KUGLER MAAG CIE

Functional Safety, Automotive SPICE® and Agile Methodology

Automotive SPIN Italia
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Agenda

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About the author: Markus Mueller

- Married with 2 children
- Director Operations at Kugler Maag Cie
- Over 15 years of experience in industry and research projects
- Assisting medium-size companies as well as international corporations, primarily in the automotive industry
- PMI Project Management Professional
- Very experienced trainer, moderator, and management coach
- Speaker at conferences and co-author of books

Qualification & Experience

- intacs™-certified Principal Assessor and trainer, intacs™ Advisory Board member, who
  - conducted more than 40 assessments, many of them for OEMs
  - trained more than 150 ISO/IEC 15504 provisional assessors from leading car manufactures (OEMs) and suppliers
  - advised OEM representatives on the development of Automotive SPICE®
- Project leader of several change and improvement projects based on ISO/IEC 15504 and CMM/CMMI®
- Providing consultancy, coaching, and active support in several ECU development projects in automotive
- E.g. project leader for the implementation of a project control office (PCO) in the electronics development of a major car manufacturer, which today controls more than 100 ECU development projects

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KUGLER MAAG CIE is a service company with recognized expertise in process improvement

Facts

- Founded in 2004, today a team of more than 50 recognized experts
- Specialized on process improvement
- Expertise in CMMI®, ISO 15504/SPICE, Automotive SPICE®, IEC 61508/functional safety, project /quality /requirements management, change management, …

Industries

- Automotive industry,
- Financial services, ICT,
- Health, telecommunications, and transportation

Customers

- Global players, culturally diverse, operating in
  - Europe incl. Italy
  - North America and
  - Asia

Partners & Networks

SEIPartner, iNTACS™, BITKOM, lero THE IRISH SOFTWARE ENGINEERING RESEARCH CENTRE, ibi, MBtech, Biz³, PDQM, SoftwareMind Where quality meets the future, MASTER SYSTEMS® *Helping to put best practices into actual practice*℠

Introductory considerations regarding “agile“ methods

Why use agile methods? – Motivation

- **Customer requirements are often changing** during the development cycle of a project – or, even more common, customers don't know their requirements at the start of development, as they are frequently developed in the course of the project
- Companies often complain that the **development cycle is too slow and not flexible enough** - they need innovative products with functionality within weeks
- The development process requires several "**non value added**" process steps and work products (from the perspective of the development team)

- Agile methods are focused on handling these challenges by
  - adapting the development process to continuously changing requirements
  - stabilizing the development process to be able to develop software under these conditions
  - introducing the high productivity of small teams with extensive expertise
    - being quick and economical
    - focusing on added value (i.e. developing only what is required by internal and external customers)

The seven “agile“ principles

1. Eliminate waste:

- Waste is everything that does not add value to a product, value as perceived by the customer.

2. Amplify learning:

- Development is an exercise in discovery, while production is an exercise in reducing variations. For this reason a lean approach to development results in practices that are quite different from lean production practices.

3. Decide as late as possible:

- Development practices that provide for late decision making are effective in domains that involve uncertainty.

4. Deliver as fast as possible:

- In development the discovery cycle is critical for learning: Design, implement, feedback, improve. The shorter these cycles are, the more can be learned.

The seven “agile“ principles

5. Empower the team:

- Because decisions are made late and execution is fast, it is not possible for a central authority to orchestrate the activities of the workers.

6. Build in integrity:

- Software with integrity has a coherent architecture, scores high on usability and fitness for purpose, and is maintainable, adaptable and extensible.

7. See the whole:

- The common good suffers, if people attend first to their own specialized interests. When individuals or organizations are measured by their specialized contribution rather than overall performance, sub-optimization is likely the result.

