peak avenue

PeakAvenue e1ns

The web-based Product Innovation Platform

Master the Challenges of Product Development

1. Challenge

Mastering complexity

- Individualized products
- Specific customer requirements
- Short innovation cycles
- Use of various components

2. Solution

Provide transparency

- Overview of project and product
- Interdisciplinary cooperation
- Networked information
- Access to engineering status and technical risks

3. Verification

Ensure compliance

- Traceability
- Documentation of all decisions
- Consistency and timeliness of data

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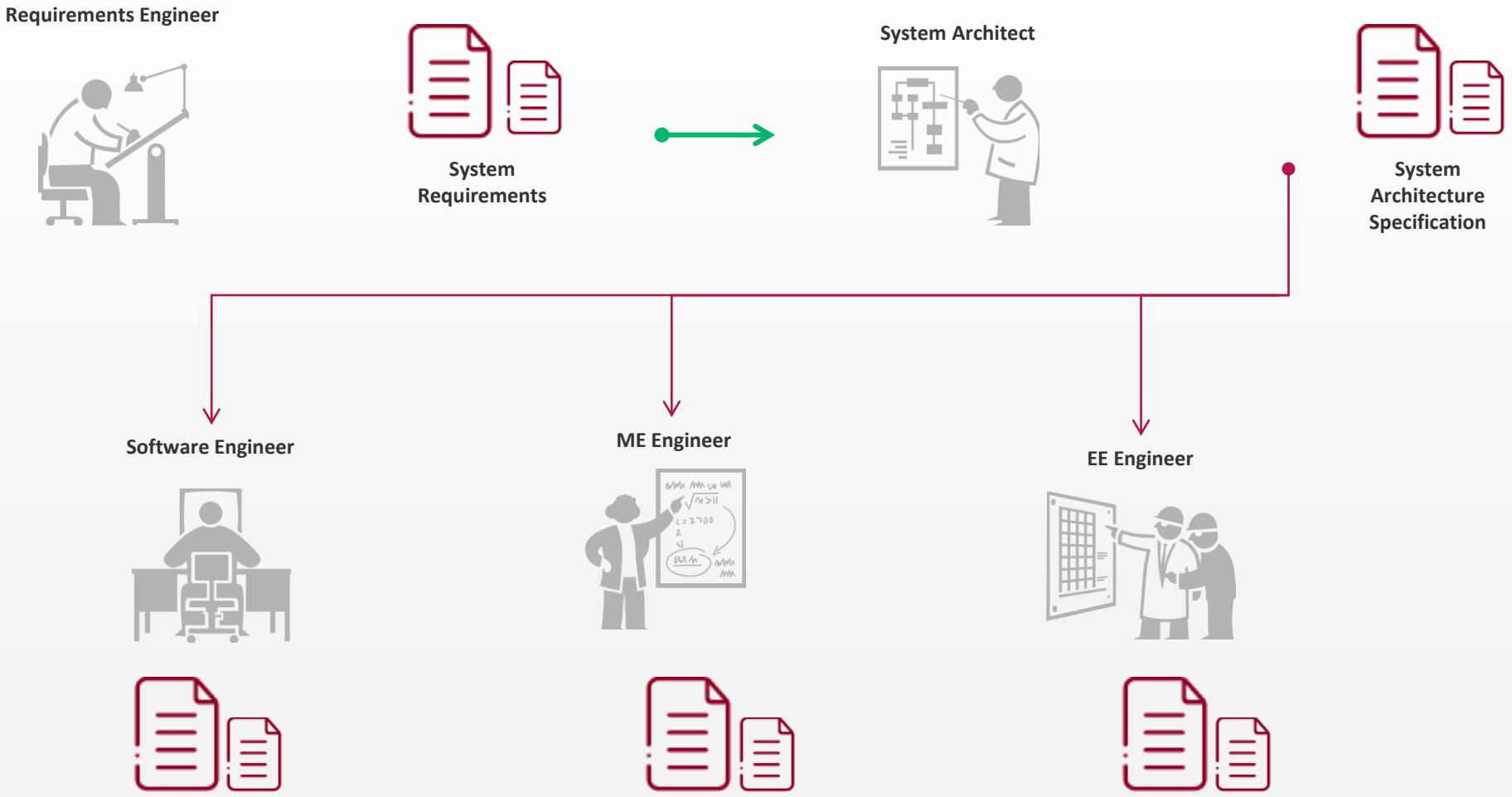
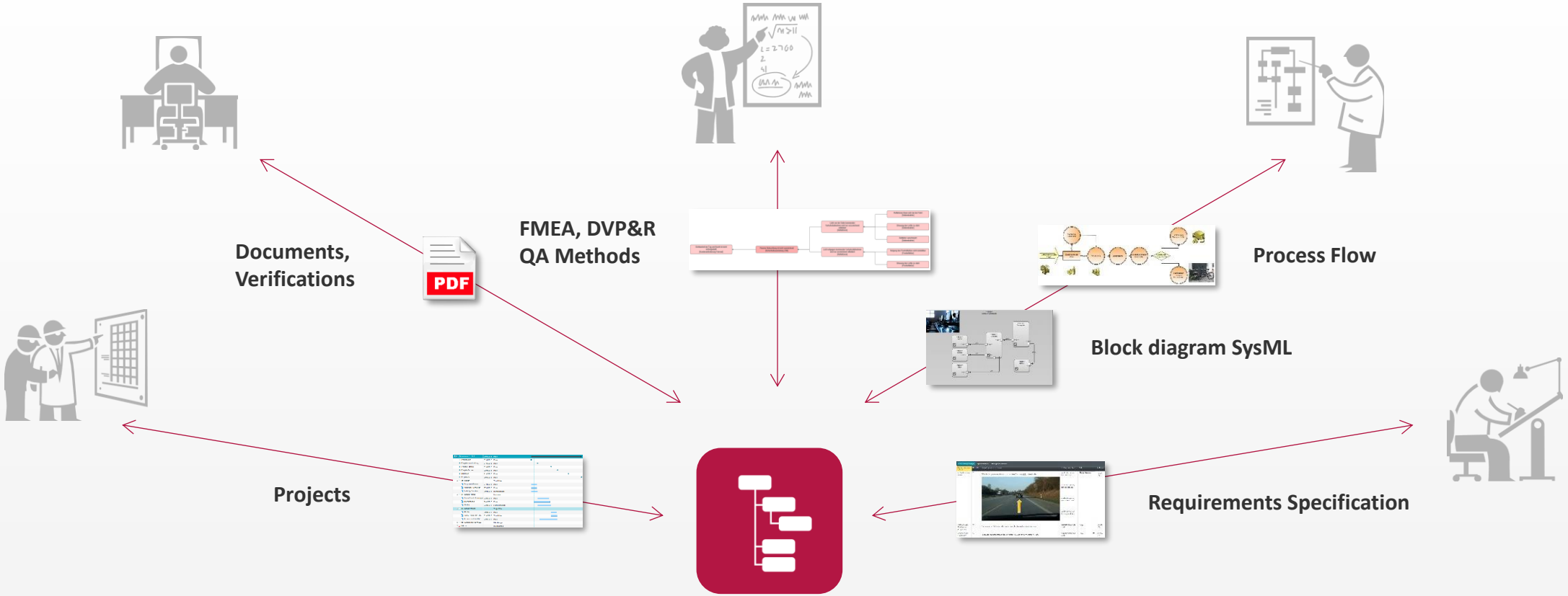
From Silo and Document-oriented Development…



… to Model-Based Development



The system model is the basis for all activities.

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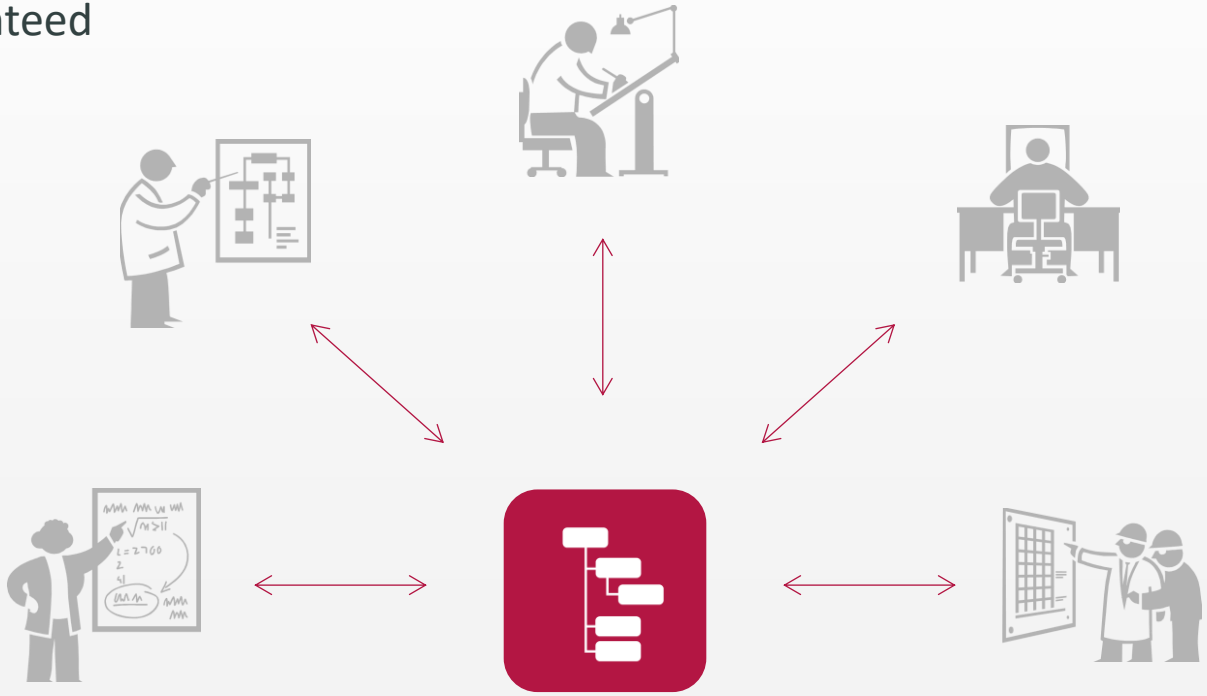
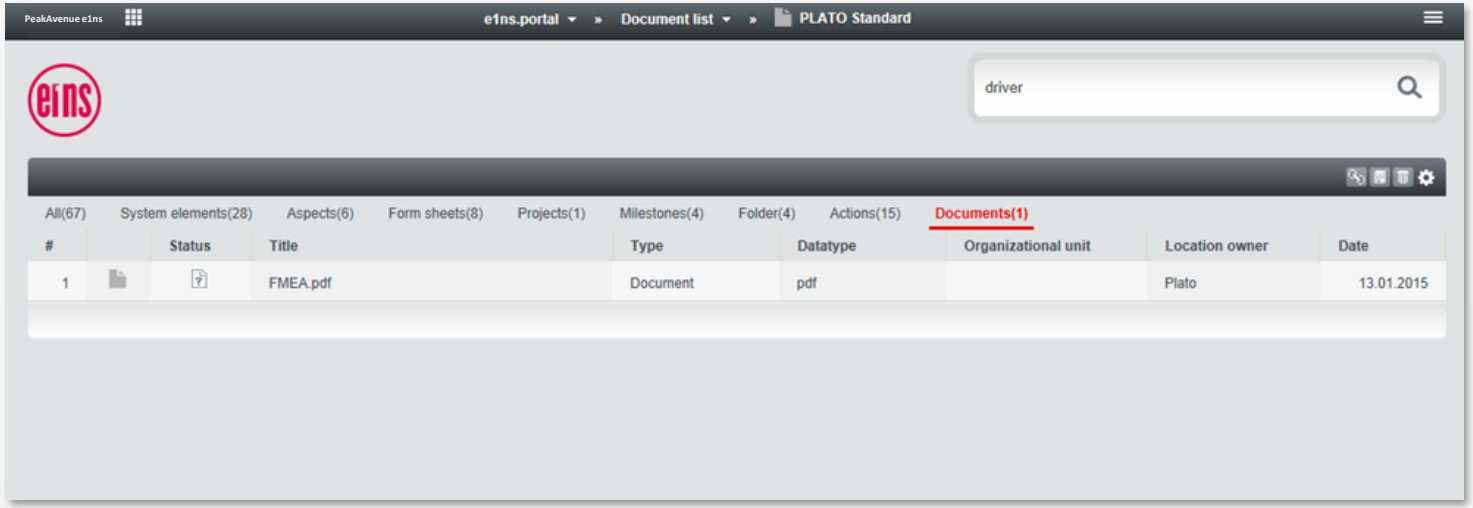
Model-Based Development

