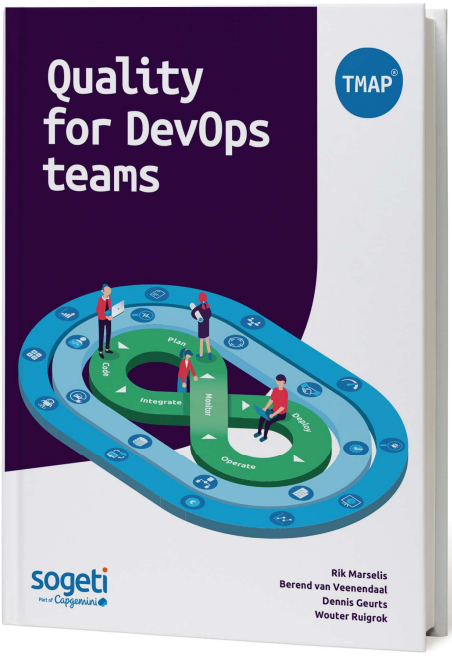
Quality for DevOps teams

Rik Marselis

TestCon: 14 October 2020

TMAP: the body of knowledge for quality engineering in IT delivery



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Challenges of today's high-performance IT delivery

The business demands:
- Deliver business value
- Deliver quality at speed

The team challenges are:
- Quality engineering is everyone's responsibility
- QA & testing is integrated in people and process

The focus is:
- Organize high-performing cross-functional teams *(you build it, you run it!)*
- Automate everything *(as long as it is useful)*

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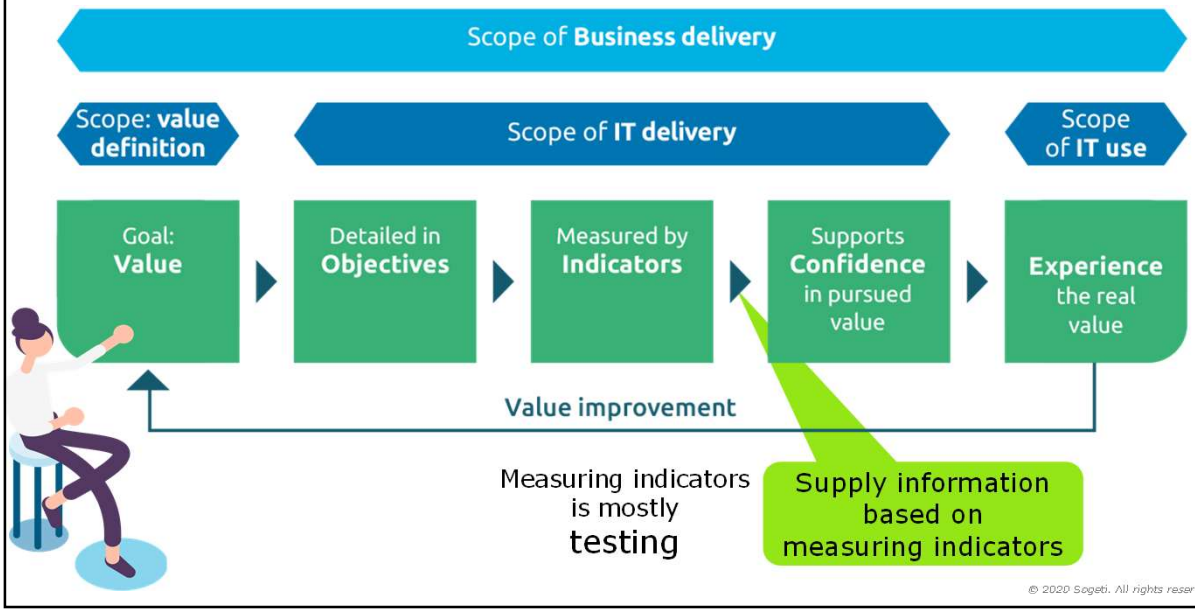
Focus on BUSINESS VALUE with the VOICE model



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Measure indicators to establish confidence in business value

TMAP describes four groups of indicators

- Business value related indicators
- IT delivery related indicators
- Team related indicators
- Problem related indicators

Customer satisfaction
Number of service calls to helpdesk

Business features done
Percentage of availability (up-time)

Availability of necessary skills
Satisfaction and happiness of team members

Number of anomalies registered compared to expected
Mean time to fix operational failures

A few well-measured and properly followed-up indicators are much better than a long list of unpractical indicators.
So as a team, together with the relevant stakeholders, discuss which indicators show whether you are moving towards the pursued business value.

