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Testing and Quality in the Scaled Agile Framework for Lean Enterprises

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biography

Derk-Jan de Grood works for Valori as senior test manager and agile transition coach. As consultant he helps originations with their Scrum adoptions and embedding the quality strategy. He is an experienced trainer, workshop host and a regular speaker at conferences like Agile Testing Days, the Seoul Testing Conference, EXPO:QA, Freetest and the STAR conferences in Europe and America. He wrote several successful books on software testing and frequently publishes articles and columns for the major magazines. On his own blog he shares his knowledge and experience for everyone to benefit. In 2014 he won the EuroSTAR testing excellence award. In 2016 he published an agile book called "Agile in the real world, starting with Scrum"

Mette Bruhn-Pedersen works as a tester, test manager, test lead, and agile transformation coach in her company Safe Journey.
She has used traditional and agile approaches to testing on both team and company level.
Since 2014 Mette has helped managers, QA & Test leads, agile teams and business stakeholders on their journey from a team-based agile setup to a scaled setup. Following the SAFe Implementation Roadmap and good practices Mette helps define value streams, launch and run Solution and Agile Release Trains. She also conducts training and coaches people on how to transition to new roles and responsibilities.

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abstract

Scaled Agile Framework for Lean Enterprises (SAFe) is becoming the most popular framework used to help large programs and entire companies achieve business agility. It builds on well-known agile-lean principles and methodologies, and puts them together to address challenges not only on team level, but also on program, large solution and portfolio level. Although the framework is described in more details than other comparable frameworks it is not very elaborate on how testing and quality practices fit in. This raises new challenges for testers, Q&A and test managers, test architects, test specialists and people in similar roles together with the entire organisation.

In this eBook Derk-Jan de Grood and Mette Bruhn-Pedersen describe what guidance SAFe actually provides and suggest additional ways testers can contribute with their special knowledge and expertise.

The eBook is based on an expert session at the 22nd Testing Retreat (2017, Hereford UK). The Testing Retreat is a peer-conference where leaders in the testing and quality profession share their experiences and insights. The participants discussed quality measures and actions that test professionals could take in order to ensure quality when using SAFe throughout the Software Development Lifecycle (SDLC). We thank all for their valuable contributions.

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Testing and Quality in Scaled Agile Framework for Lean Enterprises

Scaled Agile Framework for Lean Enterprises (SAFe®) is the most popular framework used by large programs and companies to achieve business agility. It challenges how testers, Q&A and test managers, and other test specialists work together with the entire organisation. In this eBook Derk-Jan de Grood and Mette Bruhn-Pedersen explain how testers can contribute with their knowledge and expertise in a SAFe® organisation.

The Need for Agile Scaling

Agile methodologies are widely embraced by organisations that aim for iterative and incremental delivery and a short time-to-market. Popular agile methods like Scrum and Kanban, DSDM, XP and of course hybrid models that combine agile methodologies with the more traditional waterfall methodology aim to deliver customer value in a continues flow. They focus on individual development teams. Organizations more and more start to understand that business agility and responsiveness is a key factor to survive and stay ahead of their competitors. In order to yield value, the work of single agile teams should therefore be integrated and embedded in larger business processes. The adoption of agile is shifting from a single team focus to a wider organizational approach. Many organizations embrace Scaled Agile Framework for Lean Enterprises (SAFe®) in order to enable multiple teams to collaborate on a single release, to plan and manage dependencies and last but not least, to translate business strategic needs to user-stories that can be completed by individual teams.

SAFe® as a Framework

SAFe® is a freely revealed knowledge base of integrated, proven patterns for enterprise Lean-Agile development[i]. Among the available frameworks for scaling agile, SAFe® seems to be most documented one. Other frameworks like Nexus and LeSS are less documented and also less prescriptive. This might explain the popularity of SAFe® with organizations that are used to formal processes and want a clear structure.

