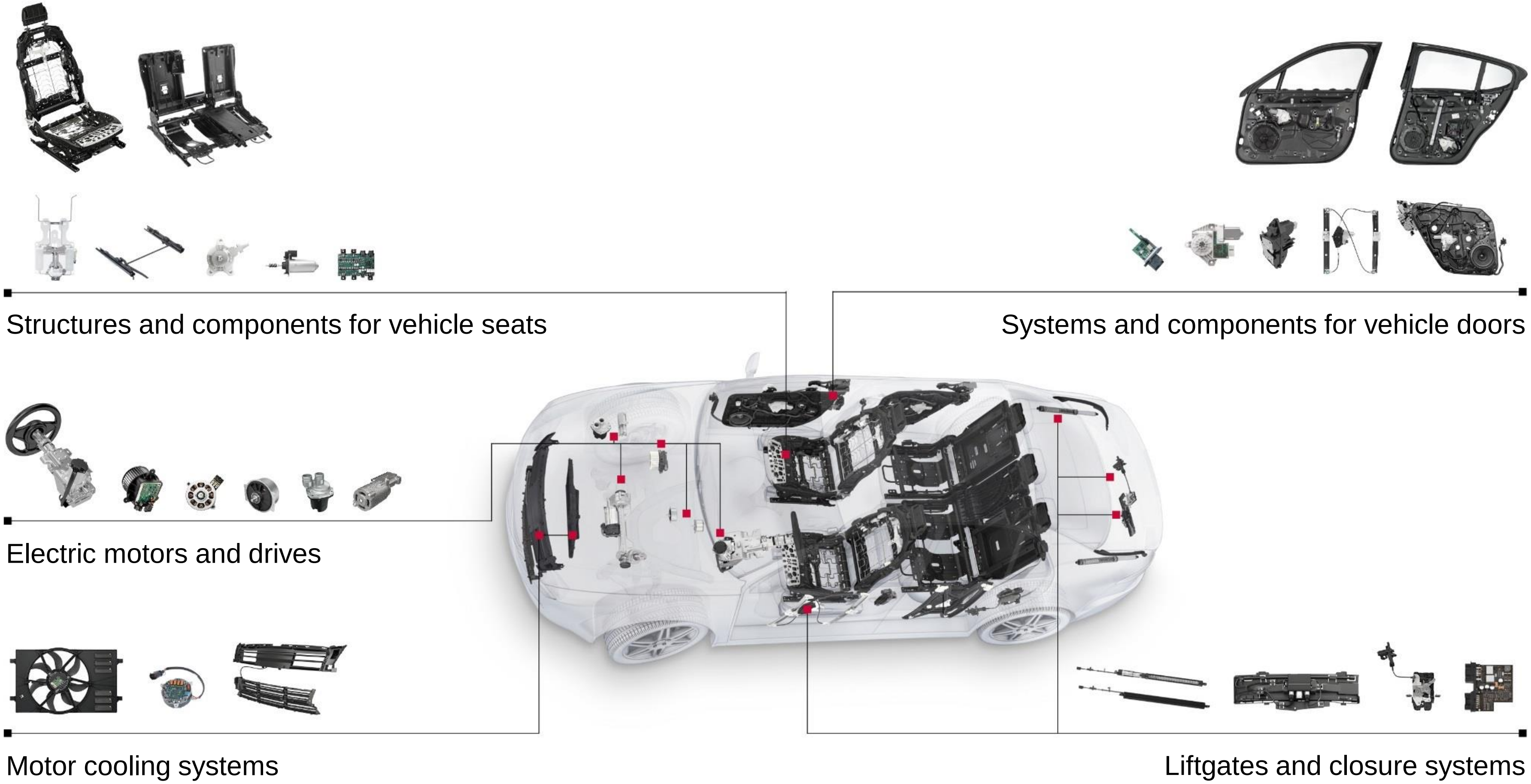
Lean Standard Development Processes – How to Do Without Extra Safety Plans, Confirmation Reviews, and Safety Audits