- Systematic, simple and fast structure building
- Different disciplines work simultaneously on one model
- Up-to-dateness and consistency are guaranteed
- Easy orientation through familiar structure



Single Point of Information

- Easy and quick access to all information
- Full-text search
- Using the web browser
  - Worldwide access
  - Minimized installation costs
- Extensive filter options



REQUIREMENTS

Formulate Requirements → **Specify Requirements** → **Verify Requirements**

- Recording system requirements (user specification/requirements specification)
- Textual description of requirements
- Use of photos, etc.
- Functional description

Advanced Driver Assistance Systems (ADAS)

Short Name/Function	ID	ASIL	Requirement Description	Possible Errors
Prevent unintended braking		C		Braking is triggered, even there is no object available.
Offer Distance control			Cars must not fall below the distance value to the front vehicle.	Distance control triggers too early.
				Distance control triggers too late.
				Distance control delivers false values.
				Unintended start of distance control.
Recognition of objects and events			Objects on the road must be detected at a distance of 40 m.	Object recognition too late.
Detecting pedestrians		sc	Pedestrians on the road must be detected at a distance of 40 m.	Object recognition too late.

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REQUIREMENTS

Formulate Requirements → **Specify Requirements** → **Verify Requirements**

- Function specifications
- Characteristic specifications
- Determine target values and tolerances
- Name test methods

Advanced Driver Assistance Systems (ADAS)

Function		Characteristics									
Req./Function	ASIL	No	Specification	Class	Rel.	Target	Modality	Min. size	Max. size	Unit	Test method
Recognition of objects and events		S1	Distance			130	~	0	135	feet	Simulation of the driving situation
		S2	Speed		<=	25	Attributive / None			m.p.h	Measuring speed by test script
Prevent unintended braking	C		No Brake signal when driving				undefined				Signal monitoring during continous test
Offer Distance control											
Detecting pedestrians	sc	S3	Distance				undefined				
		S4	Speed				undefined				

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REQUIREMENTS

Formulate Requirements → **Specify Requirements** → **Verify Requirements**

- Design test, function test, system test
- Data from the specification is used
- Test description
- Result documentation

Advanced Driver Assistance Systems (ADAS)

Function		Test plan				Test execution					Test result	
Req./Function	ASIL	Acceptance target / criterion	Test Method	Test	Description	Actual start	Actual end	Resp.	Sampls requ.	Sampls tested	Result	Remarks
Recognition of objects and events		S1: Distance 130 feet (Max: 135 / Min: 0)	Simulation of the driving situation									
		S2: Speed <= 25 m.p.h	Measuring speed by test script									
Prevent unintended braking	C	No Brake signal when driving	Signal monitoring during continous test	Test run highway and country road	Use work instruction A46	10/29/2014						Test log documented in e1ns
				Test run city traffic	Use work instruction A45	09/24/2014	11/24/2014	Snyder A.			OK	Test log documented in PLATO e1ns
Offer Distance control												
Detecting pedestrians	sc	S3: Distance										
		S4: Speed										

System and Function Analysis → System Model → Failure Analysis

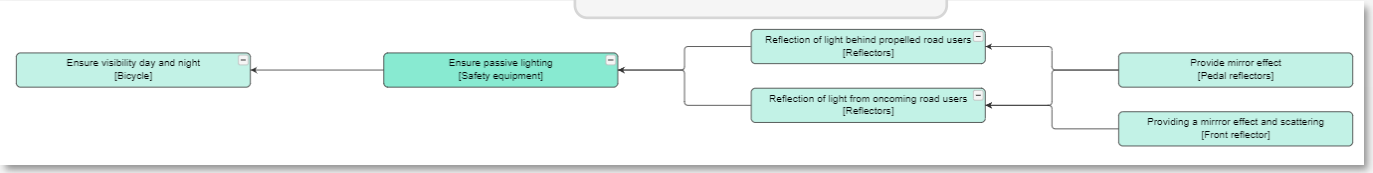
- System construction in structure depths (QFD approach)
- Linking design and process
- Visualization via a structural network
- Linking of functions and elements
- Creation of the function network

Linked elements with functions and failures

Link system element, function or failure

Structure network

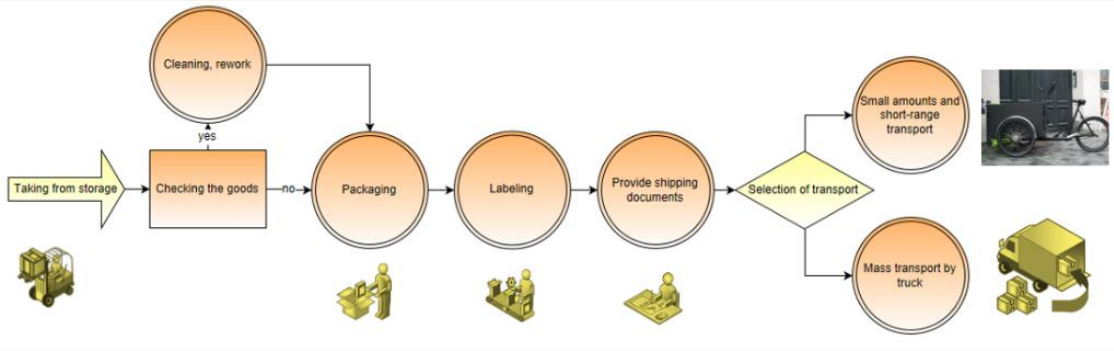
Function Network

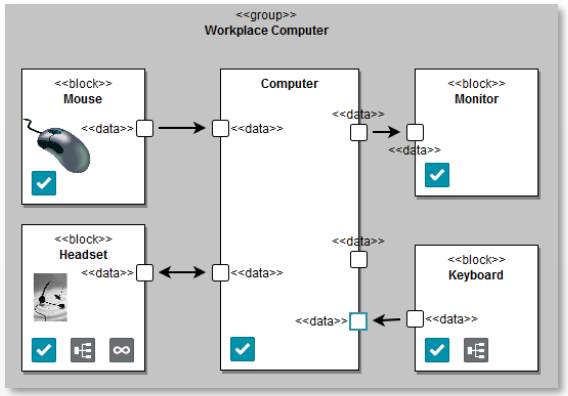


System and Function Analysis → **System Model** → Failure Analysis

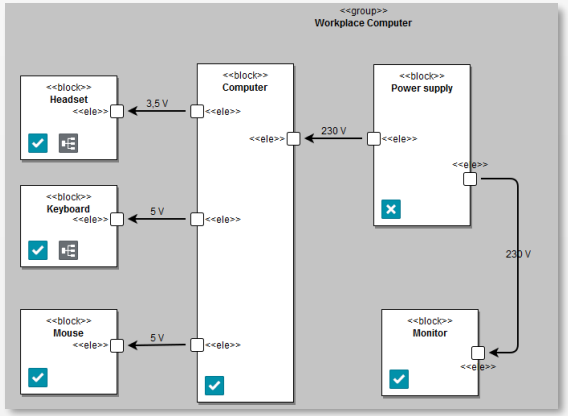
- Modeling an architecture
- Visualization of system behavior
- Views for every engineering discipline
- Unified system representation
- Display as block structure diagram
- Using the standard SysML

Separate process modeling via flowcharts:





Software



Electrics

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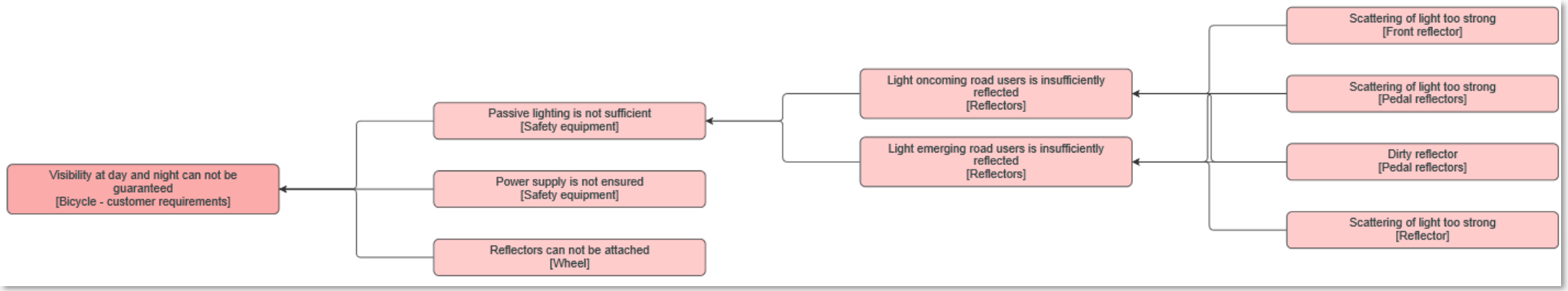
System and Function Analysis → System Model → **Failure Analysis**

- Each requirement is examined for non-compliance.
- The system uses the failure network to check for potential system failure.
- Failure networks provide data for the FMEA.
- Safety functions (Functional Safety) are defined and linked in a comprehensible way for failures.