SAFe® comes in four configurations. The Portfolio configuration that we will use as basis for our article holds three levels. On the bottom we find the **team** level. This level describes practices for the individual and co-operating teams that work on user-stories. This level builds on SCRUM and Kanban practices that many people are familiar with. The level above the team level is called the **program** level and describes how organizations divide work between individual teams and how they merge completed features into a continuous delivery pipeline. The Agile Release Train (ART) bundles the work of the teams into controlled product increments. This is the minimum configuration of the framework. On the top we find the **portfolio level**. In this level strategic themes of the organisation are translated into value streams and portfolio Epics are defined.

Where Does Quality Manifest Itself in SAFe®

Since Agile software development methodologies started to become popular after the creation of the Agile Manifesto in 2001 practitioners have explored various ways of transitioning from more plan-driven, documentation-heavy, extensive and prescriptive

processes to light-weight, collaborative and some more adaptable methodologies. This shift challenges traditional roles, responsibilities and ways of working. Although the agile methods build quality into their practices, testing and quality remains a challenge for many agile teams. We see that many development teams are still adapting their testing tools and approaches to the new practises. Scaling Agile introduces additional challenges for testing. Shifting from a single team focus to a wider organizational approach requires that testing and quality assurance scales up as well. How does one organise testing in a big, agile organisation? The early versions of the SAFe® said little about testing. Luckily, this has improved in the current version 4.5. In this article we cover some of the guidance which SAFe® offers on quality and testing and we explain our own thoughts on how quality can be further embedded in every level of our organisation using SAFe®. To a large extent the ideas we share are the result of an expert session we organised at the 22nd Testing Retreat (2017, Hereford UK). The Testing Retreat is a peer-conference where leaders in the testing and quality profession share their experiences and insights. During the session we discussed quality measures and actions that we could take in order to ensure quality throughout the Software Development Lifecycle (SDLC). We captured our ideas on post-it notes on a big poster of the so-called "SAFe® Big Picture" where we discussed how testers, test managers, test-advocates, or other quality-driven professionals can add value in SAFe®.

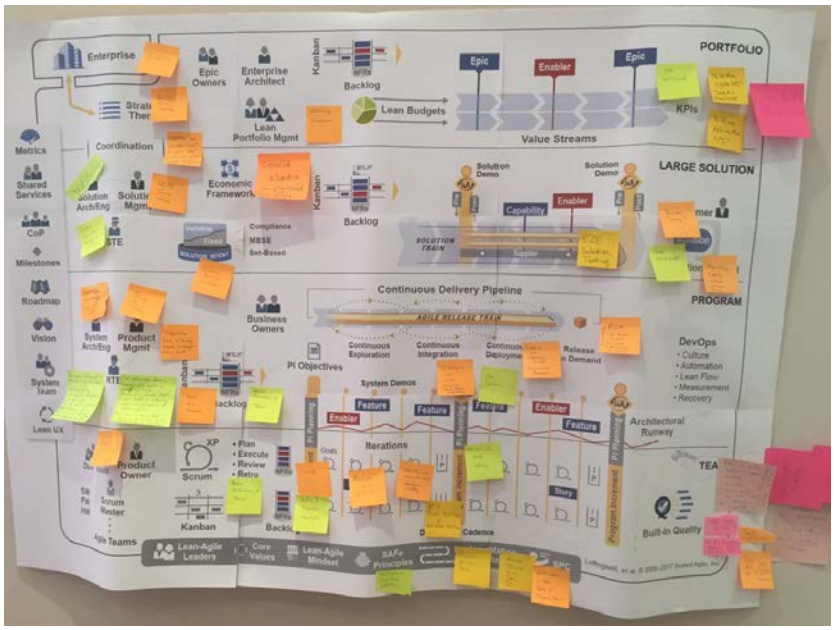

Figure 1: The "SAFe® Big Picture" with added quality consideration as a brainstorm result.

In this eBook we enriched some of the views and examples that were discussed during that session with input and contributions from fellow testers in the industry. We will go through each of the three levels and conclude with some thoughts about the role of testers and other testing professionals going forward.