Pierre Metz, Brose Fahrzeugteile GmbH & Co. KG, Bamberg

Int. IQPC ISO 26262 Conference, March, 2017, Frankfurt

Product range

Mechatronic Systems and Drives for Automobiles



Structures and components for vehicle seats

Systems and components for vehicle doors

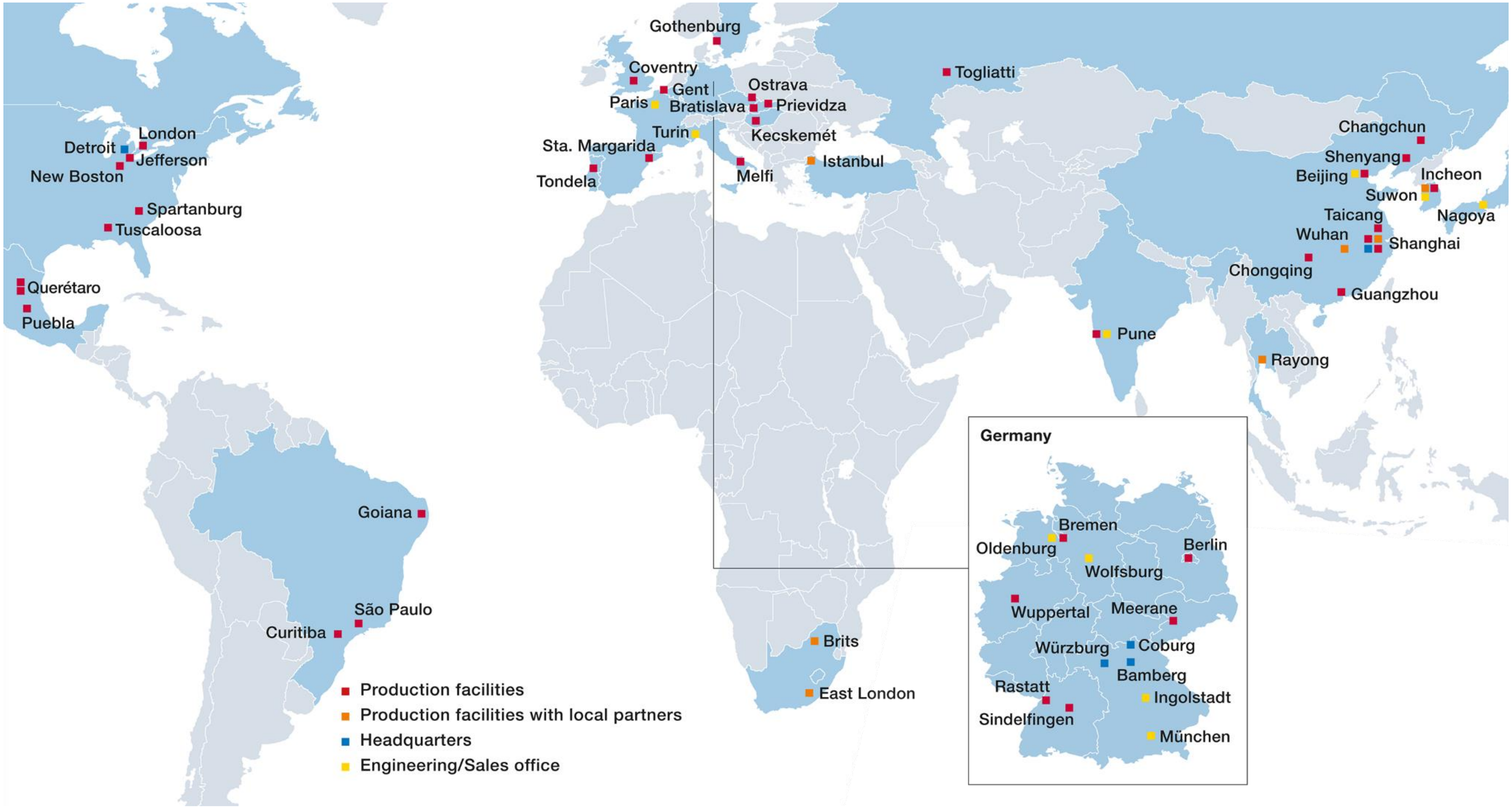
Electric motors and drives

Motor cooling systems

Liftgates and closure systems

Global presence

60 locations, 23 countries, 5 continents, almost 25,000 employees



Customers worldwide

ABTOBA3 AVTOVAZ INCORPORATED	北汽集团 BAIC Group	FOTON	BMW	MINI	ROLLS ROYCE	Bei Ben Trucks	BRILLIANCE			
CHERY	DAIMLER	Mercedes-Benz	AMG	smart	Dongfeng	FAW				
FCA FIAT CHRYSLER AUTOMOBILES	ALFA ROMEO	CHRYSLER	DODGE	Ferrari	FIAT	IVECO	Jeep	LANCIA	MASERATI	RAM
Ford	LINCOLN	GM	Cadillac	CHEVROLET	DAEWOO	GMC	VAUXHALL			
GAZ	GEELY	VOLVO	Great Wall	mazda	McLaren	HONDA	HYUNDAI	KIA KIA MOTORS		
MITSUBISHI MOTORS	LOTUS	RENAULT	DACIA	DATSUN	Renault Samsung Motors	NISSAN	INFINITI.			
SAIC	ROEWE 荣威	MG	CITROËN	PEUGEOT	NEW STRATOS	SUBARU.				
SUZUKI	TATA	JAGUAR	LAND- -ROVER	TOYOTA	DAIHATSU	LEXUS				
Volkswagen	BENTLEY	BUGATTI	LAMBORGHINI	MAN	Nutzfahrzeuge	PORSCHE	SEAT	SCANIA	ŠKODA	

ADIENT	Air International	AUTO ALLIANCE DRIVING INNOVATION®	Autoliv
BENTELER	BOSCH Invented for life	CalsonicKansei Driven by Inspiration and Innovation	Continental
DELPHI	DENSO	DYMOS	faurecia
FLEX|N|GATE	GETRAG	GRUPO ANTOLIN	Hanon SYSTEMS
HBPO THE MODULE COMPANY	HI-LEX	INTEVA PRODUCTS	KÜSTER Holding
LEAR CORPORATION	MAGNA	MAGNETI MARELLI	MAHLE Driven by performance
Mando Halla Company	MIRGOR	NHK NHK SPRING CO.,LTD.	SHIROKI
sitech	TACHI-S	thyssenkrupp	TOYOTA BOSHOKU
Valeo	Visteon®	WABCO	ZF TRW