Our understanding of agile methods

- We at Kugler Maag Cie understand “Agile methods“ as a generic term for different software development models such as Scrum, extreme programming, etc
- We are noticing that the term is increasingly used for a new way of thinking about project management as opposed to traditional, forward-planning project management.
- “Agile“ means that the management and control of projects is performed in a flexible and dynamic way. “Agile” emphasises on the positive aspects of less hierarchical leadership.
- An essential attribute of agile methods are highly networked, self-reliant, interdisciplinary teams. Also a change from defined to adaptive development processes.
- We are mainly working with Scrum, but also with KANBAN.

Challenges in automotive regarding the use of agile methods

ECU development in automotive

- requires mature products of high quality, with a long lifetime and a guarantee
- requires fulfilment of “traditional” development standards like ISO 26262, Automotive SPICE, ISO/TS 16949, OEM-specific standards, …
- requires a high degree of product documentation
- must consider that the development team of an ECU is part of a huge intercompany team that is developing a car (hundreds of companies, thousands of engineers)

Agile methods (e.g. SCRUM) do usually not support

- architectural design
- integration and test on a system level
  - SCRUM is focusing on software development
  - No/only few statements regarding hardware-software integration or system test
  - No/only few statements regarding planning of required infrastructure like HIL, etc.
- an independent quality assurance role
- a complete product documentation
  - Product documentation is perceived as non value added

Disclaimer - before we continue

- Our recommendations are based on our practical experience in automotive
  - We have to consider the existing standards and requirements
  - We do not recommend a purely Agile approach, but to integrate Agile elements into existing and proven development cycles, and to take advantage of both worlds
- Some Agile elements have already proved their worth in automotive for years
  - Incremental development in general
    - Delivery of increments/samples and validation of these at the supplier and the customer side; incorporating the return flow of results into the next increment
  - Rough overall release planning, detailed planning only for the next increment
  - Requirements are not fixed at the start, but developed and clarified during development
- "Agile" fans will say that this is a boring approach, not considering the pure "Agile" principles ... - and they will be right ... - But we do have to consider the automotive conditions …!

Best Practices – our experience in automotive

Using best practices to apply “Sgile“ principles **and** ASPICE and Functional Safety requirements

- Project organisation above the sprint teams
- Integrate sprints into the car development cycle
- Define the architecture before the sprints in such a way, that the sprint backlogs can be derived
- Standards for processes, methods, guidelines, tools, and documentation
- Independent integration and system tests (outside the sprints)
- Additional “best practices“, e.g.
  - High degree of automation, e.g. automated testing and continuous builds
  - Attend and guide the cultural change of the organisation from a “classical“ forward planning organisation to a more agile organisation

