Quality Intelligence® for DevOps

How DevOps creates value and how to measure it

Qentinel

Robotic
Software
Testing

Velocity and quality

Agile software teams are jumping on the DevOps bandwagon. The goal of DevOps is to deliver value faster. Customers can obtain value from a software release only when they start using it. Bringing Operations closer or even to the same team with Development improves collaboration and allows streamlining processes so that the DevOps team can deliver features and fixes faster. Automating and measuring 'everything' are two fundamental DevOps principles for enabling that.

There are good metrics for measuring the speed of value deliveries. Deployment frequency indicates how fast a team can deliver software to production. Lead time metrics provide useful insights on how fast a team can translate requirements into code and deploy them to users.

However, looking at the speedometer alone is not enough. It's easy to deliver something fast but much harder to deliver fast but with quality. Therefore DevOps teams need to build quality in and invest in automating integration, testing and deployment to obtain continuous feedback on functional and technical quality. Moreover, quality should not be interpreted narrowly just as the absence of bugs and conformance to requirements. A valuable delivery should provide a positive customer experience and some (ideally measurable) benefits to the user. DevOps teams need to have the means for getting usage telemetry and direct user feedback from the software in use to learn from it and improve the product or service iteratively.

Software measurement pitfalls

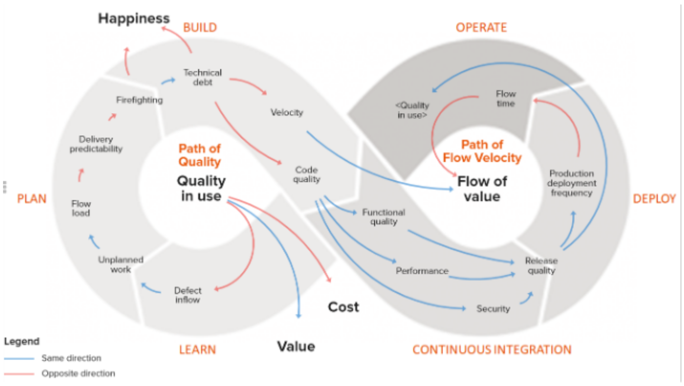
It is easy to google software metrics, also for DevOps, but it is difficult to implement a useful, effective software measurement system. Maybe the most typical problem is focusing on vanity metrics. They are metrics that may sound cool or where you may have nice scores that make your team look good – but those metrics don't help you improve anything. Metrics might be irrelevant or the data used for calculating them might be unreliable or skewed so that it makes your scores look nice. If you can't conclude any actions based on your metrics scorecard, you probably have this issue.

The second typical measurement challenge is the lack of leading indicators. Your metrics might be valid as such but you don't know what factors have caused the results. Picture this: one day you notice that your Defect Inflow from customers has increased by 50% in 2 weeks and your Production Deployment Frequency keeps on slowing down. What things are causing those? What levers should you turn to fix the situation?

DevOps Value Creation Model

Value Creation Model™ (VCM) provides a tried and true approach to eliminate the two measurement pitfalls. It is a system model, technically a causal loop diagram, which shows how value is created. To avoid vanity metrics, you need to identify your goals first and relate your metrics to them. For DevOps the goals are (accelerated) Flow of Value and (high) Quality in Use.

The DevOps Value Creation Model below has been drawn using the DevOps cycle as the background to provide a clear context for what we measure. The model shows how each phase in the process creates value or imposes a risk for losing value. All nodes in the model are candidates for metrics.