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The context of Quality and quality engineering

Quality engineering is about taking responsibility for quality as a team.

Build quality in… Into the product, into the process, into the people!

(rather than performing testing as just an activity at the end)

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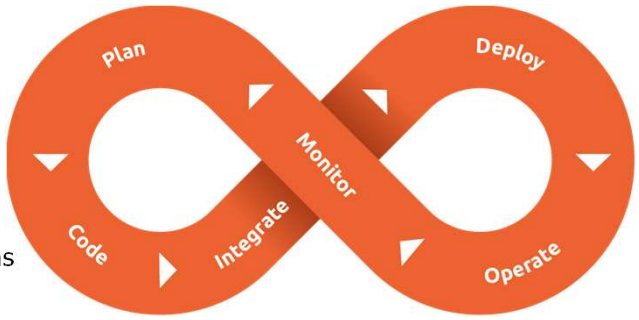
DevOps – highlights

The six DevOps principles:
(source: the DevOps handbook)

1. Customer-centric action
2. Create with the end in mind
3. End-to-end responsibility
4. Cross-functional autonomous teams
5. Continuous improvement
6. Automate everything you can



DevOps is a **cross-functional systems engineering culture** that aims at unifying systems development (Dev) and systems operations (Ops) with the ability to create and deliver fast, cheap, flexible and with adequate quality, whereby the team as a whole is responsible for the quality. Other areas of expertise, such as business analysis and quality assurance (including testing) are usually integrated in the team. A DevOps culture has an **Agile mindset** that can be supported/implemented by e.g. the **Scrum framework**.

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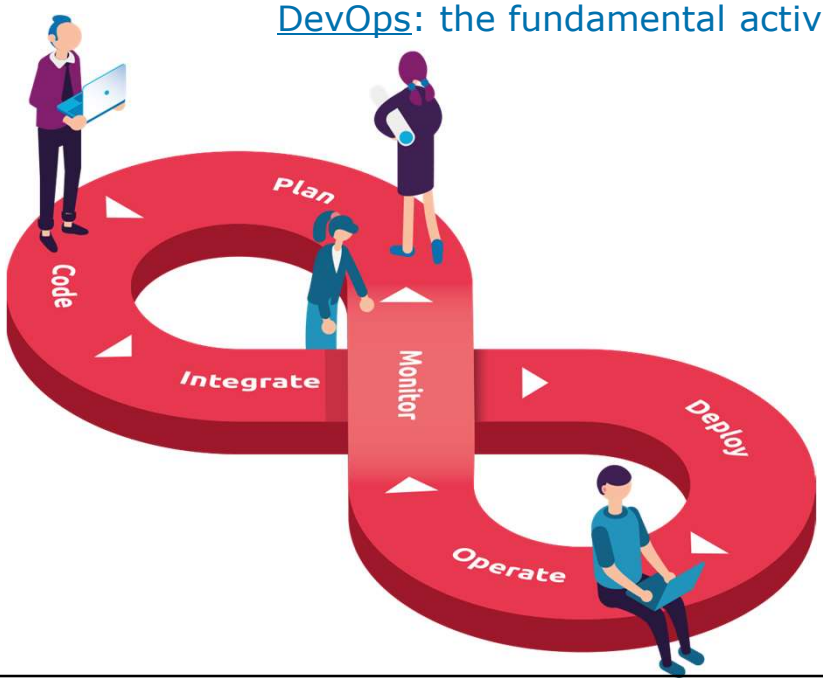
DevOps: the fundamental activities