Business development

Continuous self-financed growth

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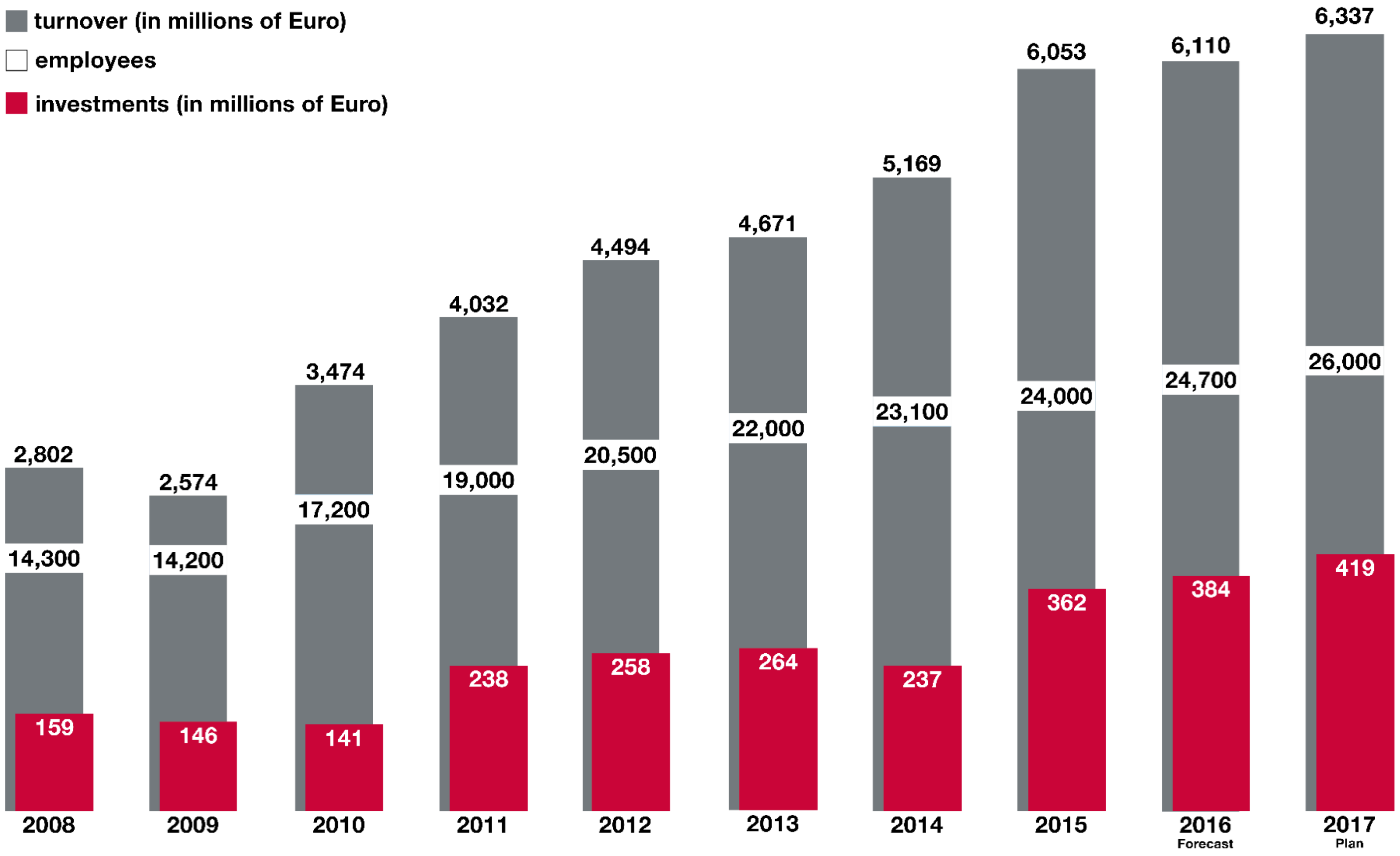
Technik für Automobile



Content

1. Recollection and Critique – Safety Plan

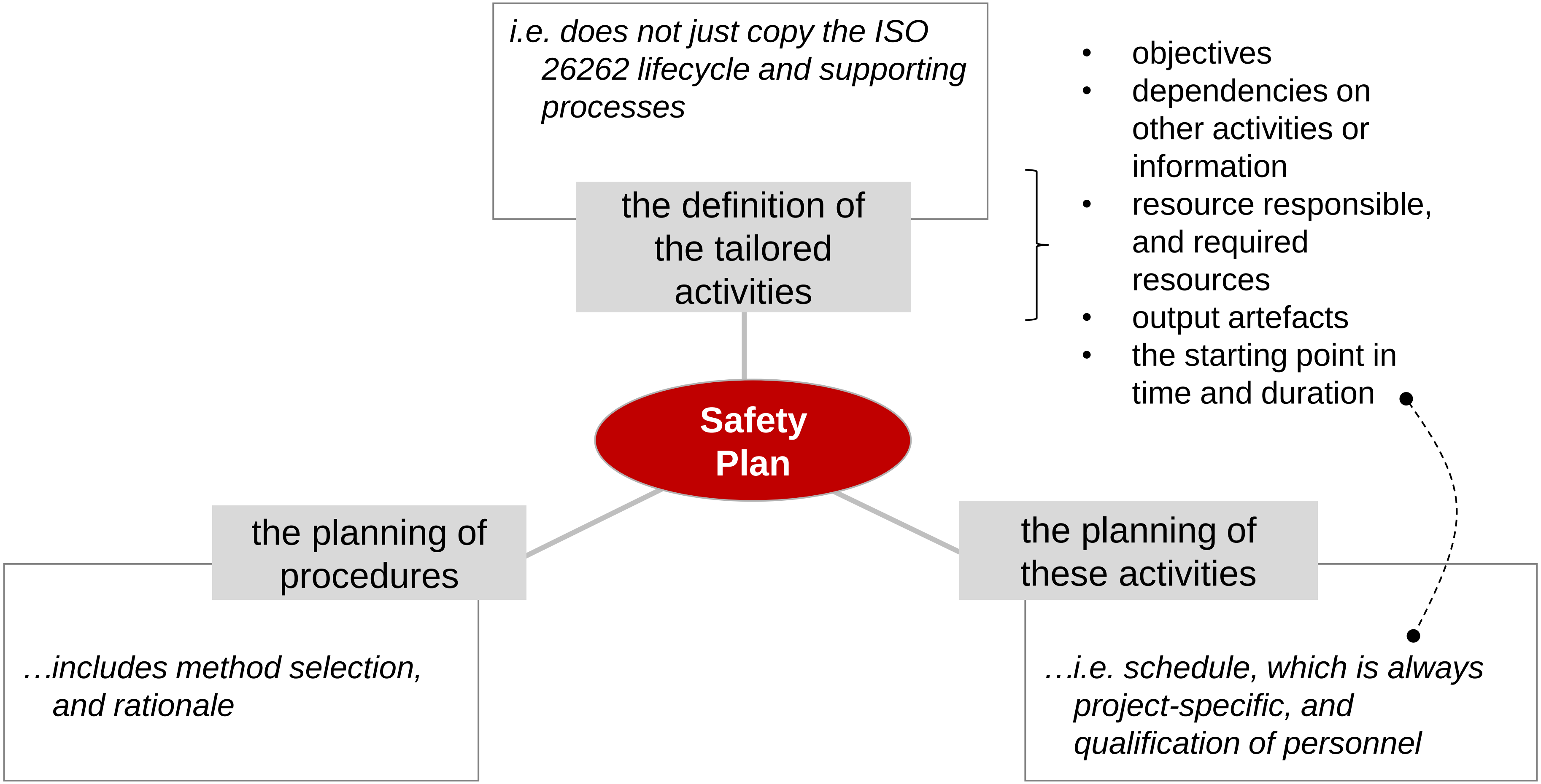
2. Standard processes – Implicit Safety Plans