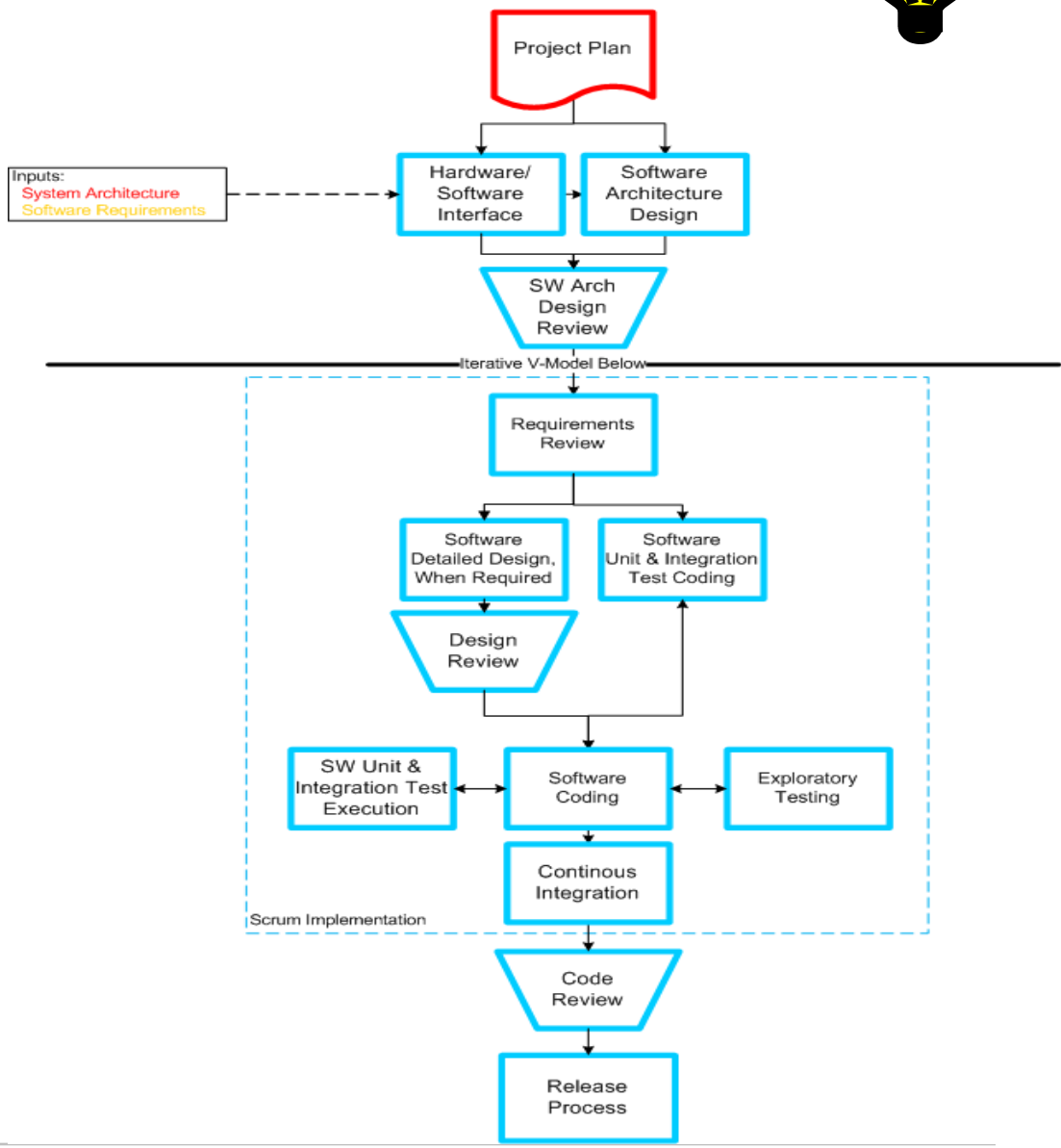
Customer references:

- Nero, Daimler TSS , Landis & Gyr, GENTEX, AWTCE, Magna

Practical example

Integrate agile methods into the development cycle

- Integration of scrum-based process steps into the SW development process



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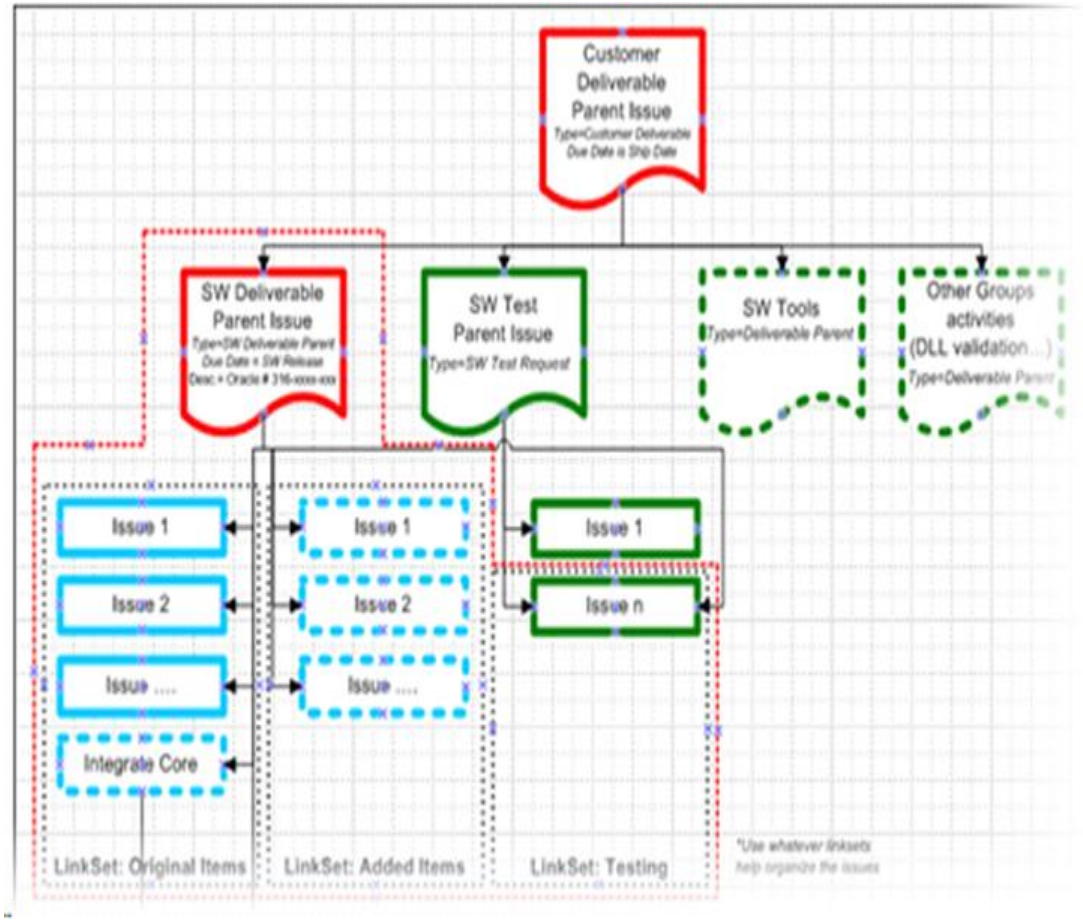
Practical example

Definition of Deliverables

- Refining customer deliverables into atomic issues for sprints



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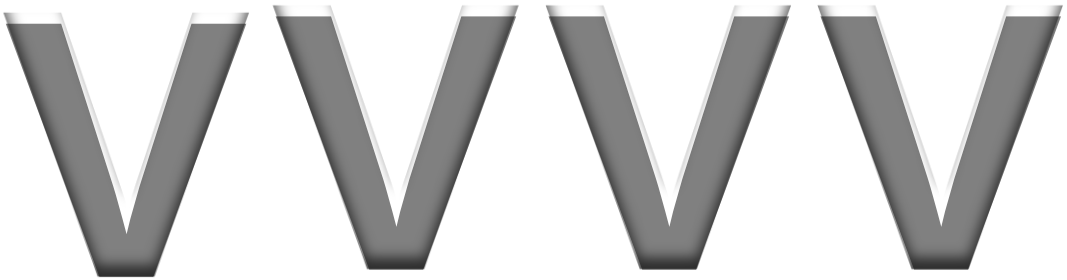
Kugler Maag Cie project experience
- Agile E/E PEP (Electrical / Electronic Product Engineering Process)

The PEP with its typical activities

Elements of the E/E PEP which were not changed
(e.g. homologation and purchasing components with long lead times)

Log handling and agile sprints for increasing functionality and component / system maturity



Car Level

E/E Level

SW Level

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Kugler Maag Cie project experience - A.SPICE level 3 and Agile

Organization: Automotive Supplier

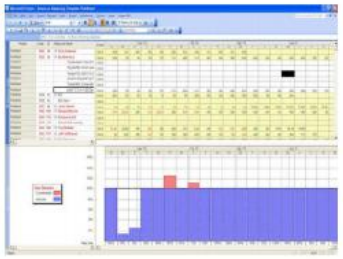
- **Goal:**
  - To support the customer in implementing A.SPICE requirements in an agile development environment
- **Approach:**