Monitor
Plan
Code
Integrate
Deploy
Operate

Testing is NOT a fundamental activity since
Quality engineering is integrated in all activities

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The starting point for High-performance IT delivery:

Cross-functional teams

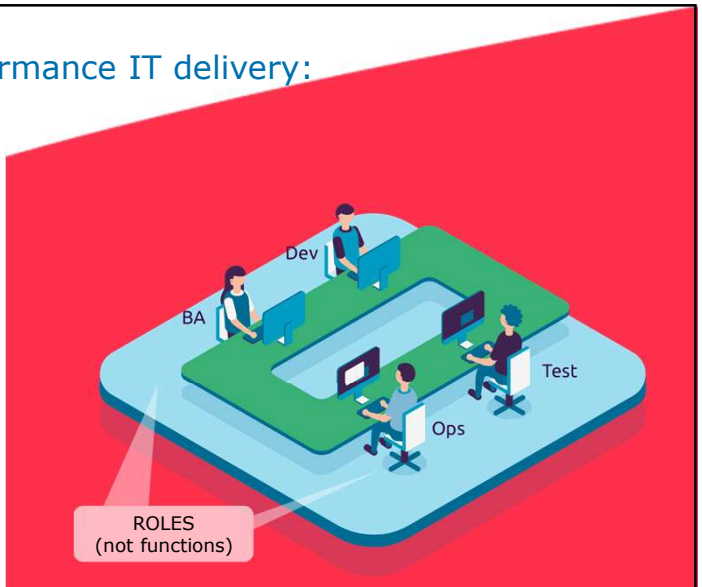
TEAM:
Together
Everyone
Achieves
More

High-performance IT delivery:

The team is responsible that tasks get done

Team members pick up tasks and thus have varying roles at various moments in time.

Team members have one or more specialisms and multiple competencies
But no team member has a monopoly on specific tasks



Example of a cross-functional high-performance IT delivery team

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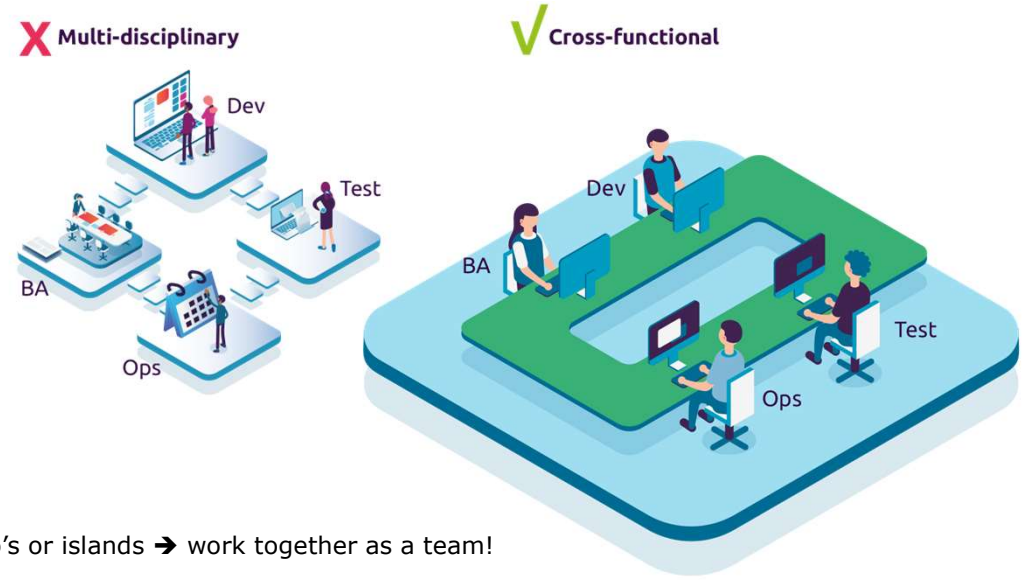
A team should be cross-functional, not multi-disciplinary



NO more silo's or islands ➔ work together as a team!