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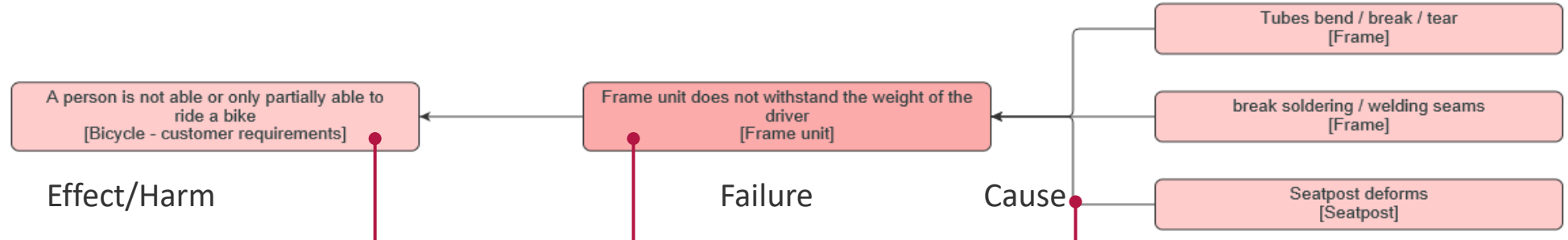
Risk Analysis → **Evaluation/Notification** → **Optimization**

- The failure network automatically fills the FMEA.
- Failure, effect and cause are entered from the structure into the form.



Frame unit

Requirements		Risk Analysis					Current Design					
Item / Function	Requirements	Failure Mode	Failure Effect	S	Class	Potential Failure Causes	Preventive Action	O	Detection Action	D	RPN	Risk
Carry weight of the driver	1: Maximum weight Driver > 115 kg (+150)	Frame unit does not withstand the weight of the driver	A person is not able or only partially able to ride a bike [Bicycle - customer requirements]	10		Tubes bend / break / tear [Frame]	Numerical simulation of the component under load	3	Load test on a test stand	1	30	R
						break soldering / welding seams [Frame]	Numerical simulation of the component under load	4	Load test on a test stand	1	40	R
						Seatpost deforms [Seatpost]	none	2	Load test on a test stand	1	20	Y

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Risk Analysis → **Evaluation/Notification** → Optimization

- The system uses the failure network to check for consistent evaluations.
- Persons responsible are informed about conflicts (Notifications).

Bicycle

Requirements		Risk Analysis					
Item / Function	Requirements	Failure Mode	Failure Effect	S'	S	Class	Potential Failure Causes
Ensure visibility day and night		Visibility at day and night can not be guaranteed	Does not meet safety requirement	9	9		Power supply is not ensured [Safety equipment]

Checking the failure network

Safety equipment

Requirements		Risk Analysis					
Item / Function	Requirements	Failure Mode	Failure Effect	S'	S	Class	Potential Failure Causes
Ensure energy supply	Voltage Dynamo = 6 V Rated Power Dynamo = 3 W Efficiency Dynamo at 20km / h >= 50 %	Power supply is not ensured	Visibility at day and night can not be guaranteed [Bicycle] (10)	1	1		none

Top Element

Person responsible

Severity changed for **Visibility at day and night can not be guaranteed** from 1 to 9.
By PeakAvenue 5 minutes ago

Sub Element

Person responsible

The meaning for the top system element "Bicycle" has changed from 1 to 9, which affects **driving not possible**.
By PeakAvenue 3 minutes ago

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Risk Analysis → Evaluation/Notification → **Optimization**

- A newsletter provides regular information on open actions.
- Easy access via an action portal. The FMEA software does not need to be started (installed).
- Each user has his own scheduling overview.

e1ns.foundation » Schedule overview

Personal Tasks | Own System Elements (Team) | from 04/01/2016 | to 08/21/2018

Target date	System element	SE type	RPN1	Failure	Cause	RPN2	Status	Recommended action	Action taken	Responsible person
05/05/2016	Battery gas measuring device STD	System/Design	90	Leak protection not ensured	Electrolyte etches hole in battery casing	90	60	P: Additional coating of battery casing	P: Additional coating of battery casing	PeakAvenue
06/23/2016	Final assembly gas measuring device STD	Process	270	Test results misinterpreted	Error in control plan	54	60	D: Additional review of control plans	D: Additional review of control plans	PeakAvenue
04/13/2017	Final assembly gas measuring device STD	Process	180	Bonding insufficient	Amount of adhesive too small	45	Eval.	P: Automatic dosing of adhesive	P: Automatic dosing of adhesive	PeakAvenue
04/13/2017	Final assembly gas measuring device STD	Process	120	Adhesive in visible locations	Amount of adhesive too high	30	Eval.	P: Automatic dosing of adhesive	P: Automatic dosing of adhesive	PeakAvenue
05/01/2017	Bicycle	Requirement	112	Lifetime is limited	Resistance to environmental influences is insufficient	84	20	P: Adjusting material selection	P: Adjusting material selection	PeakAvenue
05/28/2017	Final assembly gas measuring device STD	Process	112	Screw joint insufficient	Screw defective	64	80	D: Implement additional visual control in SOP	D: Implement additional visual control in SOP	PeakAvenue
05/28/2017	Final assembly gas measuring device STD	Process	112	Screw joint insufficient	Screw defective	64	Eval.	D: Implement additional visual control in SOP	D: Implement additional visual control in SOP	PeakAvenue

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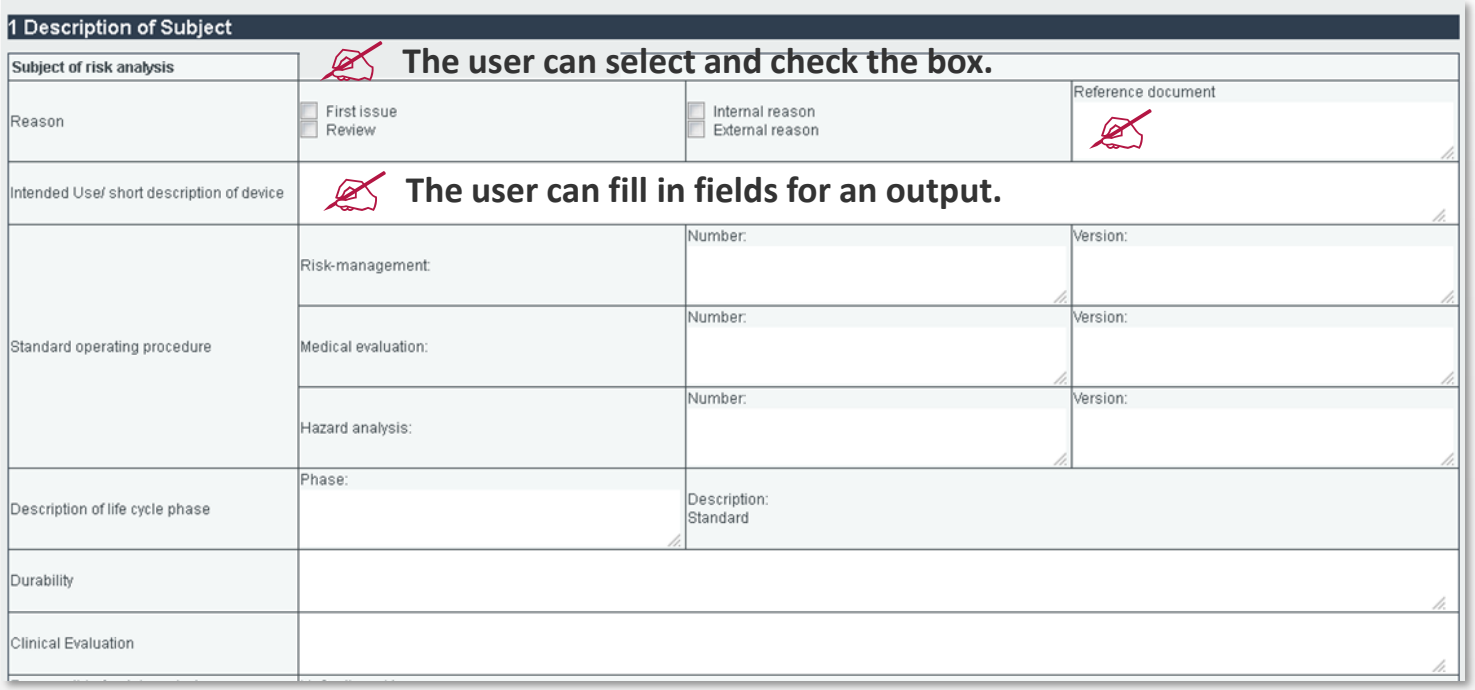
DOCUMENT MANAGEMENT

Result Documentation → **Document Storage** → **Release and Versioning**

- Documentation of the results for any milestones
- Configuration of the output according to your company's requirements
- Use of “form” elements
- Creation of folders:
  - Product master file
  - User & Requirements Specification



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DOCUMENT MANAGEMENT

Result Documentation → **Document Storage** → Release and Versioning

Creation date	Output format	Language	Creator			
05/12/2016 15:25:11	PeakAvenue standard with e1ns.aspect	de	PeakAvenue	Share	Open	Delete
05/12/2016 15:25:00	FMEA output	de	PeakAvenue	Share	Open	Delete
05/12/2016 15:24:51	FMEA output	de	PeakAvenue	Share	Open	Delete
05/12/2016 15:22:46	Team FMEA with header	en	PeakAvenue	Share	Open	Delete
05/12/2016 15:22:37	FMEA output	en	PeakAvenue	Share	Open	Delete

Automatic filing in PeakAvenue's document management system.