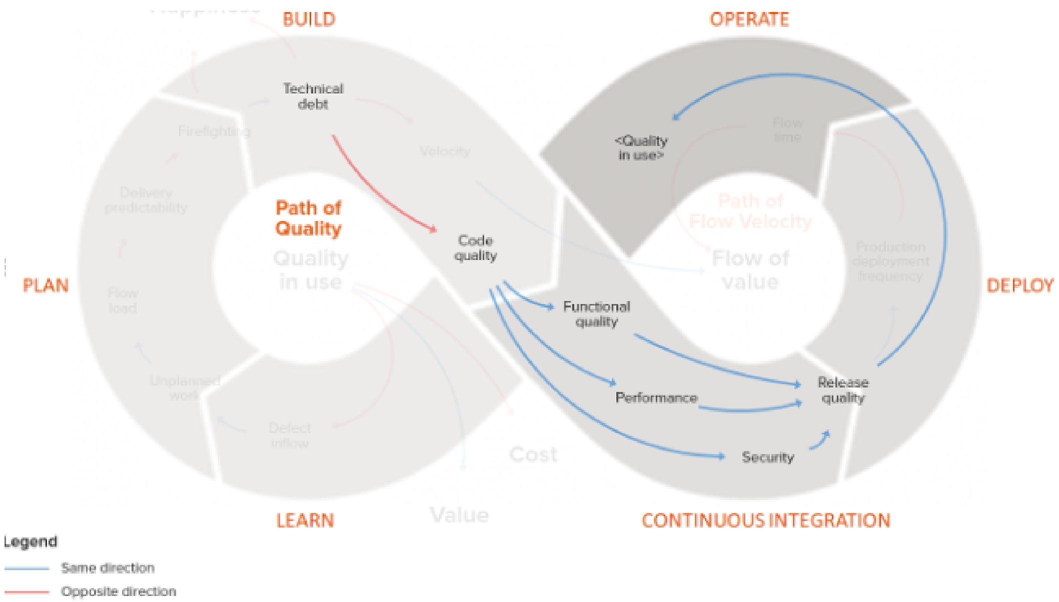


The causality chains can be used for identifying the leading indicators that have a positive or negative impact to your goals. Blue arrows in the picture denote positive (assumed) causality, so for instance when **Velocity** increases, so does the **Flow of value**. Respectively, a red arrow means that the variables move to the opposite direction. The higher is **Technical debt**, the lower is **Velocity**.

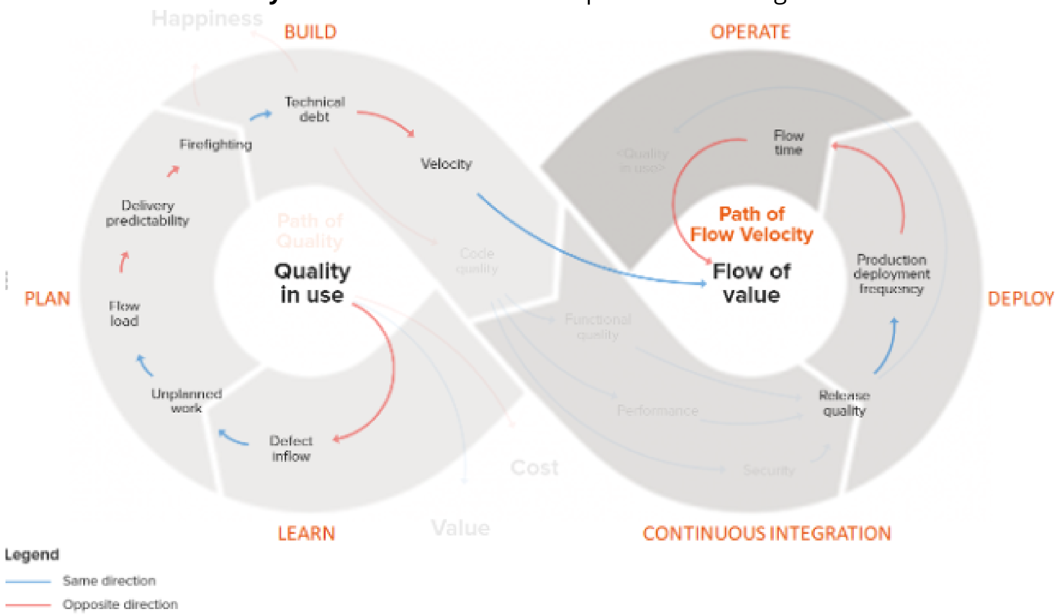
Value Paths provide leading indicators for proactive corrective actions

The concept of Value Path allows focusing on the most important causality chains in the model to address specific business issues. In this DevOps Value Creation Model we have defined four Value Paths to answer four important questions:

1. **Path of Quality:** Is the current release candidate ready for production and if not, what should I fix? What should I focus on to minimize the risk for service outages and other quality issues in Production?