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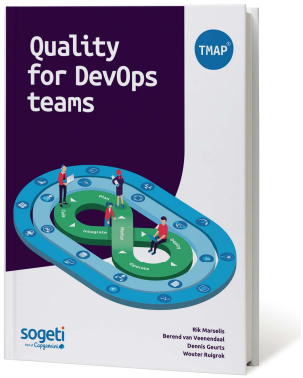

Quality for DevOps teams

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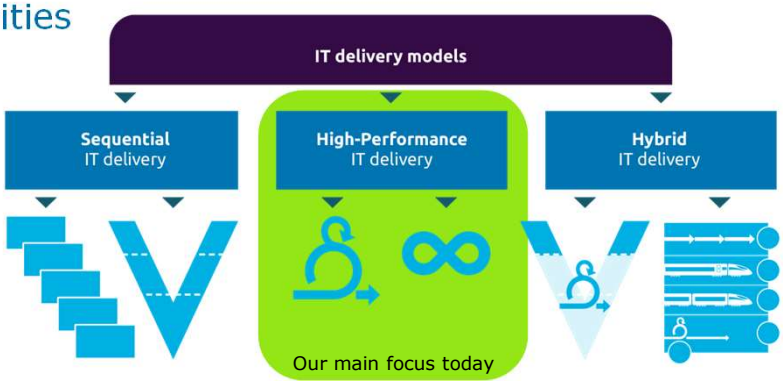
Quality engineering activities



Which quality engineering activities must be done
Does not differ much per IT delivery model

We defined a generic set of quality engineering activities
We grouped these activities in 20 so-called "Topics"

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Quality engineering topics

Two groups of topics:

- **Organizing** — Multi-team scope
  Aimed at: orchestrating, arranging, planning, preparing and controlling
- **Performing** — Team scope
  Aimed at the operational QA & testing activities.

Note: it is not black-and-white, some topics may be relevant for both, but the emphasize is on one or the other.

These topics are always relevant for quality engineering, regardless of the IT development, operations and maintenance approach.

For effective and efficient IT delivery all of these topics need to be addressed in one way or another.

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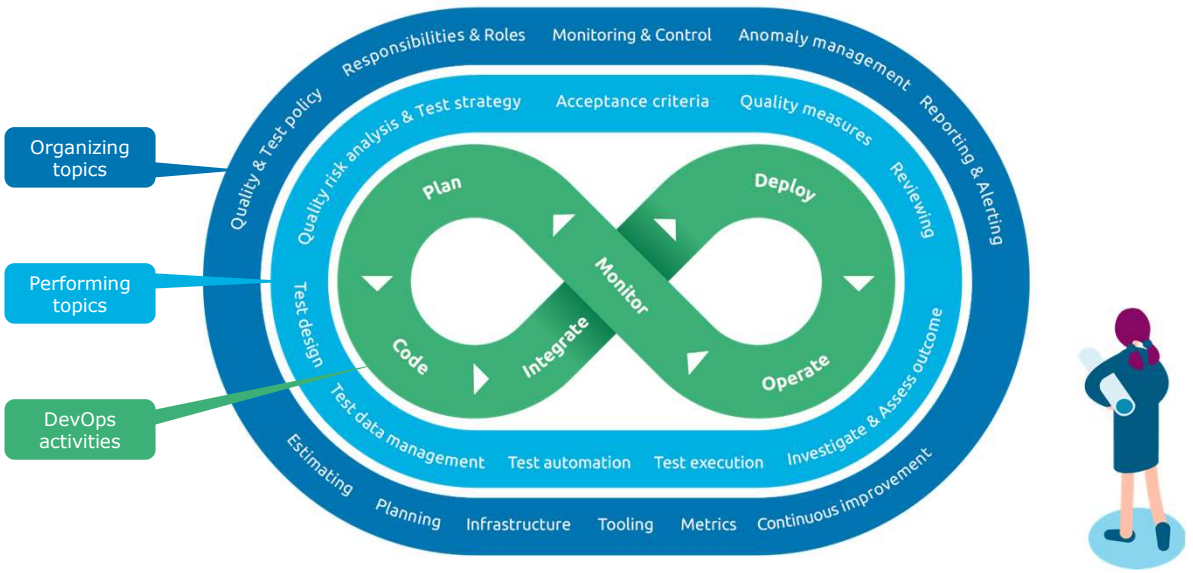
The QA & testing topics related to the DevOps activities