3. Recollection and Critique – Confirmation Reviews

4. Standard processes – Implicit Confirmation Reviews

5. Connection to Safety Audits

Recollection – a Safety Plan contains all safety-related instructions



Safety Plan

the definition of the tailored activities

i.e. does not just copy the ISO 26262 lifecycle and supporting processes

- objectives
- dependencies on other activities or information
- resource responsible, and required resources
- output artefacts
- the starting point in time and duration

the planning of procedures

…includes method selection, and rationale

the planning of these activities

…i.e. schedule, which is always project-specific, and qualification of personnel

Critical observations – safety plan

- **In practice, many safety assessors require extra project-specific safety plan documents, even though ISO 26262 clearly states:**
  - *"The organization shall … execute … organization-specific rules and processes to comply with the requirements of ISO 26262.*

    NOTE Such … can include … a generic safety plan and process description"
    (ISO 26262-2, clause 5.4.2.2)

- **Possible reasons for such an assessor's opinion:**
  - Work Product sections in ISO 26262 sound like that a first-class artefact needed for them
  - the above note is easily overlooked
  - some assessors probably do not have a standard process background
  - ISO 26262 does not have a sufficient view on the domains of "organizational standard processes" and "process change management"

(for experts: ISO 26262 primarily describes an Automotive SPICE® level 1 and 2 perspective, but „flattened out")

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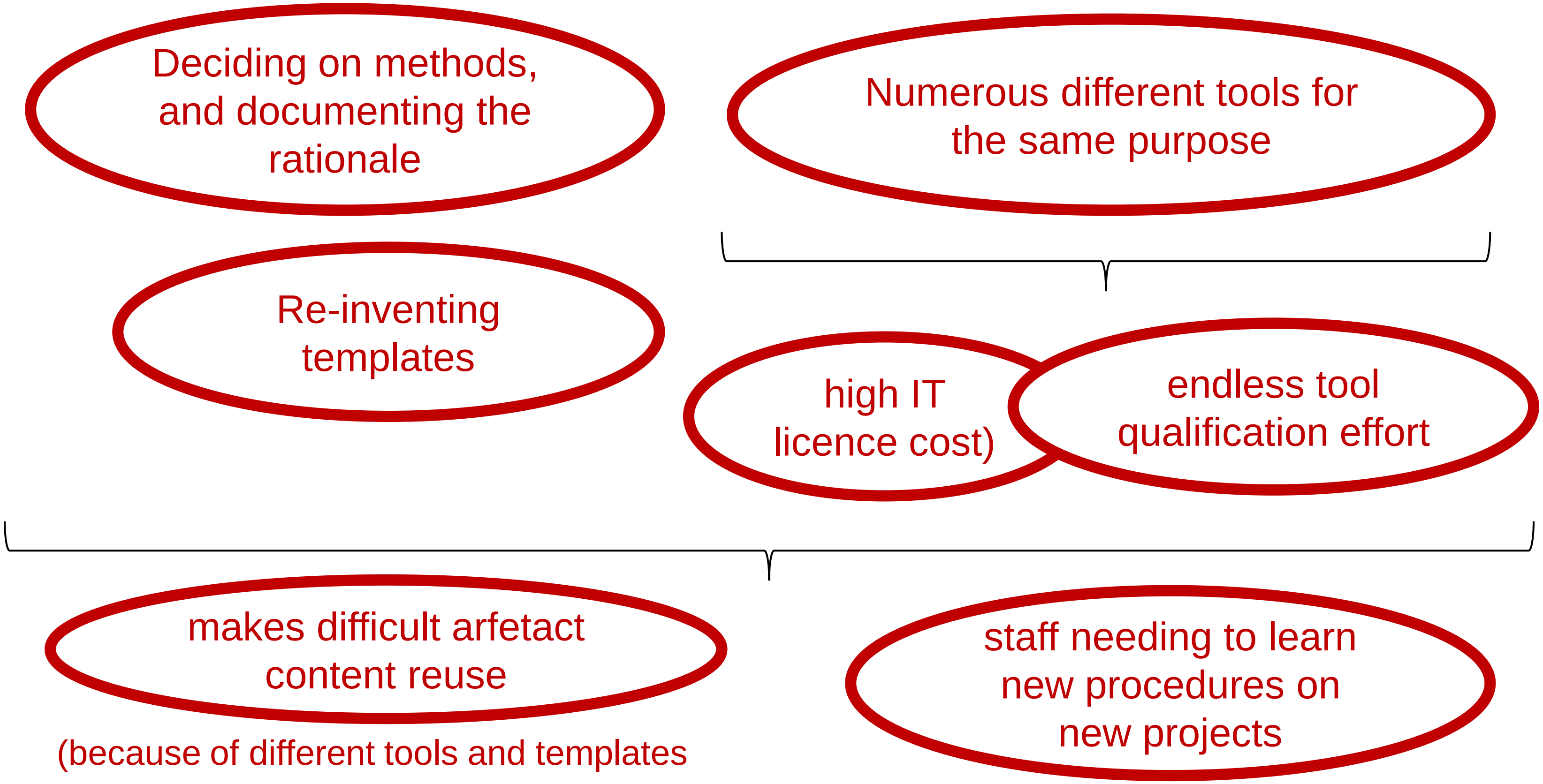
Repeated effort when you do not have standard processes



Deciding on methods, and documenting the rationale

Numerous different tools for the same purpose

Re-inventing templates

high IT licence cost)

endless tool qualification effort

makes difficult arfetact content reuse

(because of different tools and templates

staff needing to learn new procedures on new projects

Is it a solution to copy everything from project to project?