Quality at Team Level

One of the core values of SAFe® is that quality is built in[ii]. Built-In Quality practices ensure that each solution element, at every increment, meets appropriate quality standards throughout development[iii]. That is a good starting point. SAFe® recommends building tests before writing code, this is the test-first practice[iv]. Another practice SAFe® recommends is pair work[v]. At team level testers can for instance pair with both users and developers to co-create tests. Testers that are not able to code, can still pair with their team members and review the automated tests and discuss the frequency with which tests should be run.
Testers can take a leading role in order to ensure that all team members learn and use agile testing methods. E.g. by facilitating discussions with the team on how to introduce methods such as ATDD and BDD. When using ATDD and/or BDD testers can support the Product Owner and encourage that during refinement the most common examples shared and ensure that the exceptions are discussed. This practise provides the development team with a good understanding of the problems to be solved. Throughout the development of stories and features testers can pair with team members to define and test constraints.
The same goes for non-functional testing. Pair with the product owner or Business analyst to consider non-functional aspects. If testers have security or performance skills then they can also contribute to the non-functional testing in the Agile Teams as the story from APG shows.

Specific choices in a prescriptive framework

At APG we adopted SAFe® because we have value streams that run over various systems and we have multiple teams working on a shared code base. A pension provider like we are needs to comply to many laws and regulations so we chose a more formal framework. Despite SAFe® being prescriptive at times, we made our own choices regarding the Non-Functional and e2e testing. SAFe® describes that non-functional tests are done by the System team. We choose to make the development teams themselves responsible for both the NFT and e2e tests. The system team holds e.g. a security and performance specialist that can deliver support to the developers. The e2e test coordinator empowers the teams to execute the right tests on the dedicated and shared test e2e test environment. The automated regression tests deliver a typical scaling challenge. Autonomous teams check whether the adaptions they make don't break the existing processes. In a scaled environment teams are working on a shared code base. This implies that other teams make adaptions that may trigger regression and have an impact on the costumer journey. This requires thorough and automated regression and e2e testing.

Edwin van Loon
QA manager at APG

On a more practical level testers could review the Definition of Done (DOD) to help teams define quality measures for topics such as end-to-end integration and non-functional testing. The DOD is a great tool for embedding quality into the process. While discussing team members are likely to identify valuable tests that are not done or done outside the sprint. Comparison of the Definition of Done used by one team with that of the other teams enables

cross-team alignment. Agile coaches and the SAFe Program Consultant (SPC) are really helped if test-advocates bring in their vision and knowledge on how to embed these quality measures into the agile processes.

In practice we often see that test execution is still done manually and if some tests are run automatically they have usually been created after the coding is done instead of before using a test-first approach. Automated tests (if any) are often run from a separate platform that is not integrated in the build process and the release process is often only partly automated and a vulnerable process. SAFe® states that organisations should aim for a repetitive and hands-off build process that enables quick deployments in various environments. Testers can contribute by emphasizing the need for this and ensuring that the pipeline includes automated functional and non-functional regression testing.

Although many of the mentioned measures are not new to developers with Agile and Continuous Integration/Continuous Deployment (CI/CD) background, many organisations are still implementing these practises. Unfortunately, SAFe® does not describe these practices to a great extent. Neither does the framework talk much about normal roles in testing. It does not explicitly address the need for an effective quality strategy to support the Agile Teams. We think testers, test managers and other test professionals can contribute on Team level by bringing attention to quality practices and the need for a quality strategy. We deliver value by helping to implement relevant quality assurance and testing practices.

Quality at Program Level

Professional testers can add value by promoting a quality mind-set and by defining and implementing a good quality strategy. The quality strategy will most likely be defined on Program level. Since it defines what is needed in order to have an integrated and tested solution delivered to customers. Its implementation will also have an impact on team level.

A quality strategy ensures that it is clear what is critical from various perspectives both business, technological, and operational. It outlines what needs to be tested, and how this is done. It may be effective to include views and interests of external suppliers and stakeholders like the compliancy officer. SAFe® uses Brian Marick's agile testing quadrant[vi] as a guide to determine the various approaches one can take. But we think that a quality strategy should also define how feedback on the quality and progress of the product is gathered. It is important that the PI (Program Increments) Objectives are used to steer the collection of feedback and information. The quality strategy can outline how this happens in practice.
A quality strategy should also address the quality of the tests. Does the test work need auditing and how are the teams coached on their testing[vii]? In some organisation test managers help the team by performing test improvement scans and facilitation the team with the adoption of test automation and CI/CD practices. Another item to address in the quality strategy is the organisation of the tests that do not fit in a sprint (see textbox by Edwin van Loon)