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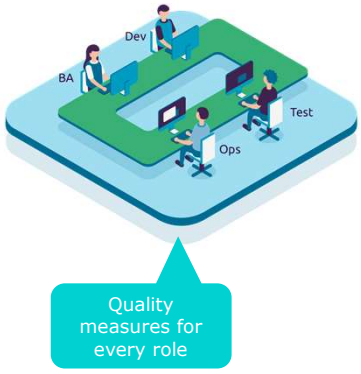
Quality measures

Examples of quality measures that are described in TMAP:

- Specification and Example (SaE)
- unit testing & mutation testing
- Test design approaches & techniques
- Feature toggles
- Monitoring
- and many many more…



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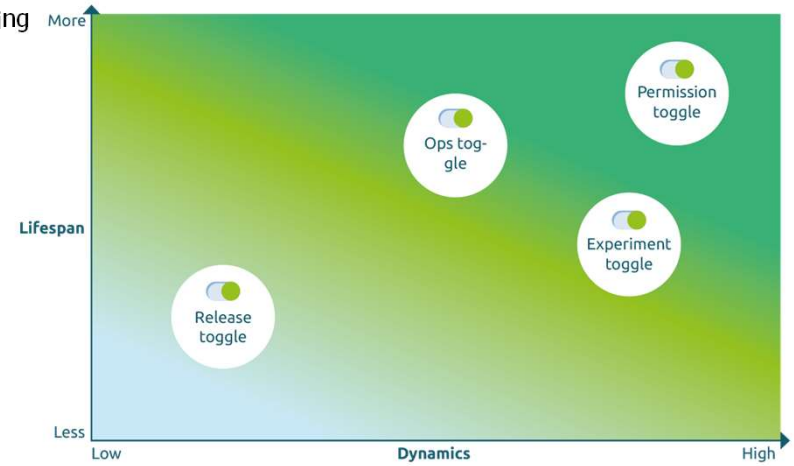

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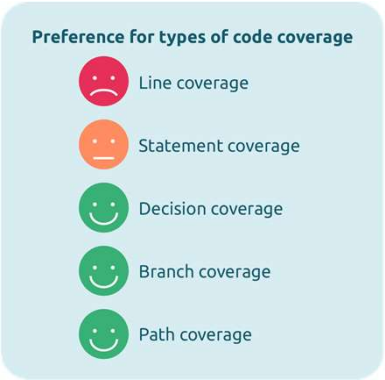
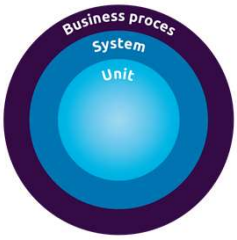
Unit testing

Code coverage demonstrates the percentage of program code that is covered by tests. Different test design techniques guarantee less or more coverage.



Keep in mind that the statement "we have reached 100% code coverage" in itself doesn't give useful information.

The type of code coverage achieved is what matters



The spheres of influence

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Mutation testing tests the test

Mutation testing is a type of testing where certain statements in the source code are changed (mutated) to check if test cases will identify the fault that was introduced this way.
This is a manner to verify the quality of the test set (instead of the object under test).
Mutation testing usually is supported by tools.

Mutation testing focuses on conditional statements.

Suppose we have the following code and test cases:

```
IF A > 10 PRINT "YES" ENDIF

Testcase1: A := 10, expected result no print
Testcase2: A := 11, expected result "YES"
```

What mutation in this code would not make any of these tests fail?

```
IF A <> 10 PRINT "YES" ENDIF     ➔  Testcase3: A := 9, expected result no print
IF A = 11  PRINT "YES" ENDIF     ➔  Testcase4: A := 12, expected result "YES"
```

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Specification and Example

To understand what "it" is that should be built and try to build "it" right the first time,
the team(s) can use Specification and Example mapping approaches.
These are collaborative approaches to define requirements and business-oriented functional tests for software products, based on capturing and illustrating requirements using realistic examples instead of abstract statements.