2. **Path of Flow Velocity**: How can I accelerate the speed of delivering value?



It is easy to see from the two value paths what the leading indicators and assumed causalities are. Here, from the Path of Flow Velocity we can see that we should get the technical debt down to improve velocity and deliver more. To get those features into use faster we need to improve production deployment frequency which calls for high quality release candidates. As shown in the Path of Quality, the quality of release candidates predicts the quality in production. If quality in use turns out to be low, loads of defects will be reported and unplanned work will cause high flow load in the team, eventually leading to firefighting and accumulating technical debt. This is why effective, highly automated quality assurance is must-have for DevOps teams.

All nodes in Value Creation Model are potential metrics

The actual metrics are defined for the nodes of the DevOps Value Creation Model. Some nodes are measured by several metrics. In those cases we can calculate an index score (0 – 100 – 200) where 100 represents the intended target level. The actual measurement scorecard, some metrics trees opened, looks like this in Qentinel Pace™:

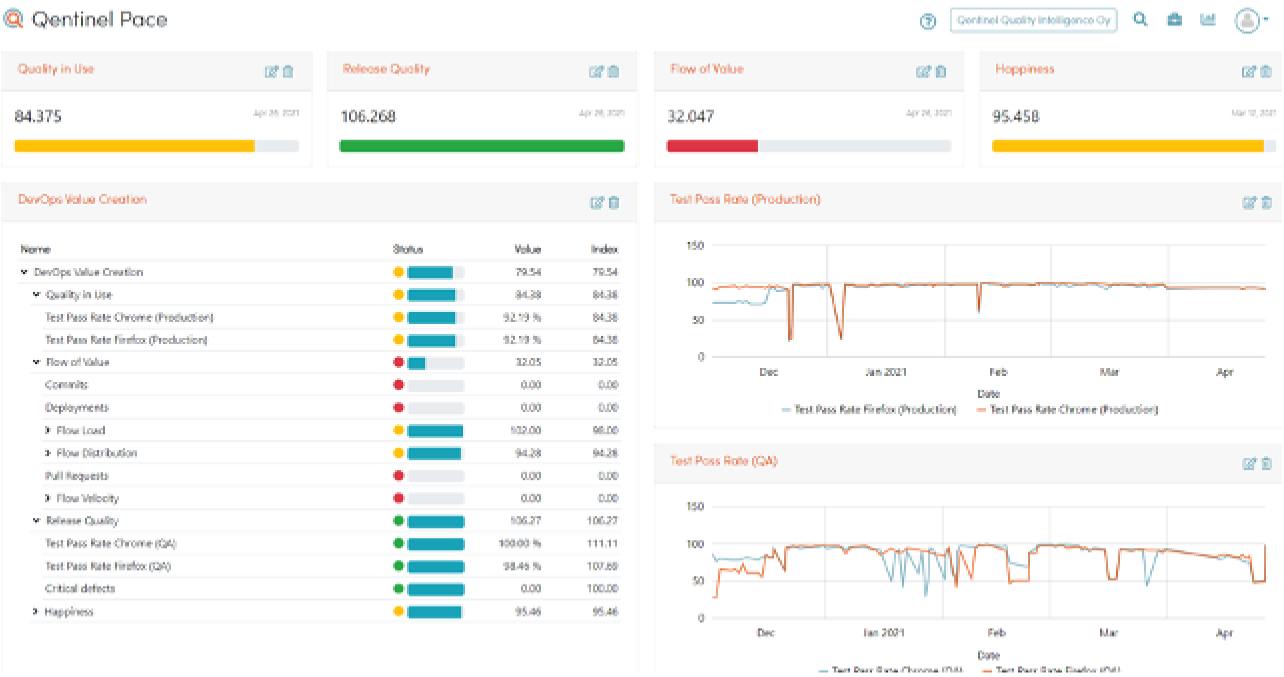
There are some key indices on top to give a quick overview of the current state of production environment, the latest release candidate under development, flow of value and team's happiness. An index score under 100 and red or yellow color indicates that there is room for improvement.