No because…

…some projects still might do things differently

…a project might take over from a poor source

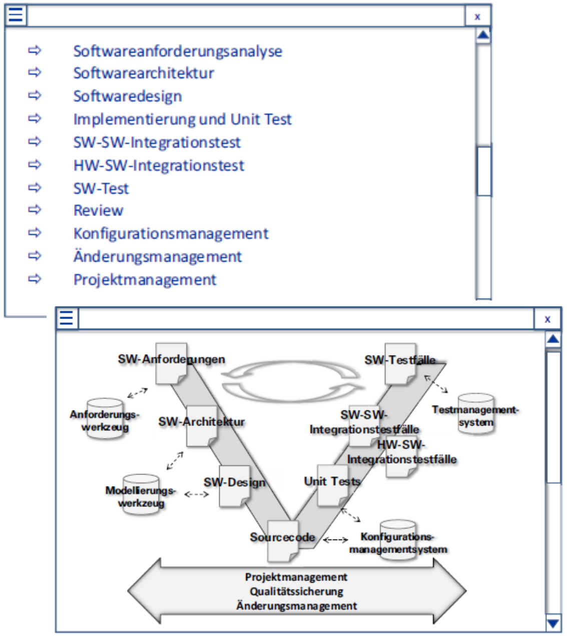
… people tend to neglect analyzing if the artefacts really fit to the new project

…there is no institutionalized improvement feedback loop

Good practices not exploited, mistakes still repeated

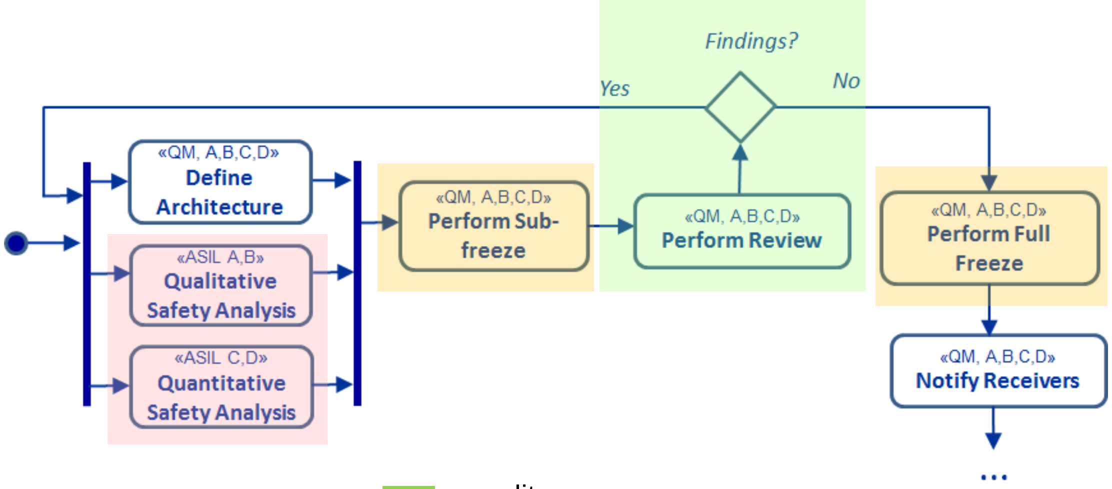
Expectation #1 – a standard process shall offer logical workflows of interwoven topics

Disadvantageous approaches:



- ⇨ Softwareanforderungsanalyse
- ⇨ Softwarearchitektur
- ⇨ Softwaredesign
- ⇨ Implementierung und Unit Test
- ⇨ SW-SW-Integrationstest
- ⇨ HW-SW-Integrationstest
- ⇨ SW-Test
- ⇨ Review
- ⇨ Konfigurationsmanagement
- ⇨ Änderungsmanagement
- ⇨ Projektmanagement

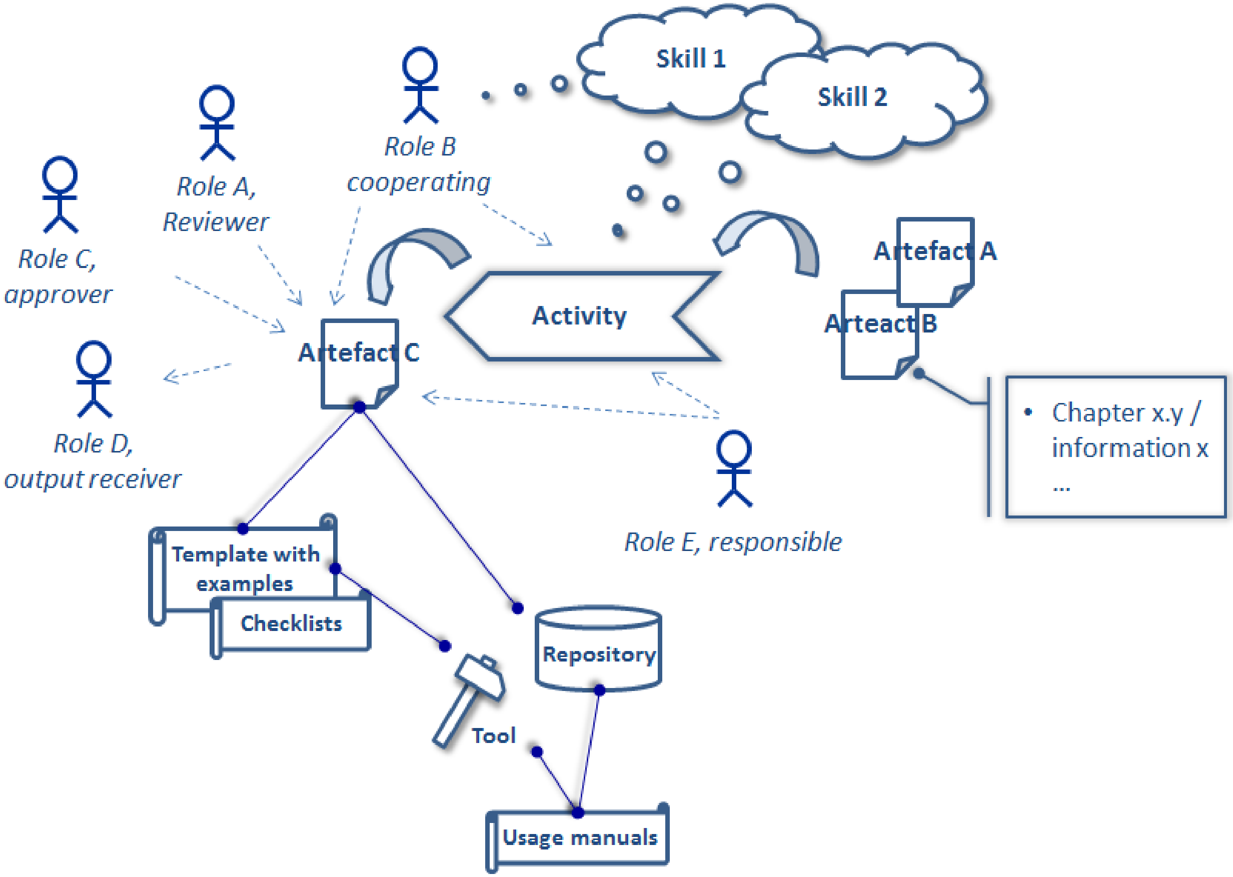
Desirable approach:



🟩 = quality assurance
🟨 = configuration management
🟥 = safety engineering, incl. Testing
□ = nominal engineering

Source
P.Metz, “Automotive SPICE® Capability Level 2 and 3 in der Praxis”, dpunkt Verlag, 2017

Expectation #2 – Besides activities, what must a standard process further contain?



Source
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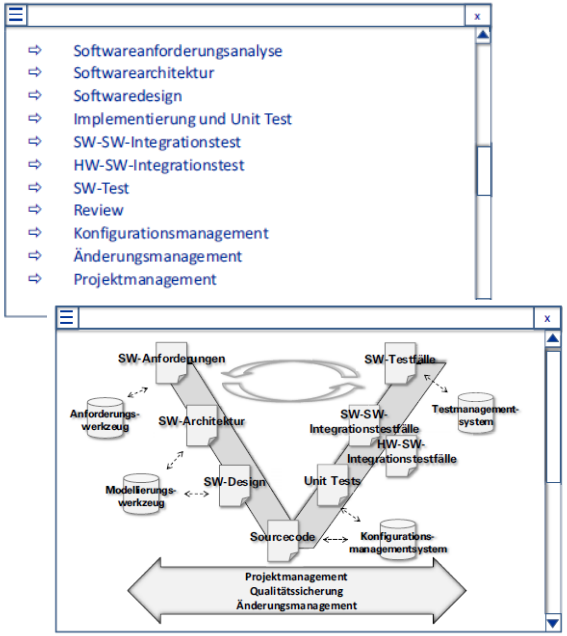
Expectation #3 – How many standard processes?

Disadvantageous approaches –

“one-size-fits-all“



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Instead –

we need standard processes for the typical types of developments:

1. **New development**
2. **Carry-over**
3. **New product line**
4. **Application of a product line**
5. **Change Request**

These

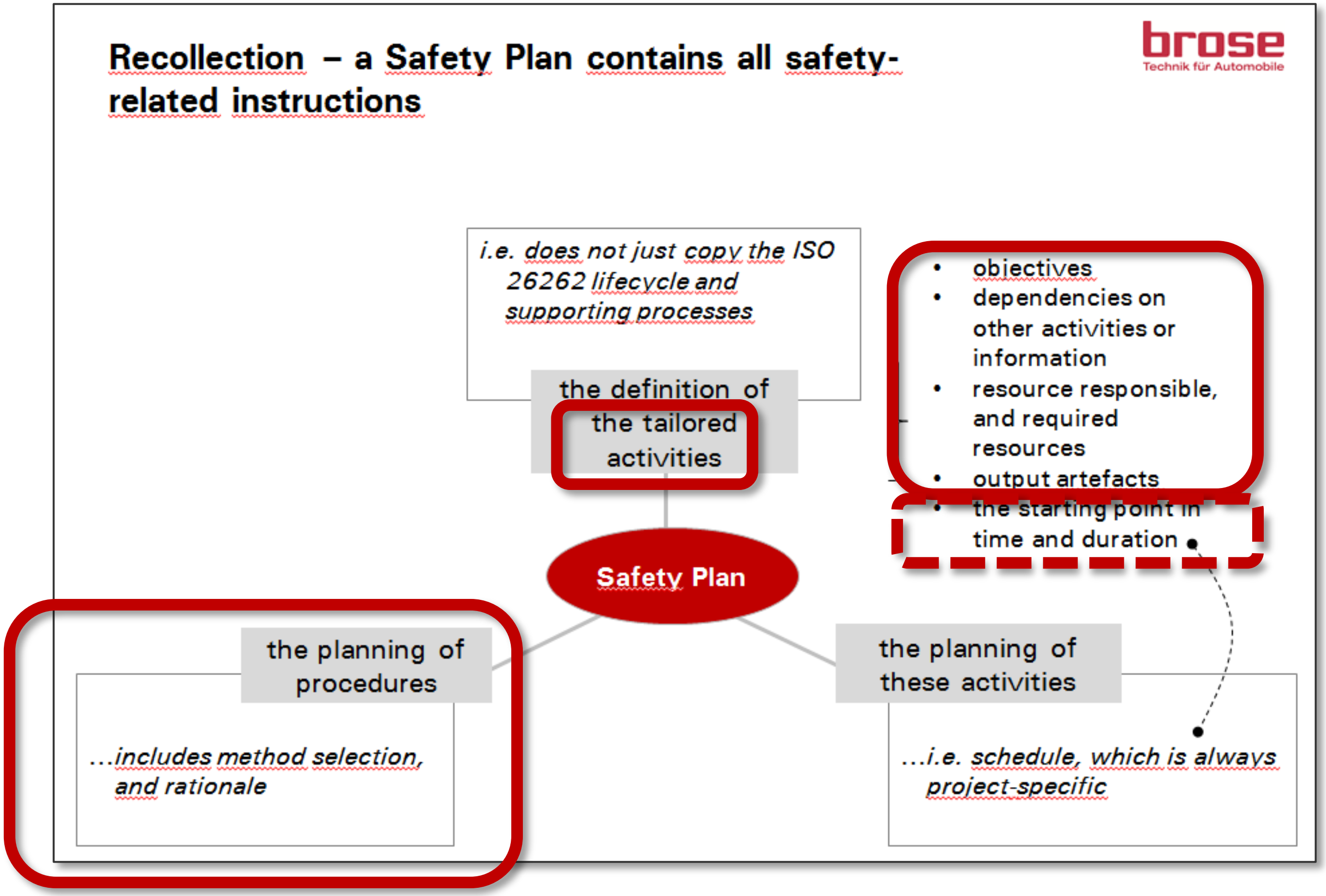
- are “reading entry points“
- may considered “predefined standard tailorings“