Some commonly used approaches are:

- Specification by Example (SbE)
- Example-driven development (EDD)
- Executable requirements
- Acceptance test-driven development (ATDD)
- Behavior-driven development (BDD)
- Agile acceptance testing
- Test-driven requirements

Keywords:

- **Common understanding of stories/features**
- **Test-first**
- **Exploring ideas**

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Whole-team approach: Four Amigos

The amigos approach is an approach whereby representatives of the various capabilities in a team get together to review a deliverable.

In the Agile community "three amigos sessions" are quite common and well known.

In DevOps we commonly identify four capabilities in the cross-functional team: Business analysis, Development, Testing and Operations. They are called the four amigos.

Whenever a deliverable has to be reviewed, the four amigos study the deliverable from their own perspective and get together to discuss their findings. Because of the discussion and the exchange of views, a four amigos session is usually more effective than individual informal reviews.

Four amigos

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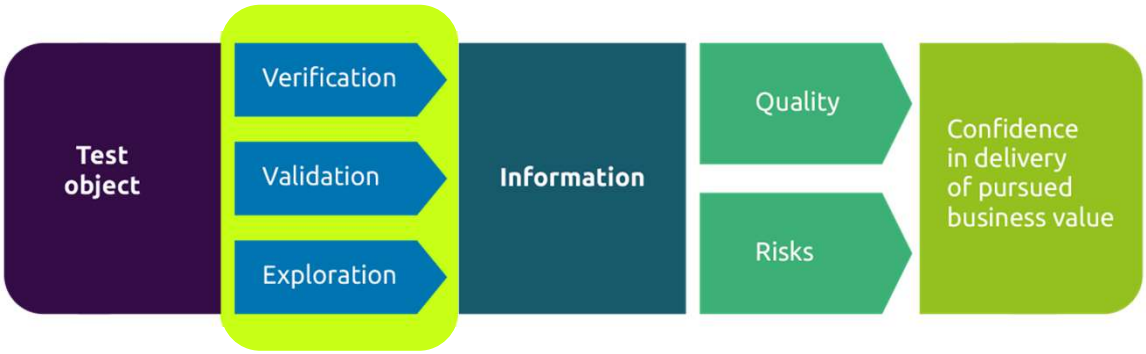
Testing = Verification + Validation + Exploration



Testing needs test design techniques and approaches

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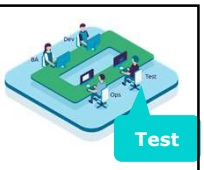
Test approaches and techniques



Coverage-based groups of test design techniques

- Process
- Condition
- Data
- Appearance

Experience-based testing

Test approaches

- Experience-based testing
- Coverage-based testing

Always combine

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Continuous everything to achieve built-in quality

Continuous Monitoring (CM)

Continuous Quality & Testing (CQT)

Plan | Code | Integrate | Deploy | Operate | Monitor

Continuous Integration (CI)

Continuous Deployment (CD)

