preexisting point of view. This can lead us to false interpretations of data.



Correlation Versus Causation. A common mistake in interpreting measurement data is confusing the correlation of two variables with the idea that one causes the other. For example, seeing projects that are behind schedule and over budget might infer that projects that are over budget cause schedule issues. This is not true, nor is it true that projects that are behind schedule cause budget overruns. Instead, there are likely other correlating factors that are not being considered, such as skill in estimating, the ability to manage change, and actively managing risk.

TROUBLESHOOTING PERFORMANCE

Part of measurement is having agreed to plans for measures that are outside the threshold ranges.

Thresholds can be established for a variety of metrics such as schedule, budget, velocity and other project specific measures. The degree of variance will depend on stakeholder risk tolerances.

Figure below shows an example of a budget threshold set at +10% (orange) and -20% (green) of the predicted spend rate. The blue line is tracking the actual spend, and in January, it exceeded the +10% upper tolerance that would trigger the exception plan.

Ideally, project teams should not wait until a threshold has been breached before taking action. If a breach can be forecasted via a trend or new information, the project team can be proactive in addressing the expected variance.

An exception plan is an agreed upon set of actions to be taken if a threshold is crossed or forecast.

TROUBLESHOOTING PERFORMANCE

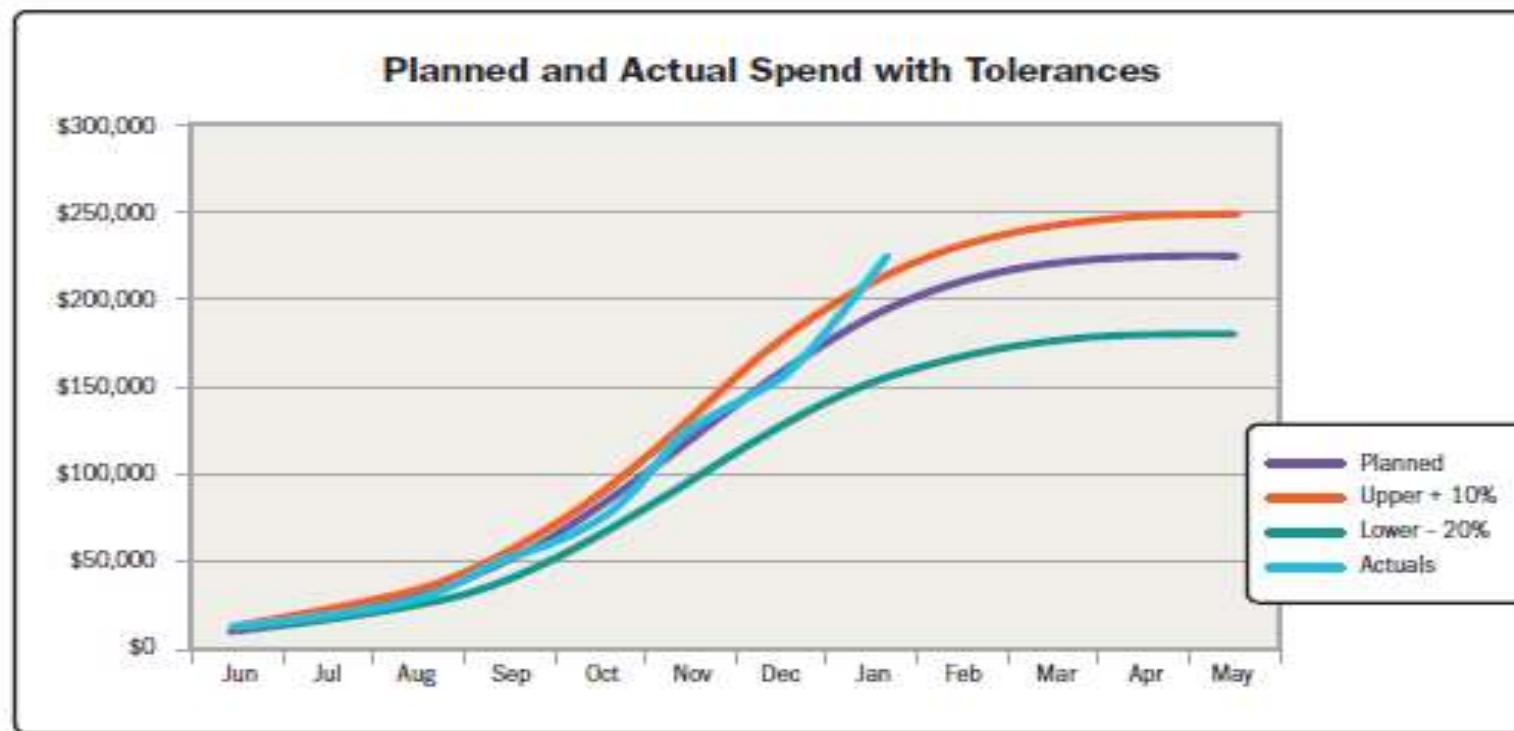


Figure 2-31. Planned and Actual Spend Rates

GROWING AND IMPROVING

The intent in measuring and displaying data is to learn and improve. To optimize project performance and efficiency, only measure and report information that will:



Allow the project team to learn



Facilitate a decision,



Improve some aspect of the product or project performance,



Help avoid an issue, and



Prevent performance deterioration.



Apply appropriately, measurements facilitate the project team's ability to generate business value and achieve the project objectives and performance targets.

INTERACTION WITH OTHER DOMAINS

The Measure Performance Domain interacts with the Planning, Project Work, and Delivery Performance Domains as plans from the basis of comparing the deliveries to plan. The Measurement Performance Domain can support the activities that are part of the Planning Performance Domain by presenting up to date information so that lessons learned can reflect favorable or unfavorable information for updating plans. The Team and Stakeholder Performance Domain interact as project team members develop the plans and create the deliverables and deliveries that are measured.

CHECKING RESULTS

The table below identifies the outcomes from effective application of the Measurement Performance Domain on the left and ways of checking them on the right.

Outcome	Check
A reliable understanding of the status of the project	Audit measurements and reports demonstrate if data is reliable.
Actionable data to facilitate decision making	Measurements indicate whether the project is performing as expected or if there are variances.
Timely and appropriate actions to keep project performance on track.	Measurements provide leading indicators and/or current status leads to timely decisions and actions.
Achieving targets and generating business value by making informed and timely decisions based on reliable forecasts and evaluations.	Reviewing past forecasts and current performance demonstrates if previous forecasts reflect the present accurately. Comparing the actual performance to the planned performance and evaluating business documents will show the likelihood of achieving intended value from the project.

Q&A

