Velocity – A Squishy Measure

By Kathy Iberle

Key Points
• **Velocity by feature is a squishy measure because the yardstick keeps changing.**   • **Measuring by stories is more useful than measuring by story points.**   • **Keeping all your stories small will give you the most reliably predictive measure.**

What is Velocity?

In our regular lives, we generally think of velocity as speed. (Except for physicists, who know velocity is speed plus direction). In the U.S., speed is usually expressed as miles per hour. Every mile is the same length as every other mile. When I'm hiking, the uphill miles may take longer, so my velocity varies, but every mile is still a mile long. Agile projects usually measure velocity in terms of stories or story points per iteration. Unlike miles, each story can be a different size. This creates some uncertainty or "squishiness" in the measurement of velocity. Let's consider this more deeply.

Velocity as Miles Per Hour

In Silver Falls State Park in Oregon, there's a lovely day hike which passes a whole series of waterfalls. The waterfalls on the main loop of the Silver Falls Loop Trail are scattered over the distance, as shown here.

Silver Falls Loop Hike	Elevation in feet	Trail Mileage
Start	1340	0.0
North Falls	1470	1.8
Twin Falls	1230	3.1
Middle North Falls	1200	4.1
Drake Falls	1060	4.6
Lower North Falls	1000	5.0
Lower South Falls	980	6.3
South Falls	1340	7.0

http://www.oregonhikers.org/field_guide/Trail_of_Ten_Falls_Loop_Hike/Log

If I hiked the Silver Falls Loop Trail, with plenty of stops to admire the waterfalls, my velocity might look like this graph.

After the first two markers, I hike a bit faster because I'm going down a gentle slope. The last mile is a trudge uphill, regaining around 400 feet of elevation in a short distance, so I slow down. Another hiker might have a different average velocity for this trail. On a much steeper trail, I might have a different average velocity. But, a mile is still a mile.

Miles Hiked: Silver Falls Loop Trail Hike
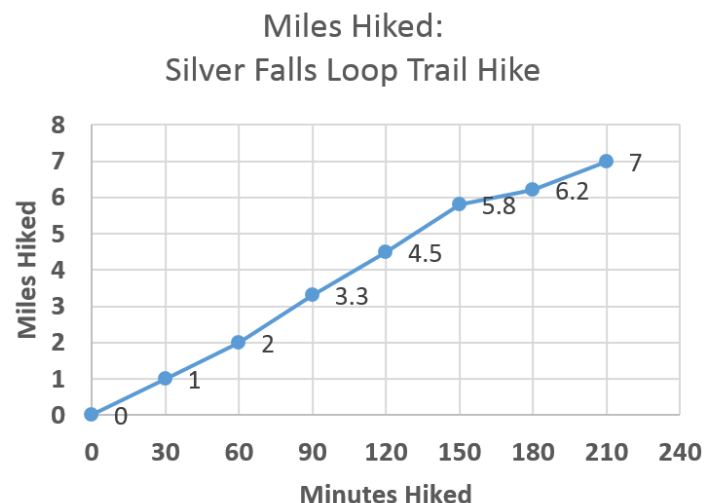

Velocity of an Agile Team

Measuring velocity in an agile team is much trickier, regardless of whether you are measuring velocity in terms of stories or in terms of story points. Unlike miles, each story or story point can be a different size. In effect, your yardstick is squishy – the distance between each unit isn't standardized. Measuring with a squishy yardstick gives you a measurement with a wider margin of error.

For instance, what if I measured my hike by waterfalls seen? The waterfalls aren't evenly spaced along the hikes. Like user stories, the effort to reach each waterfall from the last one isn't the same. This produces a much bumpier velocity.

Waterfalls Seen:
Silver Falls Loop Trail Hike

I can still calculate an average velocity in terms of waterfalls, but it isn't going to accurately predict the time it will take to reach a particular waterfall. The same is true of agile velocity – your velocity can accurately predict the total time for a whole bunch of stories, but it's not that accurate for a particular story.
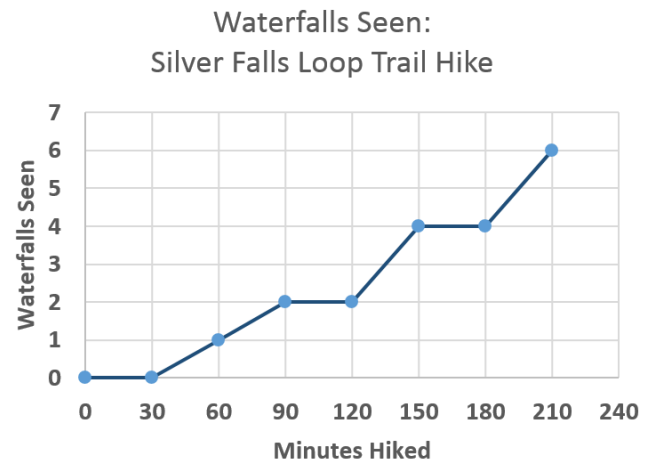
Some people suggest that we measure velocity by story points completed, and give credit for partially completed stories. This produces a much smoother velocity graph, but you're actually predicted your ability to do work, not your ability to deliver working software. Others measure by story points, but don't give credit unless the story was completed. It's still a bumpy graph, because story points aren't a fixed length either.

Johanna Rothman suggests that the team measure velocity by stories, **and** try to keep **all** the stories small, preferably around 1 day long. This method eliminates a great many of the problems caused by measuring with a squishy yardstick. Sure, some stories are still larger than other stories, but they aren't going to be very much larger since they're all supposed to be 1 day. The yardstick is less squishy, so the measurement of velocity is more precise. The team can better estimate how much work to accept.

Learn More

More thoughts about how to measure: http://kaner.com/pdfs/rethinking_sw_metrics.pdf
Does your definition of velocity include bug fixes? Should it? A thoughtful discussion:
https://www.mountaingoatsoftware.com/blog/know-exactly-what-velocity-means-to-your-scrum-team
Johanna Rothman on 1-day stories: https://www.jrothman.com/mpd/agile/2014/11/three-alternatives-for-making-smaller-stories/