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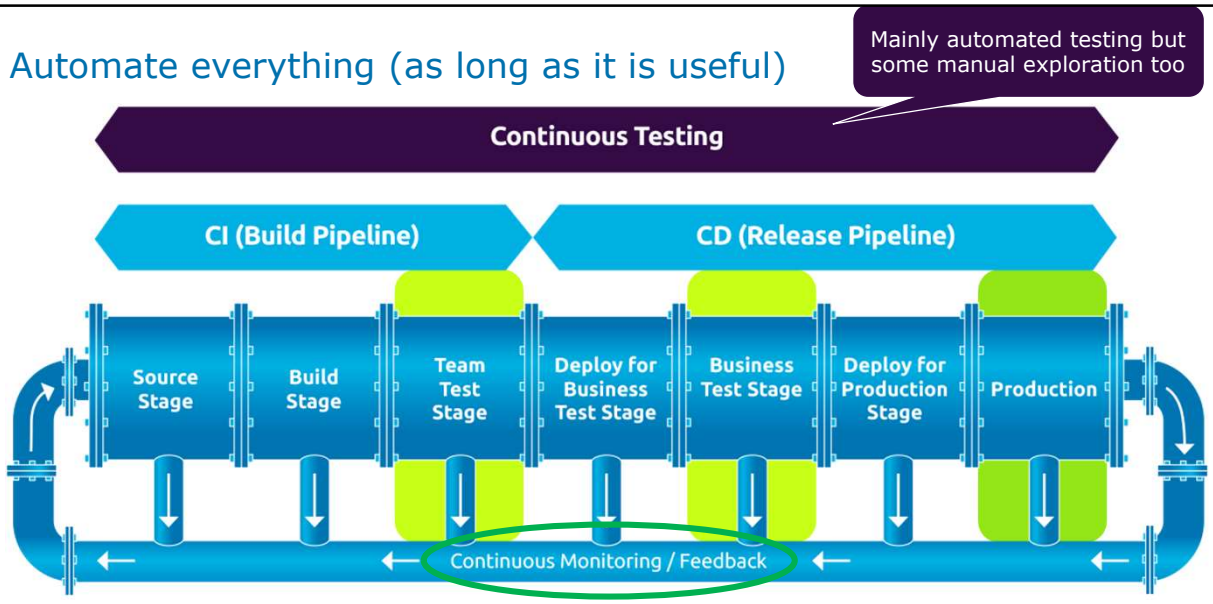
Automate everything (as long as it is useful)



By continuous testing and continuous monitoring gather information on various indicators from both test environment and live environment.

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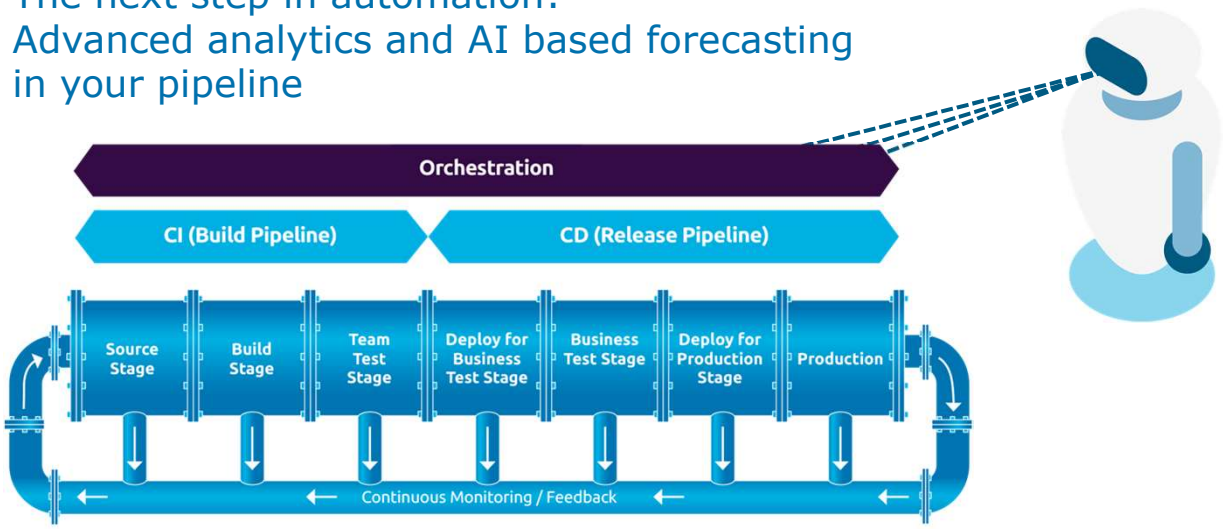
The next step in automation: Advanced analytics and AI based forecasting in your pipeline