In practice we see all too often organizations that are lacking overview and focus. A clear quality strategy that aligns teams and their work and provides a shared insight into the work

that must be done. This does not only lead to better quality solutions, but also reduces the amount of late surprises and enables teams to discuss progress, impediments and re-plan their roadmap if necessary. It ensures that teams know what is expected from them, testing is not forgotten and provides room for coaching and teaching the teams. The latter is a key issue. With the adoption of agile, testing is a team responsibility and more often than not test is done by developers and users that have limited test expertise. They feel uncertain about the way they test, or lack enthusiasm since they do not understand what to do. We believe that they can do an even better job, when they receive relevant training and are helped by experienced testers to improve test design, execution, tool support, logging and reporting. Coaching and teaching developers and users will enable organisations to have a multidisciplinary look at quality and will increase the flexibility of the team. In some organisations we see that people in the role of quality leads join the Community of practise and initiate improvements, training and knowledge events.

In SAFe® the last sprint in the Program Increment (PI) is reserved for PI Planning and if needed integration of the various assets of the system or solution. Testers can typically contribute to this sprint with the facilitation of Risk Analysis and Root cause analysis (RCA). Identifying business and technical risks prior to or during PI Planning may lead to extra acceptance criteria or even new user stories to cover the specific risks that need to be on the table while planning the next Program Increment. Many organizations do not regularly perform RCA. That is why they fail to understand the relation between incidents and testing. By setting up a feedback loop testers can help the organization to build the right solutions and ensure that the agile teams know what tests matter the most. During PI Planning it is common that the senior development manager explains the development practices. It would be natural that test managers discuss with the senior development manager how to improve test automation and to ensure clear guidelines for the Agile Teams[viii]. Other key partners for testers and test managers are the people in the various SAFe® architect roles who are responsible for the architecture vision, building the architectural runway and for helping the Agile Teams continuously improve their technical excellence. Building testable features and functionality that increases testability is vital to keep the pace and deliver value.

Integration and integration testing is a key challenge for scaled organizations since it is hard to organize cross team activities from within the teams. The Program level in SAFe® is designed to help alleviate typical integration challenges. We recommend to ensure that end-to-end integration is a starting point for planning the development and the cross-team collaboration. Testers and test managers should emphasize the quality mind-set so that integration testing is taken into account at PI Planning. Here is a story on how the Program Board can help during PI Planning.

Visualising System Integration Testing on the Program Board

In one of the financial institutes in Northern Europe Scaled Agile Framework for Lean Enterprises is used company-wide for speeding up value delivery of complex solutions. Often teams from several organizational departments contribute to building and maintaining the solutions supporting one or more operational value streams. In one of the Agile Release Trains the Agile Teams struggled to deploy to the pre-production and production environments because the system integration testing was not completed on time. As a consequence, important business deliveries were delayed. The Agile Teams, including testers, were responsible for testing their systems and then a separate Release Train Test Team was responsible for the System Integration Tests with assistance from the Agile Teams. Most often the planning and estimation of stories and features would only include the effort to code the story or feature. Effort needed for completing it was not taken into account. To alleviate the problem the Release Train Test Team was included in all the activities as an Agile Team which especially impacted on the PI Planning. The team had its own swim lane and all features which required system changes had to be completed by the Release Train Test Team as well, before it could be mapped to a release and eventually to a business milestone. In the first two PI Planning events the Release Train Test Team did not manage to plan the testing and its swim lane was empty. As a consequence, the entire plan was accepted as a "stretch plan" due to the lack of commitment from the Release Train Test Team. On the 3rd PI Planning the Agile Teams managed to both plan for the development and full testing of the features. Because of the visibility on the Program Board it was clear to everybody which features were included in which release milestones and what re-planning the Agile Teams had to do on day 2 to create a plan fulfilling the highest prioritised features. Regardless of whether your ART has a separate team responsible for specific test types it can be helpful to include it in the Program Board to ensure it is part of the planning across all Agile Teams.