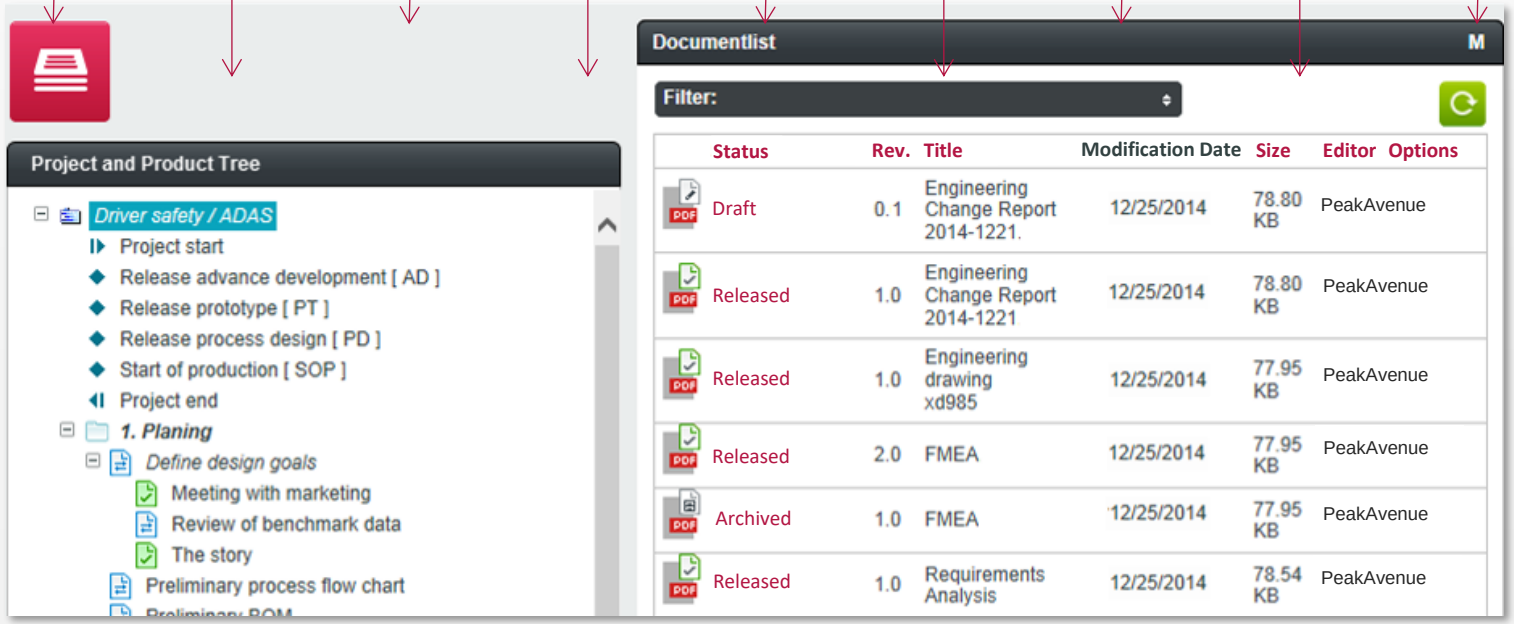
Save to storage directory.

DOCUMENT MANAGEMENT

Result Documentation → **Document Storage** → **Release and Versioning**

- Central storage
- Structure-oriented
- Release
- Versioning
- Audit Trail
- Comment function

Requirements Analysis	System Analysis	Record	Target Costing	FMEA	ROI
QFD	Specification	DVP&R	Hazard Analysis	DFMEA / PFMEA	Exploration
Functional Safety	Function Networks	DRBFM	Item Definition	FMEA 26262	Solution Evaluation
				FMECA	



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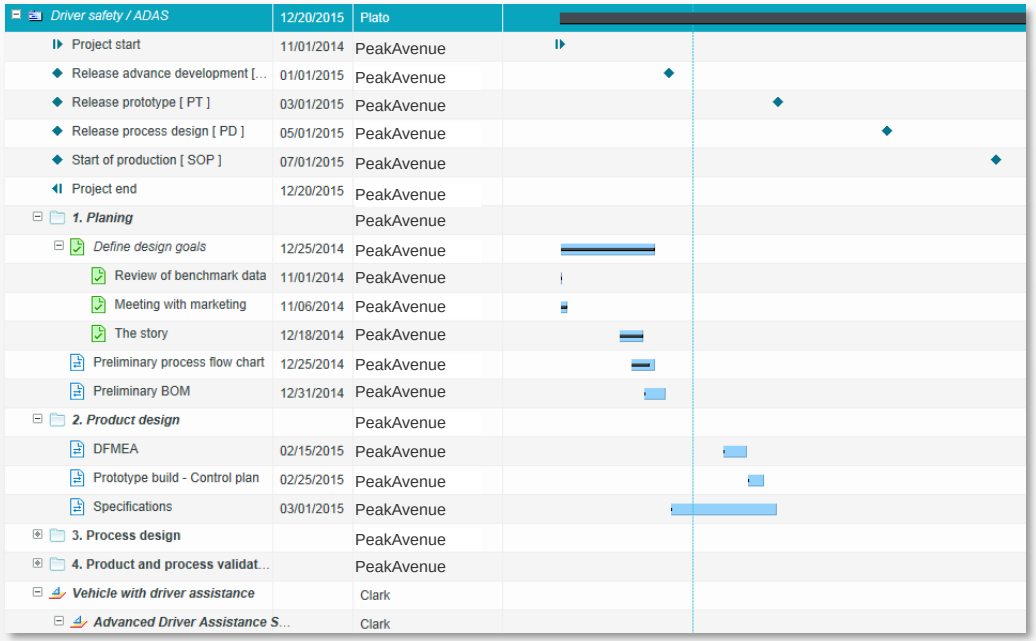
Project Planning → **Action Management** → **Key Indicators**

- “Single Point of Information“ for all projects, work packages and actions
- Planning of project stages and milestones
- Linking of all activities/actions with the system structure



Driver safety / ADAS	12/20/2015	Plato
Project start	11/01/2014	PeakAvenue
Release advance development [...	01/01/2015	PeakAvenue
Release prototype [PT]	03/01/2015	PeakAvenue
Release process design [PD]	05/01/2015	PeakAvenue
Start of production [SOP]	07/01/2015	PeakAvenue
Project end	12/20/2015	PeakAvenue
1. Planing		PeakAvenue
Define design goals	12/25/2014	PeakAvenue
Review of benchmark data	11/01/2014	PeakAvenue
Meeting with marketing	11/06/2014	PeakAvenue
The story	12/18/2014	PeakAvenue
Preliminary process flow chart	12/25/2014	PeakAvenue
Preliminary BOM	12/31/2014	PeakAvenue
2. Product design		PeakAvenue
DFMEA	02/15/2015	PeakAvenue
Prototype build - Control plan	02/25/2015	PeakAvenue
Specifications	03/01/2015	PeakAvenue
3. Process design		PeakAvenue
4. Product and process validat...		PeakAvenue
Vehicle with driver assistance		Clark
Advanced Driver Assistance S...		Clark