Release Candidate quality index is only 62.17 so there must be some major quality issues and therefore this release candidate must not be deployed to production. A quick look at the Value Creation Model tells that there is at least a security issue and technical quality is on 'yellow' so some metrics are not meeting the goals. With a few clicks in the metrics tree we can find out that CPU usage is too high and service response times are not within the acceptable control band. This kind of analyses are easy and fast to carry out now that the metric causalities have been modeled into the Value Creation Model and the metrics have been organized into hierarchic trees accordingly.

From Value Creation Model to Machine Learning models

Value Creation Model defines the assumed causalities and thus gives an excellent starting point for building Machine Learning models for predictive analytics. For instance, the decision to deploy a release candidate to production is in fact a prediction that the candidate, when deployed to production, will be of as good as or better quality than the one in production before it.

Leaders of DevOps teams do release decisions frequently and often more based on gut feeling than data. The required data might not be available at all or it might be scattered in several systems so that the data is hard to find. Carrying out an objective evaluation whether the results were better or worse than the results of the previous release candidate is close to impossible. With proper data collection and machine learning solutions we can make comparisons easier but also create predictions to support release decisions. The opportunities for using AI based analytics are not limited to this release decision case only. It is possible to leverage Machine Learning for predictions and e.g. for trend analysis and anomaly detection on a Value Path of the DevOps Value Creation Model.


Qentinel Pace
Qentinel Quality Intelligence Oy
Test Pass Rate (Production)
150
100
50
0
Dec
Jan 2021
Feb
Mar
Apr
Date
Test Pass Rate Firefox (Production)
Test Pass Rate Chrome (Production)
Test Pass Rate (QA)
150
100
50
0
Dec
Jan 2021
Feb
Mar
Apr
Date
Test Pass Rate Chrome (QA)
Test Pass Rate Firefox (QA)

Quality in Use
84.375
Apr 28, 2021

Release Quality
106.268
Apr 28, 2021

Flow of Value
32.047
Apr 28, 2021

Happiness
95.458
Mar 12, 2021

DevOps Value Creation

Name	Status	Value	Index
DevOps Value Creation	●	79.54	79.54
Quality in Use	●	84.38	84.38
Test Pass Rate Chrome (Production)	●	92.19 %	84.38
Test Pass Rate Firefox (Production)	●	92.19 %	84.38
Flow of Value	●	32.05	32.05
Commits	●	0.00	0.00
Deployments	●	0.00	0.00
Flow Load	●	102.00	98.00
Flow Distribution	●	94.28	94.28
Pull Requests	●	0.00	0.00
Flow Velocity	●	0.00	0.00
Release Quality	●	106.27	106.27
Test Pass Rate Chrome (QA)	●	100.00 %	111.11
Test Pass Rate Firefox (QA)	●	98.46 %	107.69
Critical defects	●	0.00	100.00
Happiness	●	95.46	95.46

Conclusions

Concluding, DevOps accelerates the flow of value by allowing the teams to deliver software frequently to customers without compromising quality. Measuring 'everything' is one fundamental principle in DevOps but the metrics need to be practical and actionable. Value Creation Model provides an approach to present the assumed causalities among the metrics and link them as leading indicators to the goals of DevOps. The metrics can be organized into metric trees that allow calculating indices that show the overall status of the most important focus areas. We can leverage the DevOps Value Creation Model also for developing predictive analytics solutions.

This presented approach, Quality Intelligence for DevOps, helps the DevOps teams to make more data-driven release decisions and find the right levers to turn to produce more value with software, faster.

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