Mette Bruhn-Pedersen
CEO at Safe Journey

Another typical challenge at Program level is to ensure that adequate test environments are available. Integration tests as mentioned earlier should be executed in each iteration, but some tests might be better to conduct in the last sprint of the PI. Needless to say that testers will of course promote that integration testing is done as soon as possible and lead the way for multiple releases and continues deployment.

In order to get feedback and learn how the system is used, it is important that software solutions are deployed and offered to its users frequently and with as few delays as possible. Testing the operation model to ensure operational readiness should be a topic while defining the PI Objectives and integrating the business-readiness testing in the overall quality strategy enables an early time-to-market.

Another challenge within SAFe® is governance. We noticed that progress and quality is often discussed at a Scrum-of-Scrums meeting but progress indications are often subjective (instead of fact based) and incomplete. Testing helps provide a transparent and objective

insight of the working software that is available. Ensure that lean, mean but adequate data is available to assess the progress of the release. It enables better planning and redrawing the release train roadmap if necessary.

To summarise many of the described measures fit well in the Continuous Delivery Pipeline, where we continually identify market needs and aim to get tested integrated solution into production as soon and often as possible. SAFe® does not describe these practices in great detail. Therefore integrating components and systems into solutions on a regular basis challenges most Agile Release Trains. Testing professionals can contribute by supporting a quality mind-set described in a quality strategy, coordinating and planning quality practices with relevant people both before and during PI Planning as well as providing test input in the discussions around progress and in the evaluation of working software.

Quality at Portfolio Level

At portfolio level strategic themes are translated into value streams and Epics. This level is the linking pin between organisational goals and the development work that is being done. This holds the “what” and the “how”, both technical and cultural aspects.
If we want to embed quality in to the organisation, it should be done at this level. SAFe® does not define a quality ambassador at C-level, but we feel there might be an important role for someone at this level (see textbox CQO).

Embedding quality throughout the organization with the Chief Quality Officer

Within health organizations, pharmaceutical and medical industries the management team is sometimes expanded with a Chief Quality Officer (CQO). Strangely enough the role is less well known outside the health industry[ix]. But this might change quickly. More and more organizations begin to understand that quality is not the responsibility of a single department or person, rather it should be a main focus of the entire organization. So maybe within these organizations the CQO is a welcome addition and offers an interesting career path. Does your organization need a CQO? The Chief Quality Officer is a representation of quality management within the company. A good CQO will keep quality in the forefront of the company and be a strong advocate for the quality process. He/she will be a support for the QA team and stress the importance of quality in the organization. As such, their effect could be more widespread than just the software team, as quality extends to other parts of the company as well. Therefore the CQO will ensure that metrics such as Cost of Quality, Rework Rates, and equipment utilization and time-to-market enhances the transparency of development and operations. These insights will lead to quality themes being defined at a strategic level (all the way up to the SAFe Portfolio level) so that the quality of delivery and development will be sustainable and even better constantly improving. Focus areas can be the reduction of technical debt, rationalization of the system landscape, adoption of new technologies, quality and collaboration in the supply chain and effectiveness of the operating model.

Derk-Jan de Grood
Senior Test Manager and Agile Transition Coach at Valori

If we look at the SAFe® processes he/she could contribute by:

Defining Strategic themes with a Quality Focus
Ensure that when strategic themes are defined these do not only focus on 'new business functionality'. The reduction of technical debt, test architecture, supporting and developing good QA practices must be prioritised as well since they enable a sustainable delivery rate. Many organizations are struggling with legacy that slows them down. While IT teams are trying to get time and money to optimize the IT landscape, it remains a struggle to address these items due to the fact that quality is insufficiently supported at C-level. Defining strategic themes with a Quality Focus helps the organization to become a state of the art solution provider that is distinguished by effectiveness and known for its quality, reliability and stability.