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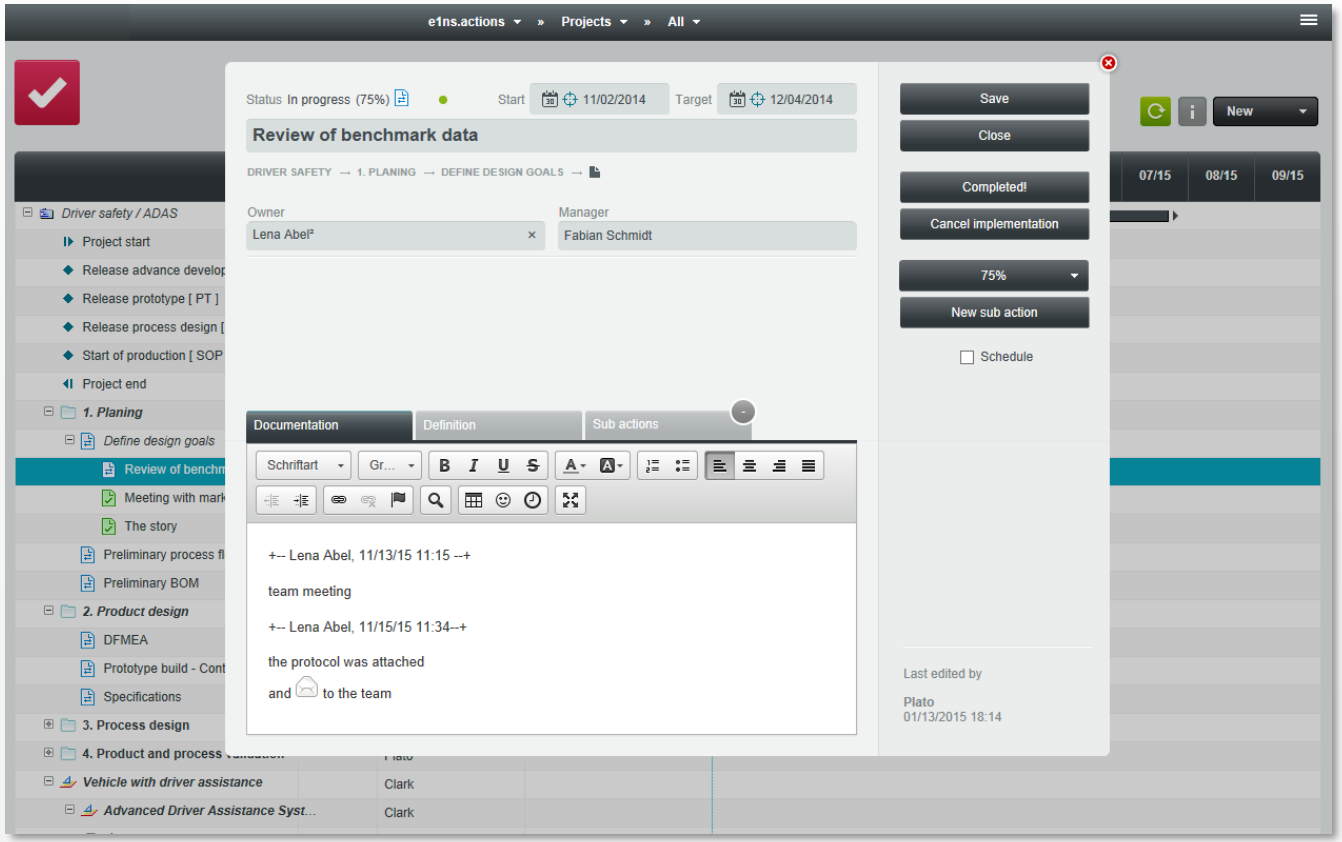
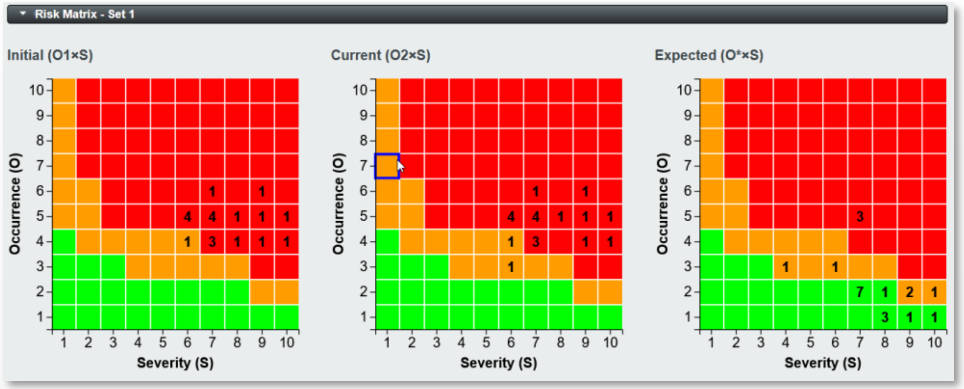
Project Planning → **Action Management** → Key Indicators

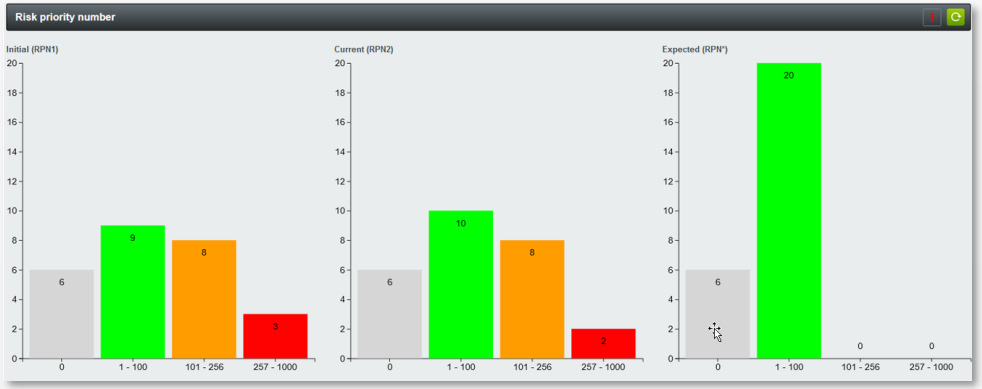
- Action Planning
- Clear assignment of appointments and persons responsible
- Central availability of all action results
- Always in view: planning and status



Project Planning → Action Management → **Key Indicators**

- Support during decision-making processes by providing current status information
- Visualization of various risk indicators
- Ensuring the transparency of potential risks
- Action status, deadline status, and delays are displayed
- The maturity of analyses and projects is made transparent
- Early identification of trends and outliers

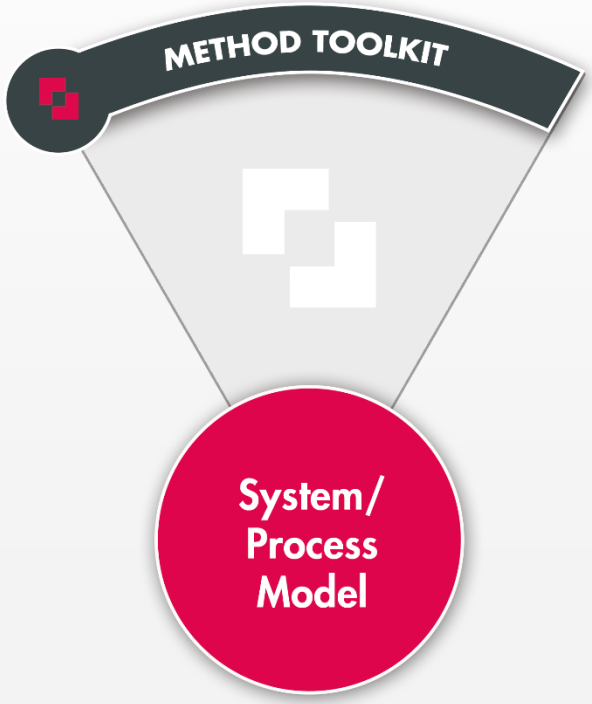




Method Toolkit

Provides individual forms for the implementation of engineering methods and analyses for enterprises in a web application.

- Using existing knowledge



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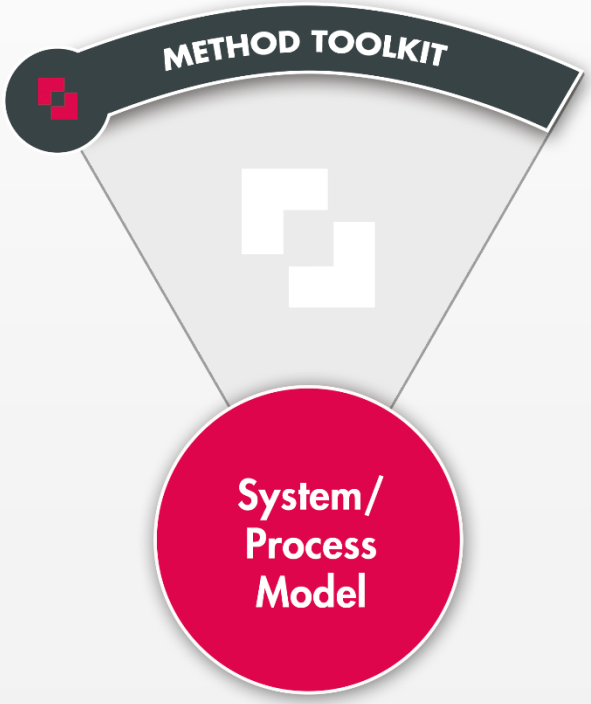
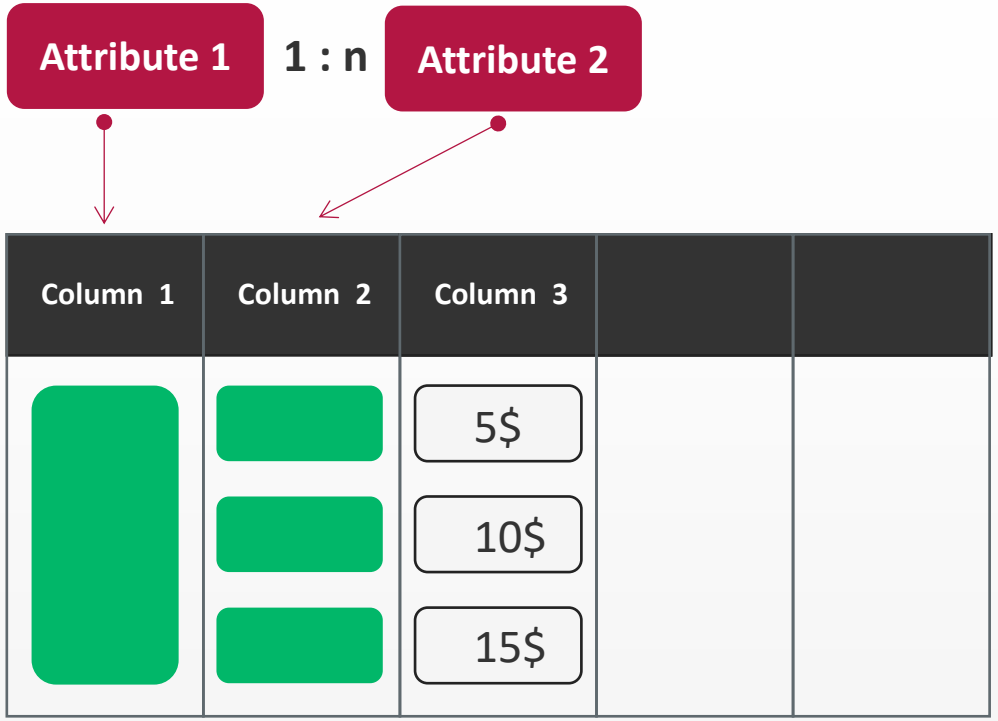
Method Toolkit

- Define data types and the column order
- Specify relationships between data
- Perform calculations