Source
P.Metz, “Automotive SPICE® Capability Level 2 and 3 in der Praxis”, dpunkt Verlag, 2017

Tailoring of standard processes

- **Standard processes are abstractions from concrete projects – otherwise they would not be widely applicable**
- **Therefore:**
  - standards are tailored to a concrete project context…based on arguments!
  - which means: adding, redefining, or removing something.
- **Such tailorings are to be done by both**
  - quality assurance representatives
  - the project members

Conclusion: most of the safety plan is inherent in an instantiation of a standard process tailoring



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Recollection

- **ISO 26262:2011 says Confirmation Reviews…**
  - *are about ISO 26262 compliance of … work products to the … requirements of ISO 26262 with respect to formality“*

    (combination of ISO 26262-2, clause 6.2 and Table 2)
  - *…include the checking of correctness with respect to formality, contents, adequacy and completeness regarding the requirements of ISO 26262*”

    (ISO 26262-2, 6.4.7.1, Note 2)
- **NOTE: the only distinction criterion is “formality against ISO 26262“ as *content* and *completeness* is a matter of verification reveiws and safety assessments** [1]

[1] P.Metz, A.Schnellbach “Critical View on, and Revision of, the Confirmation Measures in ISO 26262:2011”, 6th IQPC International Conference “Applying ISO 26262”, March, 21st – 23rd March, Berlin, Germany

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Putting it all together…

- **What we have seen so far:**
  - standard process instantiation (as expected above) will implicitly contain the safety plan (except schedules)
  - confirmation reviews address *structural* ISO 26262 compliance

- **Conclusion to draw:**
  - comfirmation reviews take place at the time the standard process elements are defined (ISO 26262 mapping)
  - so for projects they are implict !

NOTE! Such standard process audits do *not* require external service providers [3]

- **Prerequisite, however:**
  - we so need an effective standard process adherence monitoring 1

3) P.Grabs, P.Metz “A Critical View on “Independence“ in ISO 26262-2“, 4th EUROFORUM conference “ISO 26262”, Sept 12th–14th, 2012, Leinfelden-Echterdingen, Germany

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Mechanisms for process adherence monitoring (combinations meaningful):

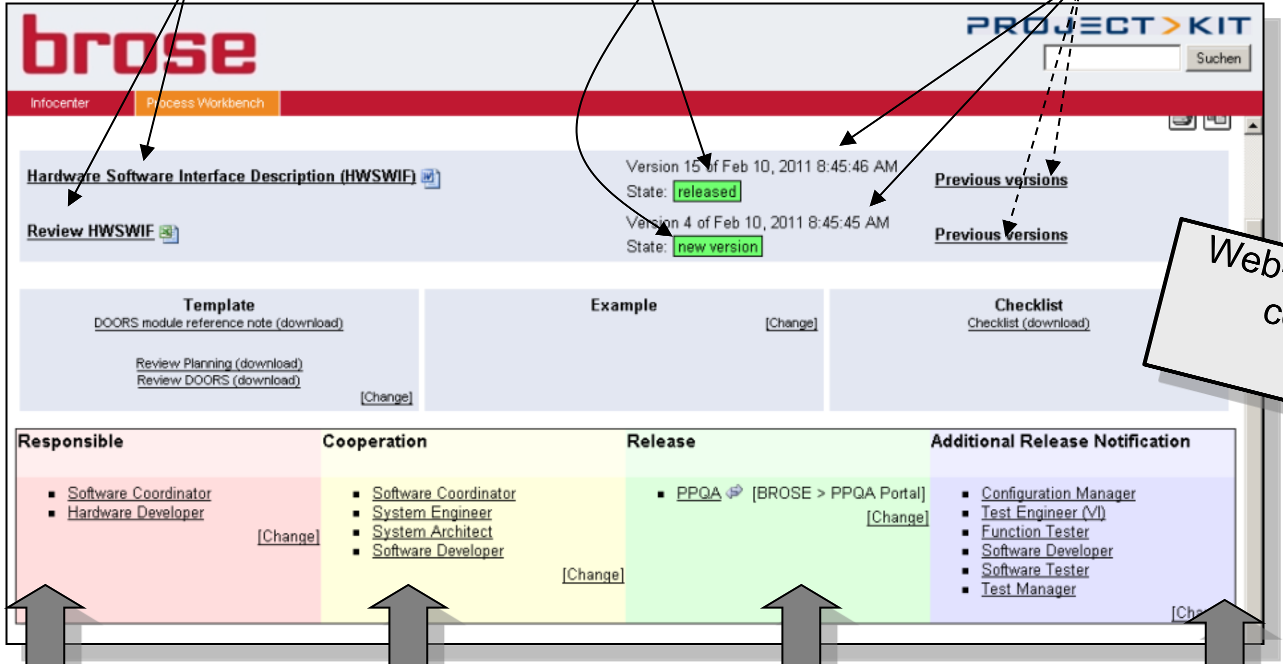
- Internal process audits
- Lessons learned workshops
- Stage gate reviews / quality gates between development phases
- Automated work product monitoring, see below…

Work Product-Centric Standard Process “Instantiation“

Upload of work products (WP) and review evidence…

WP lifecycle states

WP version and version history…



Hardware Software Interface Description (HWSWIF)

Version 15 of Feb 10, 2011 8:45:46 AM
State: released

Previous versions

Review HWSWIF

Version 4 of Feb 10, 2011 8:45:45 AM
State: new version

Previous versions

Template	Example	Checklist
DOORS module reference note (download) Review Planning (download) Review DOORS (download) [Change]	[Change]	Checklist (download)

