

Metrics for Agile Projects: Finding the right tools for the job

Agile project managers have a wide range of metrics to choose from when it comes to tracking the progress of Agile projects.

By understanding the variety of metrics, Agile project managers can determine how and when to use them most effectively—in order to perform one of the key functions of Agile: communicating progress to the customer.

The Agile project manager is responsible for the overall delivery of the project's objectives and does this by keeping the team focused, encouraging teamwork and individual productivity, ensuring that the team has the resources required to be successful and managing the customer relationship as the product is built.

Many of the familiar metrics such as Gantt chart and WBS are no longer applicable, given that Agile project managers are not developing long-term, multi-month project plans with predictions that reach far into the future. Agile project managers therefore need to use other metrics, such as burn-down charts, to understand where their projects stand.

Agile project managers also need to expand the use of the metrics at their disposal to fine-tune the progress they are showing on their projects. Best practices for progress reporting include a detailed examination of how and when to use the methods available, daily meetings, iteration delta tables, release and iteration burn-down charts, progress reports, running tested features (RTFs) and earned value management (EVM).

Rather than being focused on updating Gantt charts or keeping the project dashboard current, an Agile project manager is kept free to focus on the performance of the team at the highest level of productivity and collaboration, as well as on isolating the team from distractions, barriers and digressions that could harm their concentration.

A deeper understanding of the variety of metrics for agile will enable PMs to determine how and when to use them most effectively to communicate progress to project stakeholders.

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Given that within Agile environments, the team members are expected to manage their own workloads, the project managers serve to ensure that their teammates have the information, resources and technical coaching they need to be successful.

Tools for Tracking Progress

Exhibit 1 is an example of a chart that project managers can use to communicate iteration status to the customer and stakeholder community. Designed to communicate the changes from one iteration to the next, this chart helps stakeholders see what the original plan for the current and next iterations looked like a couple of weeks ago and how they look today. Features that are new, have been deleted and/or moved from one iteration to another, are all clearly indicated.

Two Weeks Ago		Today		Prev.	Current Status
Iteration 1	This is item 1...	Iteration 1	This is item 1...	1	✓
	This is item 2...		This is item 2...	1	✓
	This is item 3...		This is item 3...	1	✓
	This is item 4...				
Iteration 2	This is item 1...	Iteration 2	This is item 4...	1	
	This is item 2...		This is item 5...	2	
	This is item 3...		This is item 6...	2	
	This is item 4...		This is item 15...	New	
Iteration 3		Iteration 3	This is item 8...	2	
	This is item 9...		This is item 13...	3	
	This is item 10...				
	This is item 11...		This is item 9...	2	
	This is item 12...		This is item 7...	2	
	This is item 13...		This is item 11...	3	
	This is item 14...	This is item 10...	3		
		This is item 12...	3		
		This is item 14...	X		

Iteration Status Chart

Exhibit 1.



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Another tool that many Agile project managers use to track progress is the burn-down chart, illustrated in Exhibit 2. The project manager starts at the upper left of the chart, before any development work is completed and as features are completed or "burned down," the project manager tracks that progress with a simple line chart. In this example, the project manager is tracking a release, which contains a total of 200 features, or story points, that the team must "burn through."

A burn-down chart can also track the progress of iteration by substituting "days" for "iterations" on the y-axis. As features are built and tested, the number of story points remaining is plotted and a line connecting each point is drawn.

By keeping the burn-down chart current, project managers can offer their customers a quick, visual representation of the functionality that has been delivered and is left to be delivered, as well as provide clues regarding the team's productivity.