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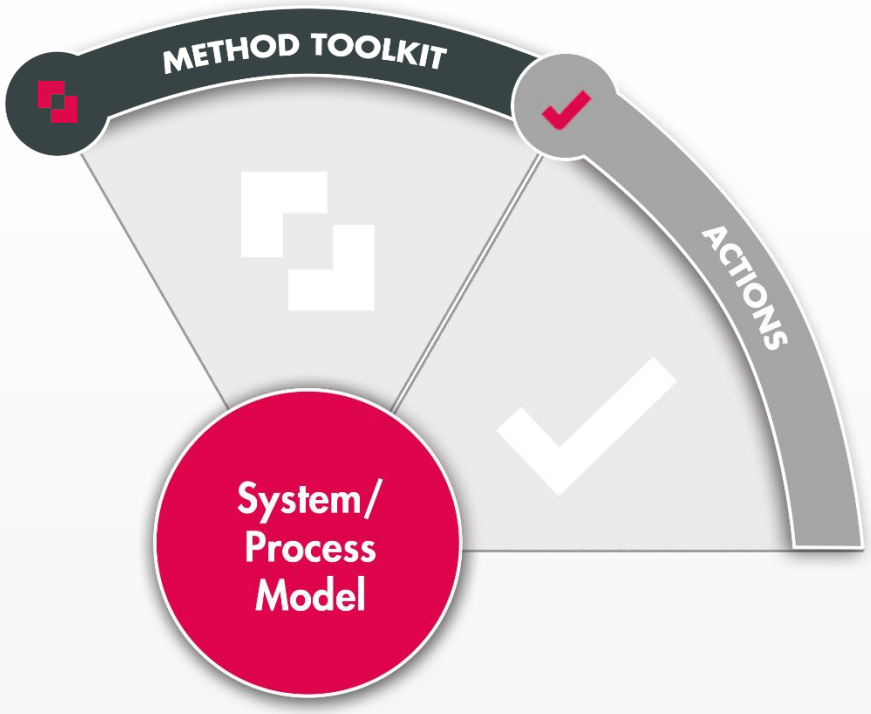
Actions

Ensures the initiation, implementation and controlling of actions.

- Integrated project planning
- Transparency of implementation status and results



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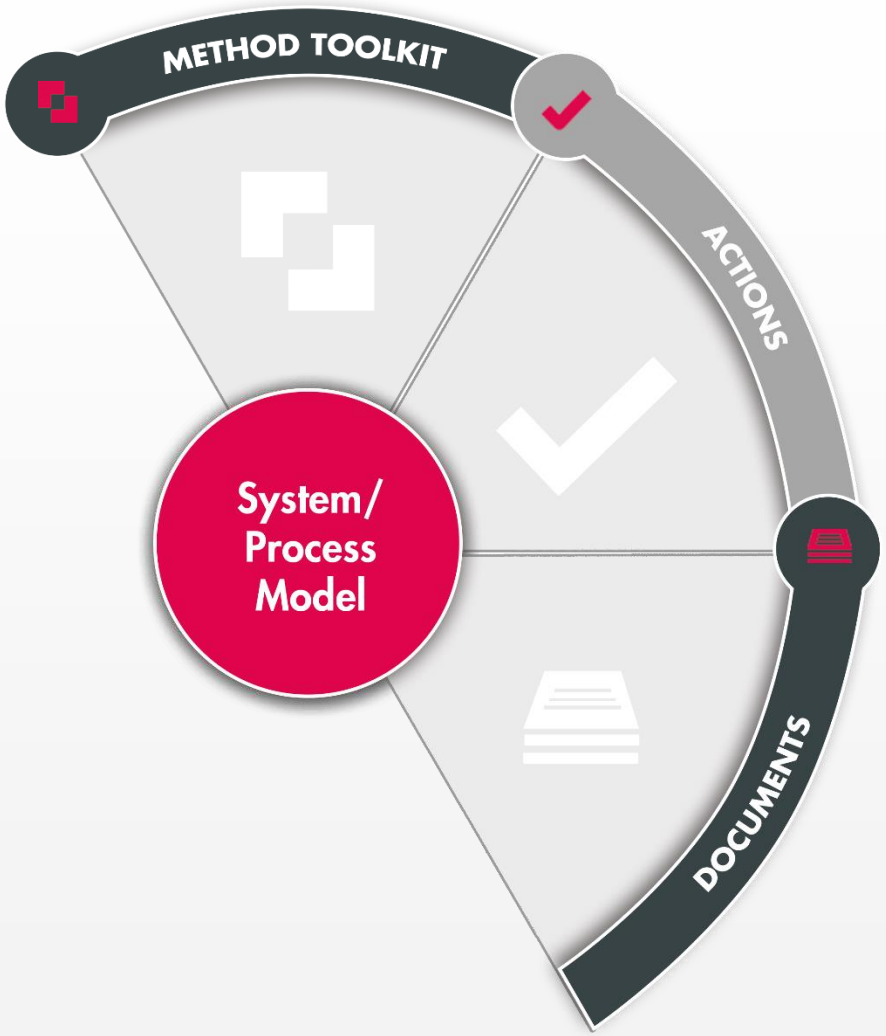
Documents

Supplies a central storage and management of all documents in the PDP.

- Files are uploaded via “Drop Zone”
- Easy and quick finding
- Feedback option via comments



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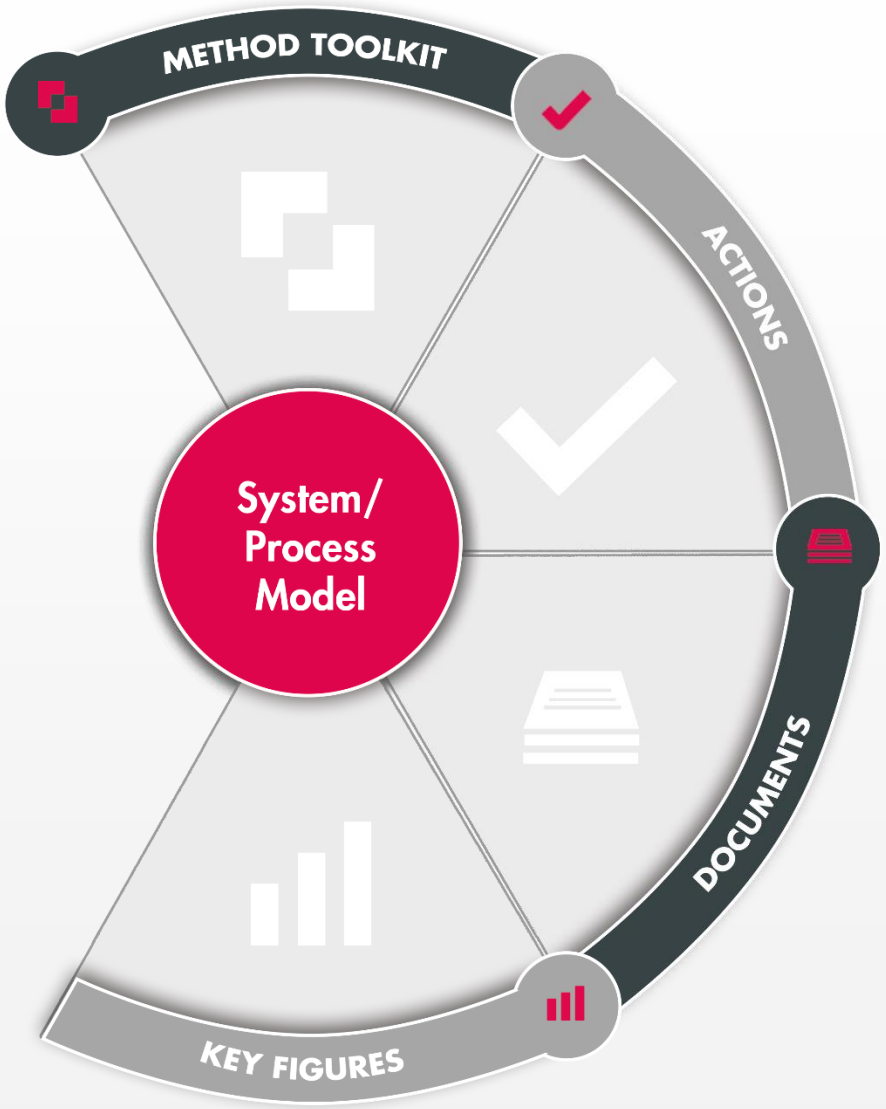
Key Figures

Supplies an easy access and comfortable interface to find information about current events and trends.

- Preparation and condensing of data
- Individual filters provide analyses regarding your specific questions
- Visualization of the project status



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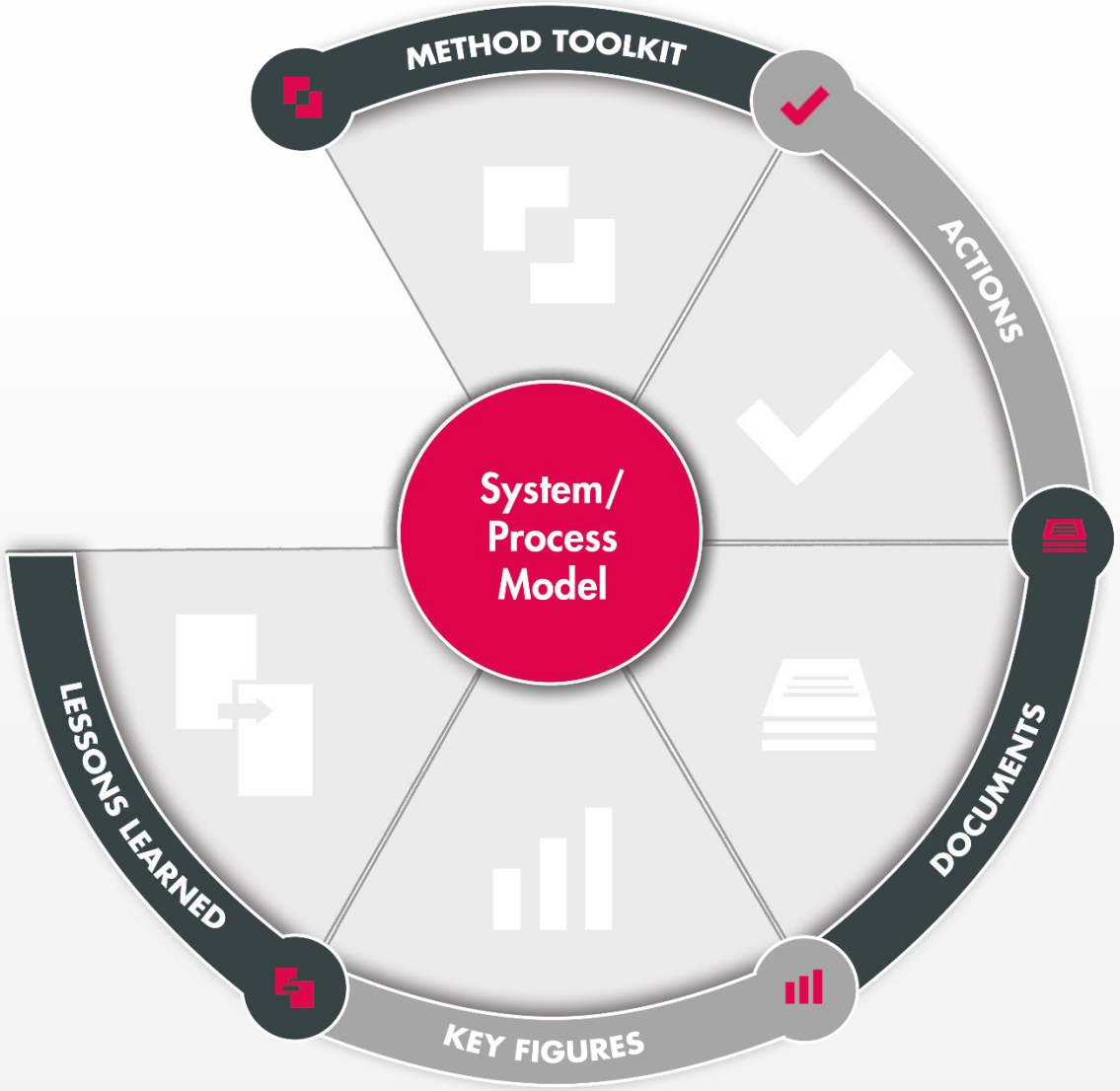
Lessons Learned