  Principles for implementing A.SPICE
  - A “compelling reason” to change
  - Do less, but do it well from the start
  - Core Process Improvement Group with the authority to:
    - design and implement the process
    - invest in tools
    - set expectations for staff
    - communicate to management
- **Results:**
  - Target A.SPICE capability levels achieved
  - A.SPICE implemented in a useful way
  - High degree of automation

Project Planning & Management

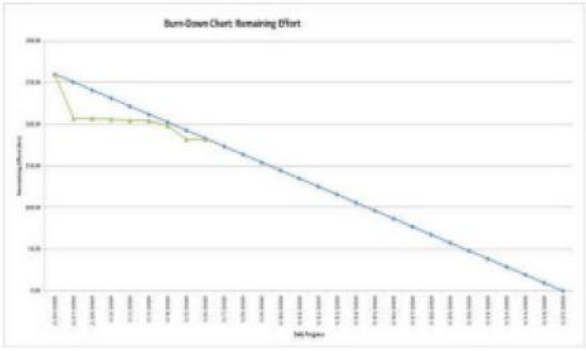
GENTEX CORPORATION
A Smarter Vision®

- V-model combined with SCRUM & Sprints
- Project Planning & Scheduling
  - MS Project Gantt in Server for Macro
  - Detailed planning in issue tracking tool using parent/children relationships
- Burn down charts for progress to plan



Resource assignment with MS Project Server with weekly resource leveling meetings

Daily SCRUM meetings



Focus on Delivery On Time with Burn Down charts

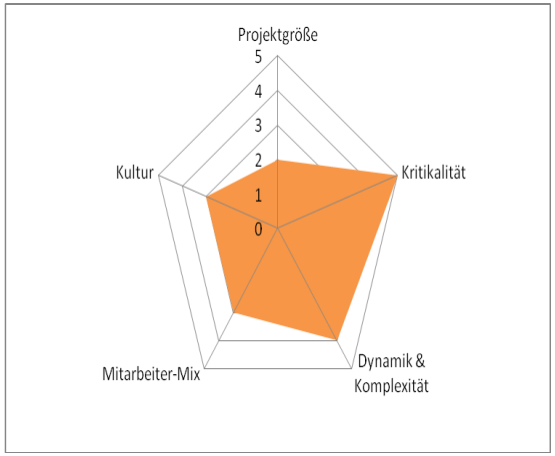
Source: Presentation „Agile, SPICE, and corporate values: A case study in effectively merging the best of each to improve software quality at Gentex; Walstra E., Gentex Corporation, USA
International SPICE Days 2010, Stuttgart, June 21-23rd, 2010

Potential analysis to estimate cost and benefit

- To align and balance Agile and traditional forward planning we propose a
  Quick Check Agile Development.
- This cost and benefit analysis (duration approx. 2 days) to introduce Agile methods into the existing development organisations identifies
  - what the potential and the risks are
  - what the consequences are for management, organisation and processes
  - what needs to be changed
- Result is a detailed analysis with concrete improvement suggestions to integrate Agile methods into the development organisation

Analyse risks and opportunities in the following dimensions:

1. **Employees -** Know-how and experience, …
2. **Dynamics and complexity** - of your products, stability, and requirement change rates, …
3. Organisation and **project culture**
   team motivation, degree of freedom re. solutions, team stability, …
4. **Project size** - team size, duration, project and product types, …
5. Product functionality and **criticality**
   Stability of design, security and safety of products, …



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Summary

- Agile methods help to handle the development of innovative products involving
  - frequent customer requirement changes during the development cycle
  - high-productivity small teams with extensive expertise focusing on added value
- Agile methods like SCRUM usually do not support some essentials, which are required in the automotive context.
- We therefore do not recommend a pure Agile approach, but to integrate Agile elements in the existing and proven development cycles and to take advantage of both worlds.
- We propose a Quick Check Agile Development to identify cost, benefits and risks of introducing Agile methods into existing development organisations.
- Any questions ?
- If yes – please don't hesitate to contact us! www.kuglermaag.com
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