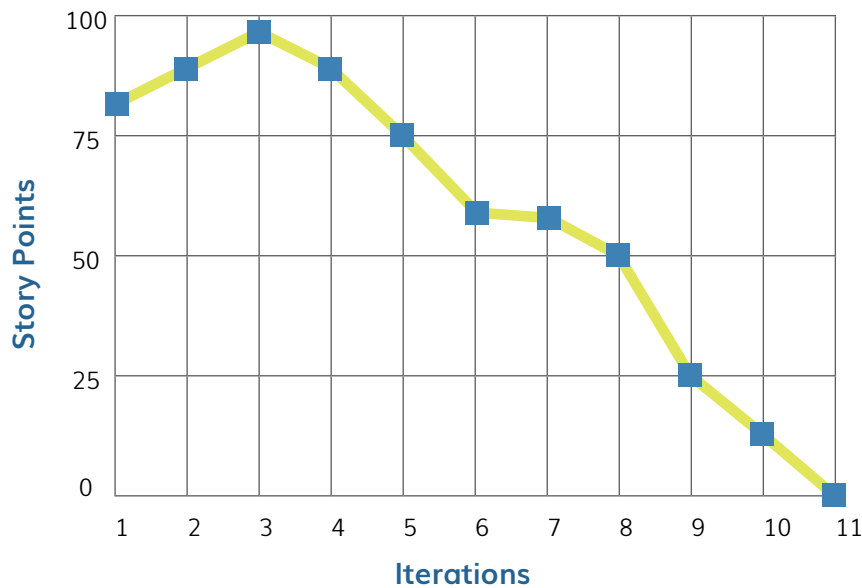
If the chart has a flat line, this shows that the team is not making progress as expected. This sends a signal to the project manager that a technical issue, an organisational barrier or a teammate's productivity requires attention. If the plot moves upward it indicates that new features have been added to the backlog or features previously considered complete have moved back to development.

In Agile development, a new feature added to iteration can mean many things. It can be a positive sign of fruitful interaction with the customer or can be the first indication of scope creep or project gold-plating (in which team members add features).

If an upward tick in the burn-down chart signifies that a feature previously considered complete has moved back into the unfinished column, this is a negative indicator.

By keeping the burn-down chart current, PMs can offer their customers a quick, visual representation of the functionality that has been delivered and is left to be delivered, and provide insights regarding the team's productivity.

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Burn-Down Chart

Exhibit 2.

Features should only be burned down on the chart if they are developed and tested and ready to be integrated into the iteration or release. Counting unfinished features creates all sorts of complications, from damaging internal team trust to corrupting the entire burn-down process.

Project managers should therefore set clear rules regarding the state of completion required before a feature, or story point, is counted as burned down.

The burn-down chart also reveals the team's estimating success. If the plot is proceeding as expected, and the trend line is an even, steady descent from the top-left corner to the bottom right, this signifies that the team has been extraordinarily successful at predicting its velocity and selecting the right features and right number of features to include in the iterations.

If, on the other hand, the line is choppy, sloping up and down and stalling frequently, it can indicate that the team is not cohering efficiently, or that unforeseen complexities are arising that must be addressed.



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It should be clear that, in all of these circumstances, the project manager and the team can use the burn-down chart as a key indicator, not just of progress but of the internal productivity of the team.

As developers implement the features for which they have been assigned, there is the risk of creating little islands of technology which do not integrate with the product.

The collaborative techniques of Agile project managers should assist in minimising integration problems. Agile project managers must guard against this contingency and the mechanism typically used for this is often referred to in the Agile community as "frequent integration."

Most experienced PMs can cite an initiative in which all of the separate elements were tested and performed appropriately, only to find that when put together, the interaction of the parts created unexpected issues, consequences and even failures. In fact, many projects are thrown off track by late integration challenges.

Although integration is not a feature and will not show up in a task allocation session or on a burn-down chart, prudent project managers make sure that they have allocated time in their iteration cycle to pull the separate components of their design together as they are created—and ensure that they are working as a unit.

Some Agile teams will assign a single teammate to be the integration manager, with responsibility for ensuring that they fit together.

Team Communications

While the burn-down chart can provide an at-a-glance overview of the team's progress, this is not enough to help the team stay on top of the project effort.

In most Agile approaches, teams use a variant of the daily meeting to track the daily issues, risks and challenges that arise. These sessions are called stand-up meetings because, by standing rather than sitting around a conference table, teams are more likely to keep these meetings short, concentrated and effective.

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In this method, the team stands together to answer three simple questions:

- What have you done since the last stand-up meeting?
- What will you do until the next stand-up meeting?
- What issues, risks or barriers have arisen that could distract you from accomplishing the goals?