Using an existing example as a template for a similar project reduces the amount of work and time required and avoids errors that have already been detected.

- Reusing knowledge
- Working with templates and variants
- Company-wide, uniform way of working



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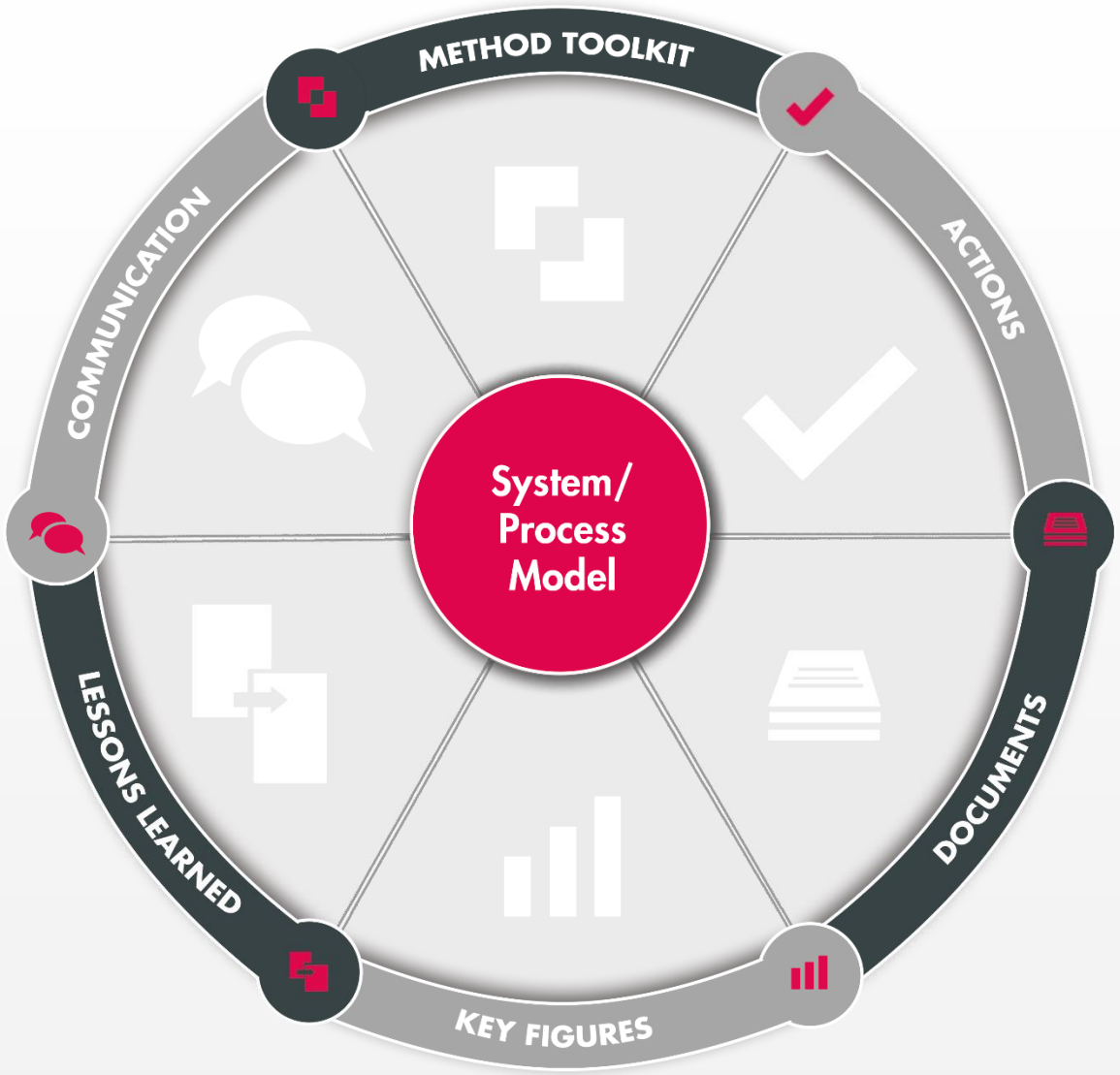
Communication

The integrated notification system informs about activities and changes.

- Collaboration of all team members
- Everyone is working on the current status



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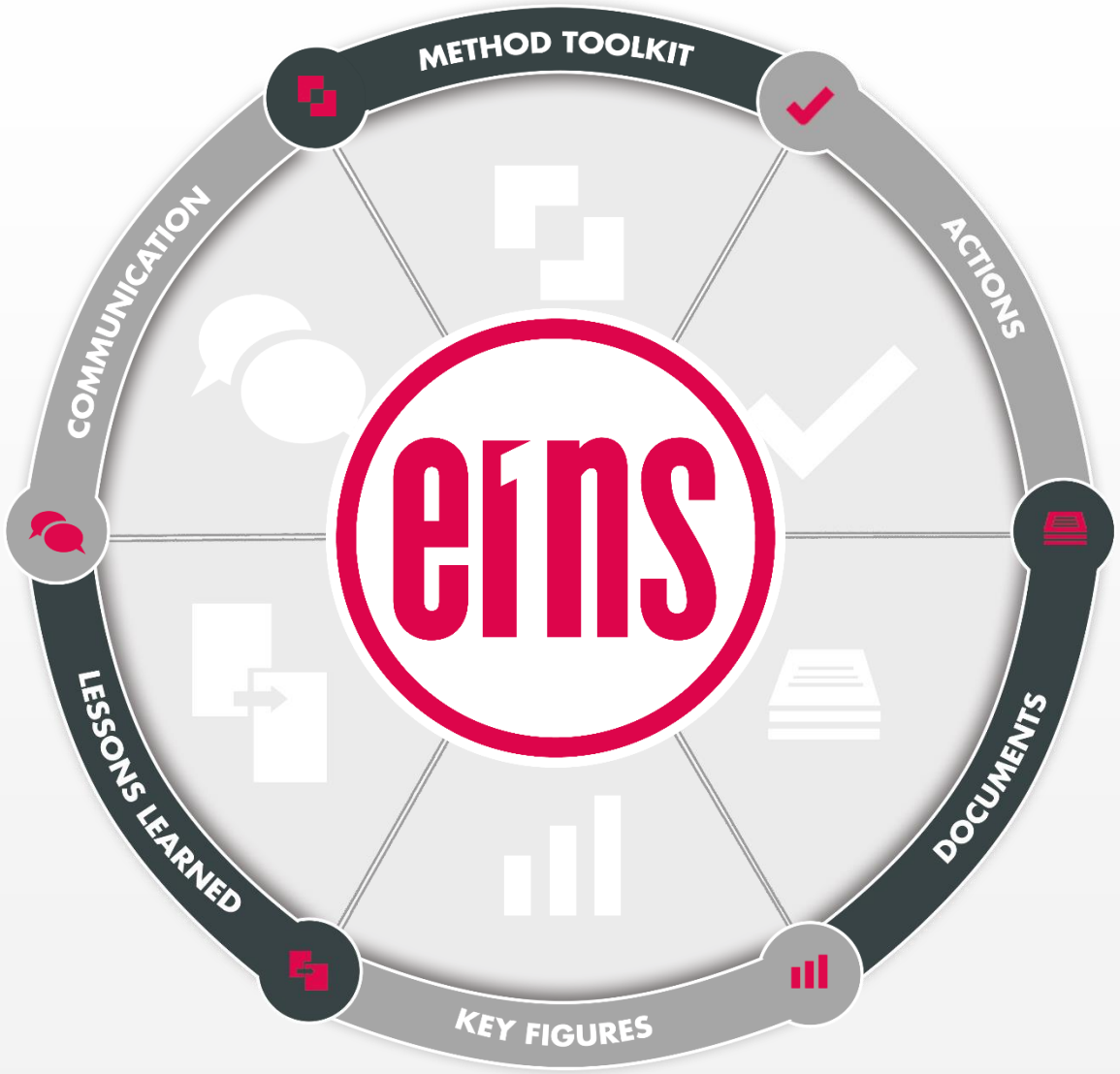
PeakAvenue e1ns

1. Search like in Google™
2. Work like in Excel®
3. Document storage like in Sharepoint®
4. Web-based Software



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FUNCTIONAL SAFETY INTEGRATED IN THE PDP