Prioritizes the Compliance Epics

Compliancy should be planned and guarded. We notice that compliancy is often not in the veins of the IT people. This lead more than often to late surprises and penalties. On the portfolio level ensure that compliancy epics are defined and the required functionality regarding e.g. security, traceability, revenue assurance is implemented. A quality focus will ensure that the right proof (logging, testing of controls and documentation) is available. This will stand out during audits and will reduce the miss alignment between what is needed by the authorities and what is implemented. SAFe® describes the Quality Management System (QMS)[x] as a set of approved practices, policies, and procedures. The QMS ensures that development activities and outcomes comply with all relevant regulations and provide the required documentation to prove it. The QMS might be in the portfolio of the compliance officer, but the quality ambassador should also include the QMS in the quality strategy.

Defines KPI's
The portfolio level is all about business. During the testing retreat we discussed organizational readiness at the program level as measure to ensure that technical solutions will be used and yield benefit. We concluded that an assessment is advisable; do the implemented strategic themes and deliver the value that we expect. The quality ambassador at this level could help the organization to define KPI's that provide this insight and help to assess the user experience of the value streams in a broad sense.

A role for Testers, Test Managers, Test-Advocates and Other Quality-Driven Professionals

In the previous sections we have given a few examples of quality considerations that can be made in the various levels of SAFe®. Communication and managing dependencies are typical challenges of scaling. The discussed measures focus on having a strategy so people know what is expected of them, taking quality into account during planning sessions and ensuring that quality related works get sufficient priority. We find there is a need for a quality focus at

all levels. We recommend taking a strategic approach to quality and testing as the story from Air France KLM shows.

A Strategic Approach to Quality and Testing

At Air France KLM SAFe® is implemented in phases throughout the whole organization. This means that each product team encounters some challenges regarding their testing maturity. It is important that each team has a minimum level of test maturity.
The test department actively approaches the teams to perform a Test Maturity Health Check (TMHC). With this health check we give insight in the quality of their test process and suggest improvements. The health check is a simple document that is used as a guide during our assessment. The most important part of the assessment is the communication and relation between the test manager who will assess the TMHC and the delegates from the product team. The actual improvements can be done by themselves or with support from our test department. We deliver a test coach that helps to structure the test process, or we provide a test analyst who can help the team to set up structured test cases.
Currently our department receives a lot of requests to help with test automation. Some teams have no experience and need help to get started and to select their tools. Other teams already use test automation but have challenges to improve their tests. To understand the challenges of the product teams we have created a Test Automation Quick scan. The quick scan is a questionnaire which covers all the topics of test automation. As a result, the quick scan provides a score which is analysed by our test experts to advice the best fitting test automation solution for that team. Finally, we organize test events and service demos on a regularly basis. By doing so we enhance the visibility of our test department, stay in contact with the product teams and promote the quality mind-set.

Ronald Kerkhoff
Senior Test Manager at Air France KLM

People who are currently in testing and quality roles have a lot of knowledge and can take an ambassador role and ensure that quality is built in.
For test professionals this might require some skill-up. Test automation and implementing continuous delivery pipeline requires technical knowledge at team level. To be effective at program and portfolio level you will need to acquire business skills. In order to make SAFe® effective testing professionals can help others build in quality and facilitate broad collaboration. This means that non-testing professionals will skill-up on quality and testing practices. We can help them through coaching, teaching and showing them the strategic advantages a quality focus has. Scaling requires team work of all people to make it work. Testers might very well take a lead to create the awareness that true business agility requires built-in quality. And that implementing Scaled Agile Framework with its current guidance on quality practices is not sufficient. It requires attention on all levels, discipline and quality ambassadors who are ready to help relentlessly build quality solutions.

About the Authors

Derk-Jan de Grood works for Valori as senior test manager and agile transition coach. As consultant he helps originations with their Scrum adoptions and embedding the quality strategy. He is an experienced trainer, workshop host and a regular speaker at conferences like Agile Testing Days, the Seoul Testing Conference, EXPO:QA, Freetest and the STAR conferences in Europe and America. He wrote several successful books on software testing and frequently publishes articles and columns for the major magazines. On his own blog he shares his knowledge and experience for everyone to benefit. In 2014 he won the EuroSTAR testing excellence award. In 2016 he published an agile book called “Agile in the real world, starting with Scrum”

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In her spare time Mette promotes quality assurance and software testing in Denmark and world-wide through her engagement in Danish Software Testing Board (DSTB) and ISTQB®.

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