Some other characteristics of the daily meeting are:

- Each meeting is 15–20 minutes; everyone stands in a circle.
- Each meeting occurs at the same location.
- The order of presentation is defined.
- Team members share status/obstacles.
- All team members are invited but only people involved in the iteration speak.

The meeting is the forum for discussing the tasks that slipped or were completed early and the unexpected barriers or challenges that arose in the previous day of development, as well as refining plans on a daily basis depending on the realities of this particular effort and team.

Features and tasks can be swapped by team members as they discover their own suitability for the tasks they have accepted. Schedules can also be refined as the team's velocity becomes clearer.

The daily team meeting is often referred to as the heartbeat of the Agile methodology. Agile project managers have an important responsibility to the customer; they must coach the customer on the responsibilities of acting as the organisation's representative on the development team. This is often a new and unfamiliar role to customers, who are accustomed to developing a set of requirements and then waiting for the product to appear from the development lab.

The intimate, continuous participation of the customer in the development process and in the decisions made is a key precept of Agile development, but that does not mean that the customer is prepared to play that role effectively.

By standing rather than sitting around a conference table, teams are encouraged to keep these meetings short, concentrated and effective.



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Agile project managers need to help to mentor customers through the process, bringing them into the iteration planning sessions, inviting them to the daily meetings and helping them to understand the project status by teaching them to interpret the burn-down charts that the team uses to track its progress.

The role of the customer in an Agile project is demanding and the project managers must ensure that customers understand and fulfil their role. Without the constant input, reaction and support of the customer, the Agile effort will flounder.

Whilst iteration status charts, burn-down charts and daily stand-up meetings are effective progress reporting tools, they can be obscure to the uninitiated and do not answer stakeholder questions about value delivered, costs and resources consumed or future expectations.

It is therefore critical that Agile project managers devise strategies for tracking and measuring the team's performance on the project and for reporting that progress to the customer and stakeholders.

With Agile, the elements that are not directly tied to developing the product are kept "barely sufficient" — enough to deliver the value that the customer is expecting, but with a minimum of overhead and complexity associated with them.

This philosophy is applied to metrics as well. In many Agile teams, the burn-down chart, or some variant, is the sole visible metric of progress. Other teams go to the opposite extreme and attempt to apply the methods of traditional project management to Agile projects.

In general, most would agree that something more than the burn-down chart is required.

For teams coming from a traditional project management environment, familiar techniques like earned value management (EVM) with an Agile twist can bridge this gap.

EVM is a project measurement technique used to evaluate and predict project performance against the plan. Project managers training in the

It is imperative that project managers devise strategies for tracking and measuring the team's project performance and adequately answer stakeholder questions about value, costs and resources.

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Project Management Institute (PMI)[®] process will recognise this technique, which measures three elements:

- Planned expenditures
- Actual expenditures
- Actual work performed against planned expenditures

This last element measures the value of what has been delivered for the amount of budget spent. If you have spent 80 percent of the budget and only delivered 20 percent of the value then you have a productivity problem.

Formal EVM is a rigorous process, measuring components such as:

- Planned value (PV) represents the budgeted cost of a defined amount of work, for instance how much was budgeted for the work expected to be done in the next three weeks.
- Earned value (EV) represents the budget for the amount of work expected to be done during a defined time period.
- Actual cost (AC) is the real cost of delivering the actual work accomplished in a specified period.

These metrics are then used as the basis for calculations that give project managers guidance on the performance of their projects.

In traditional project management, it is assumed that the scope is fixed, any changes will be managed through rigorous change control and the project will proceed in a predictable manner in which past performance is indicative of future progress.

EVM calculations are made based on a detailed work breakdown structure (WBS) and project managers focus on areas out of compliance to keep the project on track. Managers and customers rely on EVM to understand project performance and to manage teams, contractors and vendors.

With Agile projects, many of the underlying assumptions are not applicable. Project scope is assumed to be defined broadly and only the current iteration is planned and estimated in detail. Changes are expected as the product is refined and optimised, making it difficult to baseline a project.