Phase: System definition

- FuSa — Hazard analysis
- FuSa — Functional safety concept
- QM — System FMEA
- QM — Technical safety concept
- QM — Requirements for HW, SW
- QM — FMEA component
- FuSa — FMEDA

Phase: Implementation

Phase: Verification

- Integration and test of module, component, system — QM
- Quantitative safety verification ASIL C,D — FuSa

Phase: Validation

- Series release — QM
- Safety case — FuSa

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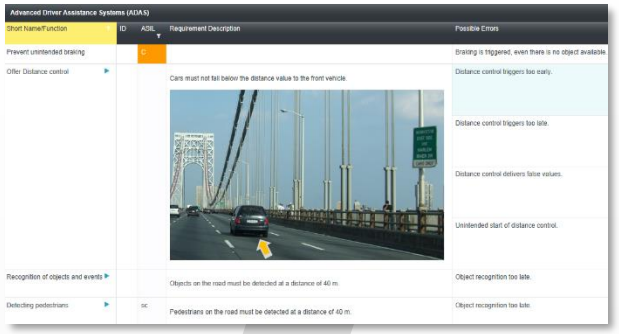
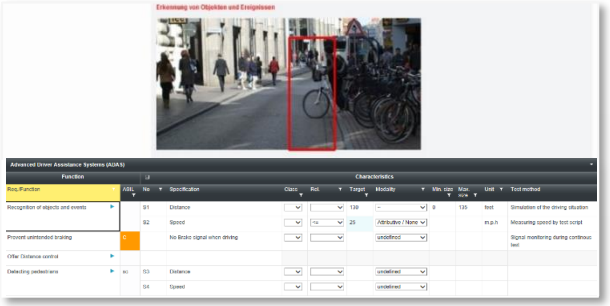
REQUIREMENTS, SPECIFICATIONS, HAZARD

Phase: System definition

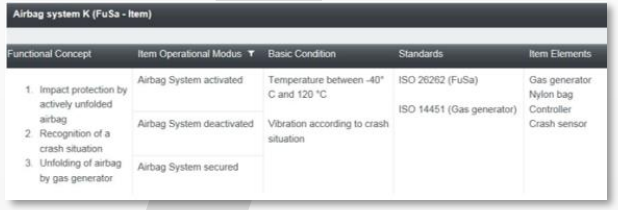
- FuSa — Hazard analysis
- FuSa — Functional safety concept
- QM — System FMEA
- QM — Technical safety concept
- QM — Requirements for HW, SW
- QM — FMEA component
- FuSa — FMEDA



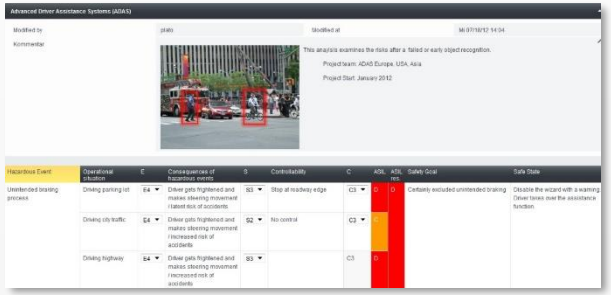
Requirements



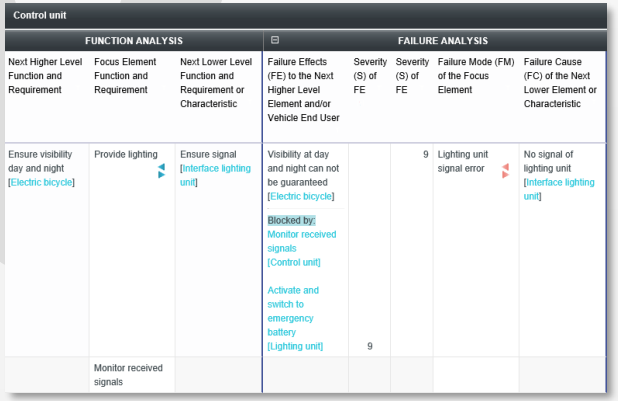
Specifications



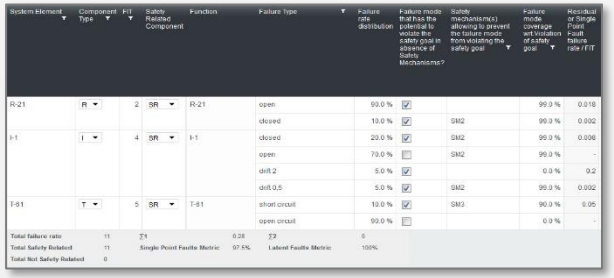
Item definition



Hazard Analysis



FMEA



FMEDA

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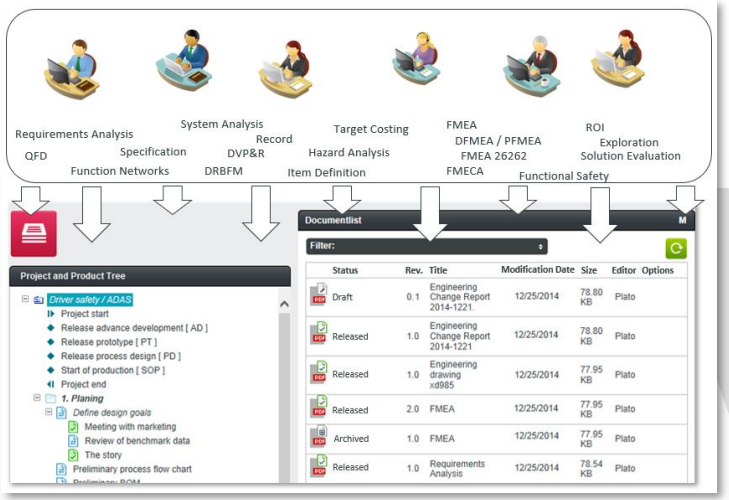
VERIFICATION, RELEASE, DOCUMENTATION

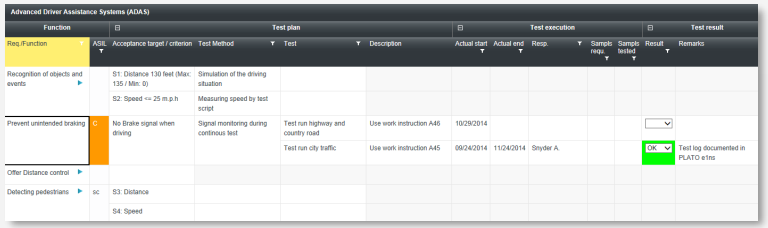


Documentation

ASIL D

ASIL C (D) | ASIL A (D)

Result: ASIL Decomposition



DVP&R

Safety case | FuSa

Series release | QM

Phase: Validation

Quantitative safety verification ASIL C,D | FuSa

Integration and test of module, component, system | QM

Phase: Verification

One model. All methods. Your process.

- A uniform system in your private cloud
- Technology 100% web-based
- Single Point of Truth - Receive information at the touch of a button
- Multiple scalable from SMEs to large corporations
- Easy integration into existing IT infrastructure
- Integrated notification tool - system informs about any activities (e.g. changes)

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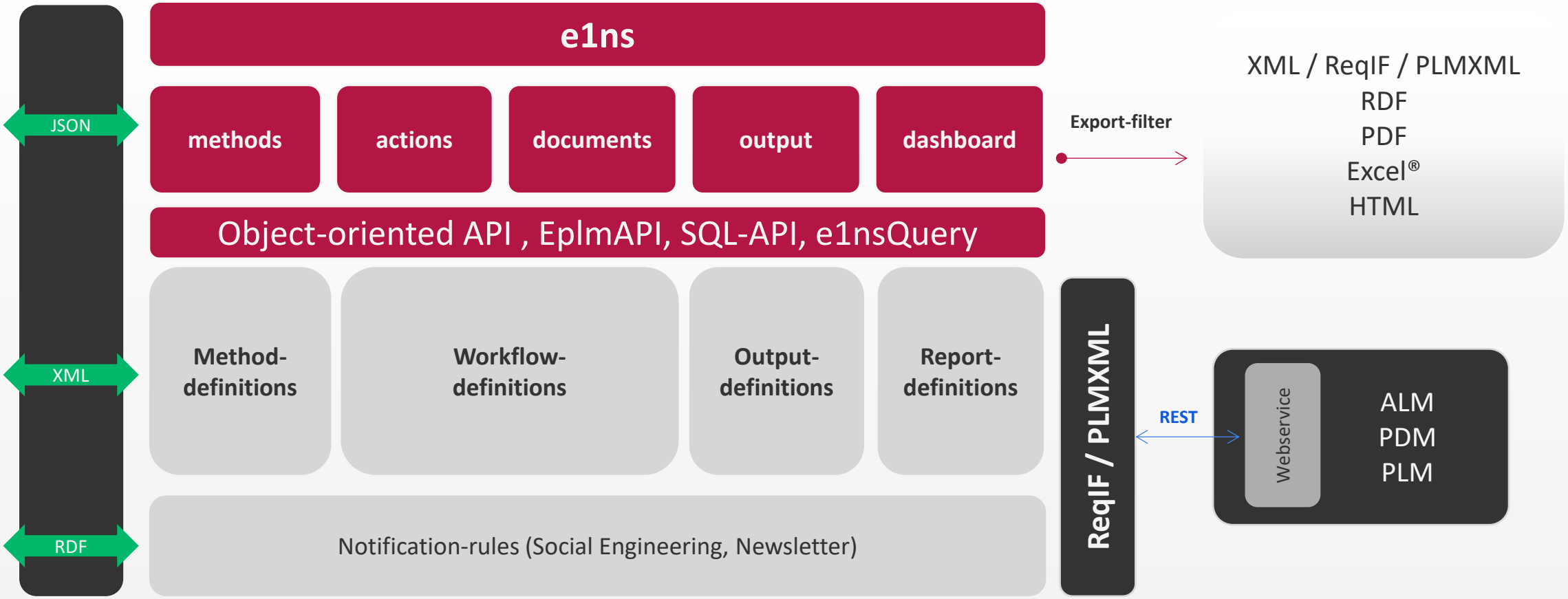
“Enterprise Open Source” and 100% web-based



= Runtime (C++, Python)

= Plugins (Open Source, Python)

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Questions?

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