Responsible	Cooperation	Release	Additional Release Notification
▪ Software Coordinator ▪ Hardware Developer [Change]	▪ Software Coordinator ▪ System Engineer ▪ System Architect ▪ Software Developer [Change]	▪ PPQA [BROSE > PPQA Portal] [Change]	▪ Configuration Manager ▪ Test Engineer (VI) ▪ Function Tester ▪ Software Developer ▪ Software Tester ▪ Test Manager [Ch

Web-frontend for our config mgmt system

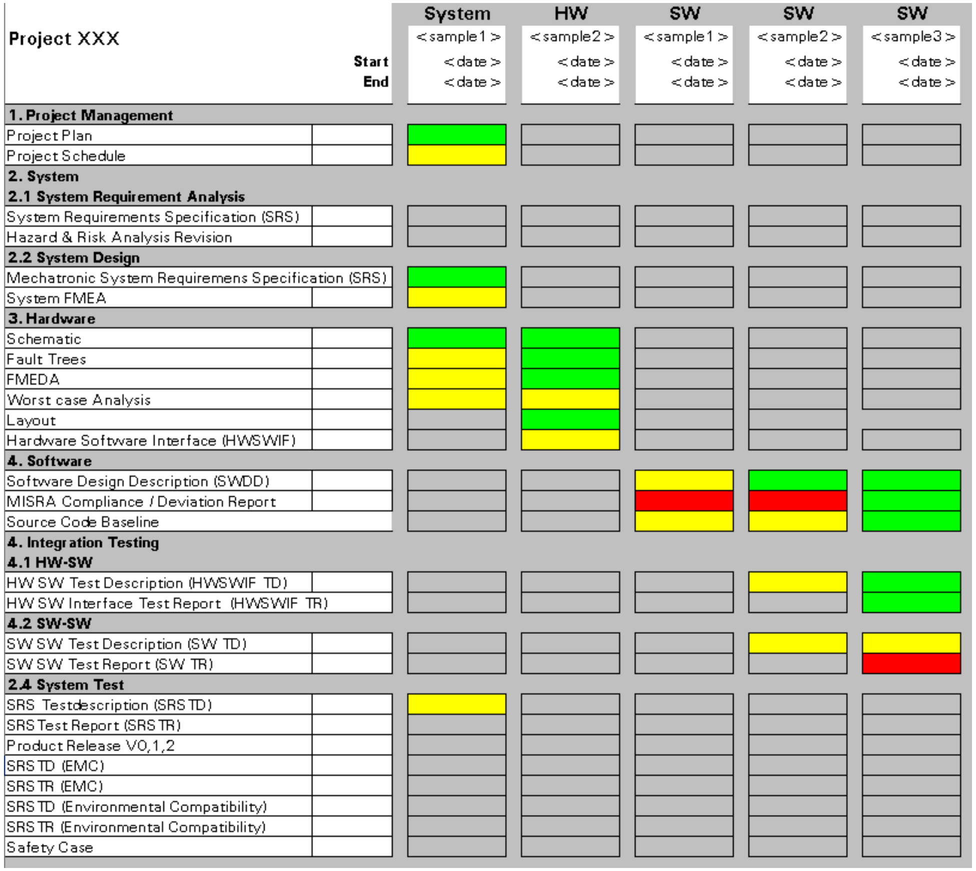
Work product owner…

…and co-workers, or input providers

Independent approval (state ‘released‘ *cannot* be set by WP owner)

Automated stakeholder notification of any state change

Further mechanisms for process adherence monitoring – automated work product monitoring



Project XXX		System	HW	SW	SW	SW
		<sample1>	<sample2>	<sample1>	<sample2>	<sample3>
	Start	<date>	<date>	<date>	<date>	<date>
	End	<date>	<date>	<date>	<date>	<date>
1. Project Management						
Project Plan		🟩				
Project Schedule		🟨				
2. System						
2.1 System Requirement Analysis						
System Requirements Specification (SRS)						
Hazard & Risk Analysis Revision						
2.2 System Design						
Mechatronic System Requiremens Specification (SRS)		🟩				
System FMEA		🟨				
3. Hardware						
Schematic		🟩	🟩			
Fault Trees		🟨	🟩			
FMEDA		🟨	🟩			
Worst case Analysis		🟨	🟨			
Layout			🟩			
Hardware Software Interface (HWSWIF)			🟨			
4. Software						
Software Design Description (SWDD)				🟨	🟩	🟩
MISRA Compliance / Deviation Report				🟥	🟥	🟩
Source Code Baseline				🟨	🟨	🟩
4. Integration Testing						
4.1 HW-SW						
HW SW Test Description (HWSWIF TD)					🟨	🟩
HW SW Interface Test Report (HWSWIF TR)						🟩
4.2 SW-SW						
SW SW Test Description (SW TD)					🟨	🟨
SW SW Test Report (SW TR)						🟥
2.4 System Test						
SRS Testdescription (SRS TD)		🟨				
SRS Test Report (SRS TR)						
Product Release V0,1,2						
SRS TD (EMC)						
SRS TR (EMC)						
SRS TD (Environmental Compatibility)						
SRS TR (Environmental Compatibility)						
Safety Case						

Exploited for

- progress tracking at project level
- reporting to higher level mgmt
- process adherence monitoring

In addition to that:

- Semantic rule checks for, and across, work products in the tool chain

Conclusion – extra artefacts for safety plans and confirmation reviews are not necessarily required

- **In a state-of-the-art standard process approach the following is implicit:**
  - safety plan (except schedules)
  - confirmation reviews
- **The confirmation review of the “safety plan“ itself is represented by**
  - standard process compliance checks against ISO 26262
- **Safety audits are represented by**
  - standard process compliance checks against ISO 26262
  - standard process adherence monitoring

NOTE: this also contributes to an Automotove SPICE® Level 3 capability ! [4)]

[4)] P.Metz, “Automotive SPICE® Capability Level 2 and 3 in der Praxis”, dpunkt Verlag, 2017

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