Formal EVM measures PV, EV and AC, which are used as basis for calculations on project performance



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Applying EVM to Agile Project Management

To apply measurement techniques like EVM to Agile project management, project managers should focus on the expected outcome rather than the method.

The use of burn-down charts as a measurement and reporting tool provides many of the benefits of EVM, but in a different form. If the burn-down charts are kept scrupulously current and analysed prudently, project managers can use them as a key indicator of project progress, problems and risks.

Some Agile proponents have taken the application of EVM to a further level with AgileEVM. In a paper presented to The Institute of Electrical and Electronics Engineers (IEEE), a team of Agile developers proposed a disciplined, quantitative technique for applying EVM to Agile methods. (Sulaiman, Barton & Blackburn).

AgileEVM uses story points, rather than tasks performed, as the basic unit of measurement and measures iterations planned against iterations completed to derive the value delivered.

As in EVM, AgileEVM requires initial baselines such as number of planned iterations, number of planned story points in a release and planned budget for the release. Also needed are the total number of story points completed, number of iterations completed, actual cost and the number of story points added or deleted from the release plan.

AgileEVM makes EVM more compatible with agile techniques, while providing a familiar terminology and reporting mechanism.

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Agile EVM Metric	Definition
PSP (planned story points)	Total number of story points planned for this release
PW (planned weeks)	Total number of planned development weeks
BAC (budget at completion)	Total budget for the release
AW (actual weeks)	Number of development weeks elapsed to date
CSP (completed story points)	Number of story points completed to date
PPC (planned percent complete)	AW/PW
APC (actual percent complete)	CSP/PSP
AC (actual cost)	Total budget spent to date
PV (planned value)	Budgeted cost of the story points that were scheduled to be completed as of today; PPC*BAC
EV (earned value)	Budgeted cost for the story points actually completed as of today; APC*BAC
CV (cost variance)	Difference between planned budget and actual spend; EV - AC
SV (schedule variance)	Difference between planned schedule and actual time spent; EV - PV
CPI (cost performance index)	EV/AC
SPI (schedule performance index)	EV/PV
ETC (estimate to complete)	Based on current state, how much additional budget is needed to complete the release; $1/CPI*(BAC - EV)$
EAC (estimate at complete)	Based on current state, what the total estimate cost of the release will be at completion; $EAC=AC+ETC$
Estimated time to complete	Based on the current state, the total estimated time needed to complete the release; $1/SPI*PW$

Agile Earned Value Management

Exhibit 3.

For example, the budget for the release is \$100,000 for a completion of 100 storyboards. At this time, you have completed 25 of the storyboards at a cost of \$20,000.

Actual percent complete = 25 completed storyboards/100 storyboards = 25 percent complete.

EV = actual percent complete X total budget = \$25,000.

These modifications make the version of EVM more compatible with Agile techniques, while providing a familiar terminology and reporting mechanism.



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Agile projects do not necessarily need to reinvent every artefact; traditional status reports can be used as long as it is clear that they refer to the current iteration rather than the entire effort.

A typical status report, with an executive summary, accomplishments report, listing of upcoming activities and issues/barriers list, has the added advantage of being familiar to the audience.

As long as the project team stays focused on completing the development work and delivering a working product or prototype rather than being distracted by status reporting, traditional methods of communicating progress can be effective.

It is important to remember that many executives, stakeholders and customers are steeped in traditional project reporting methods and can feel unconnected or un-informed during the migration to Agile techniques.

Customer-focused Agile project managers work closely with their clients and sponsors to develop reporting mechanisms that tell clients what they need to know and inspire confidence in the team through transparency and communication.

Agile project managers therefore need to consider the specific needs of their Agile project and utilise the variety of metrics available to effectively communicate their progress to their project stakeholders.

References

Project Management Institute. (2008) A Guide to the Project Management Body of Knowledge (PMBOK® Guide) (4th ed.). Newtown Square, PA: Project Management Institute.

Sulaiman, T., Barton, B. & Blackburn, T. (2007). AgileEVM – Earned value management in scrum projects.

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