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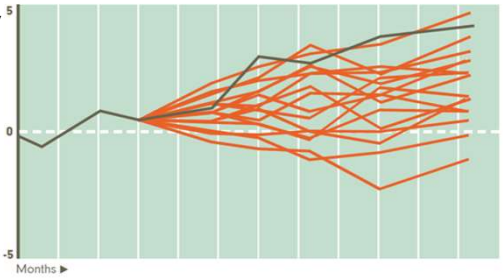
Advanced analytics and AI based forecasting in your pipeline

- Predictive analytics uses multiple models
- The available data from test execution and live monitoring is fed into multiple models
- Each model calculates the expected evolution of quality
- The results are shown in a "plume"



Today

- The digital quality engineer determines, based on the relevant parameters, which is the most likely future situation. If the quality is at risk a "code red" can be issued.
- Based on this forecast the team can decide what actions need to be taken to ensure quality.

Near future

- Prescriptive analytics determine the most likely situation and if quality is at risk immediately triggers corrective action.

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Quality Forecasting with Artificial Intelligence based on measured indicators

Descriptive analytics

What happened

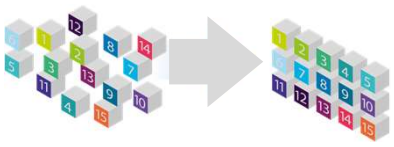
Predictive analytics

What could happen

Solve problems before any user experiences a failure ☺

Prescriptive analytics

What should we do now



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Conclusion: The change that quality engineering achieves

No more

Messenger of Bad News

Enabler of an adequate quality level that delivers Business Value

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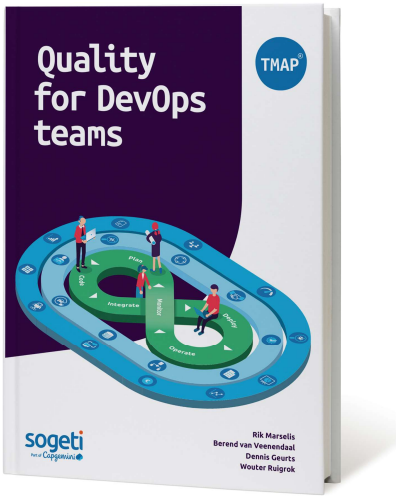
TMAP: body of knowledge for quality engineering



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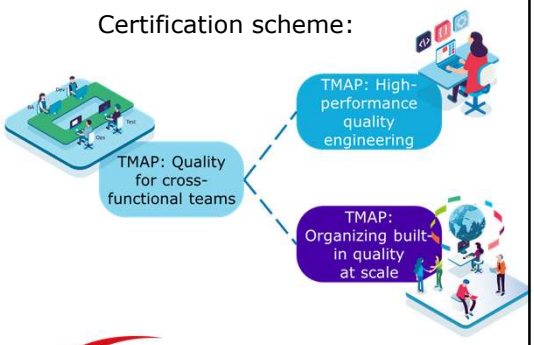

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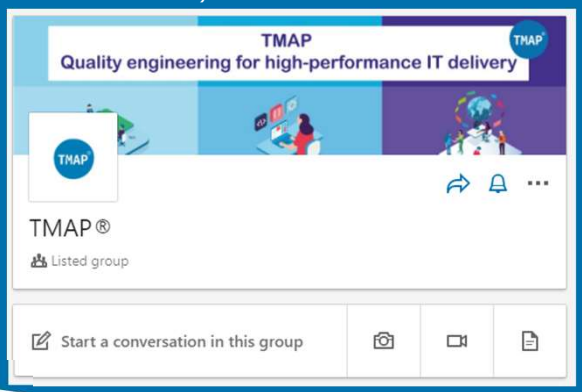

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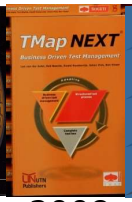
Rik Marselis
Principal Quality Consultant

1980

2018

2020

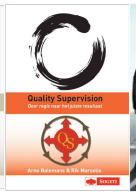
2007



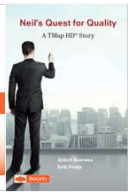
2008

2009

2012



2012



2014

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