The new FMEA (Failure Mode Effects Analysis) software benchmark (Excerpt)

The objective of the benchmarking conducted by the FMEAplus Akademie was to provide a comprehensive overview of the currently available FMEA software and to make an allocation based on predefined functionalities and criteria.

Classification criteria

Priority 1: Criteria that must be met

Mandatory criteria are those which, in accordance with the state of the art, are necessary to prepare a methodically correct and complete FMEA, considering several rules.

Priority 2: Criteria that should be met

The criteria that should be met include the criteria that make the creation of an FMEA easier, clearer, supportive for the operator and moderator, or in any other way directly related to the creation of the FMEA and are very useful.

Priority 3: Criteria that are to be met

This category includes all other features and criteria that are not directly required for the creation of the FMEA, but which are used by some customers in the preparation or the follow-up of an FMEA.

Criteria definition

Cat.	Criteria	Specification
Criteria that must be met	7 steps	Preparation, structure, function, actions, error analysis, optimization and presentation can be carried out correctly and completely.
	Requirement, characteristic, function, process characteristic	Distinction between requirements, functions and features. Consistency of characteristics between system, design and process FMEA Correct implementation product/process characteristics.
	Special characteristics handling	Consistency, transparency and handling.
	Baseline assessment	All standard catalogs (VDA, AIAG, etc.) are available. Individually creatable / copyable, sorting/grouping function bonus for separate column for product-specific examples.
	BxA matrix (impact level / eg. medicine)	BxA matrix, on consequences (consequences have meaning and incidence). Representation in tables, lists and matrix.
	Differential analysis (RPZ, RMR, ...)	Clear representation. Optimized and differentiated.
	FMEA XML MSR interface	Easy and correct import and export via XML MSR format.
	VDA/AIAG/individual form	All forms (VDA, AIAG, ...) are included. Additional individually customized (additional field contents can be determined by macros?).
	Graphical error analysis	Representable and processable in a horizontal tree diagram as well as in a horizontal hierarchy tree. Optimal optics and fast editing.
	Graphical analysis of functions	Representable and processable in a horizontal tree diagram as well as in a horizontal hierarchy tree. Optimal optics and fast editing.

	Graphical structure analysis	Representable and processable in a horizontal tree diagram as well as in a horizontal hierarchy tree. Optimal optics and fast editing.
	Hierarchical representation	The structure and other attributes can be represented in a logically structured and clearly illustrated hierarchy.
	Action management	Developed actions regarding implementation, effectiveness and detection capability must be consistently communicated and monitored. Task communication for project management. Actions tracking system and comfortable import of processed actions. Similar actions should be copied with the same status (1-click).
	Pareto analysis	Representation of the highest risks (BxA, BxE, AxE, RPZ, RMR) in accordance with the Pareto principle (80/20). Quick overview and simple creation. Optimized and differentiated.
	Manual recording possibilities	Functionality, clarity. Simple generation of date, tasks and people in the program.
	Risk matrices (root cause level)	Correct, fast graphical implementation. Optimized and differentiated matrices.
	Cross-structural links	Clarity and usability of linking different FMEA structures. (e.g., process and product FMEA).
	General team definition	Fast simple FMEA-team FMEA-related definition, direct copy to the log, cover page and form. Definition of meeting team;
	Variant handling	Possibility to create variants of former FMEA and the correct and a fault-preventing handling of these.
	Versioning	Creation of versions of the FMEA after processing with marking (date, processor and scope of change, blocking the edition)
Criteria that should be met	3D-light coefficient / RMR	Correct determination from BxA, BxE and AxE (also RMR). Clear representation. Individually customized templates
	Operation during moderation	The most important point. Fast and easy to use, clearly structured software.
	Drag and drop modeling	Fast work in both forms of representation by "drag and drop" so complete strings can be repositioned or copied, multiple selections.
	Excel interface	Simple output of various FMEA analysis data in Excel format. (Form, actions, individual, ...). Easy import and export of Excel files. (Forms, actions, ...)
	Focusing and info reduction in graphics	Rapid focus of individual functions to support detailed discussions about a function. Hide and show additional information.
	Global actions	Definition, editing and overview of the global actions at a central or any point.
	GRA (operating conditions)	Different operating conditions of the system under consideration can be displayed. Simple, clear risk analysis at the beginning of the project is possible.
	Groups of actions	Differentiation of actions in e.g. development, service and customer service or various optimization proposals for a decision. It is evaluated whether and how these groups can be created.
	Offline processing	For "Wall moderators" and Home office.
	Automatic log	Creation of an automatic log of all actions made (additions, alterations, contents, etc.)
	Simultaneous processing	Correctness, operability, manageability, clarity in consolidation, behavior in conflicts.
	Language handling	Number of languages, scope and effort, translation options.
	Symbolic persons and dates	Use of symbolic persons (project leader, designer, test engineer, etc.) and symbolic dates (DV, PC, SOP, etc.)

	Merging / Separation	Actions (including errors and functions) with processing option, that is, separation / merging possibility.
	Zooming	Fast zoom in or out of the content as assistance in discussions during moderation and presentation (including video conferencing).
Criteria that are to be met	Requirement management	Handling and communicating with requirements. M to n links are possible?
	Block diagram handling	Block diagram for efficient communication. Minimum requirement: annex to the FMEA or better to directly copy or link elements (e.g., stamping). Visible connections. Representation of signal strings. Classification of modules.
	Block diagram interfaces	Linking to tools for block diagrams / system architectures (e.g., Enterprise Architect).
	CAD interface	Drawing can be imported directly from the CAD system or database, characteristics can be copied to the FMEA by stamping.
	ASIL decomposition	ASIL: Integration of ASIL decompositions, also graphically visible.
	DOORS interface	Are links possible? Operability, import and export possibilities.
	Error autom. linking	Error link based on the (existing) function link is possible including selection options.
	Window technology, several monitors	Clear and individual representation. Hierarchical representation, function tree, etc. Freedom in the arrangement of elements. Support moderation. Second monitor. Fast window arrangement randomly.
	FMEDA	Input and evaluation of quantitative failure rates, types of failures and diagnostic capabilities. Certification of the software in accordance with the required standards (DIN EN 61508, ISO 26262). Linking to FMEA.
	FTA (qualitative/quantitative)	Miscalculations are excluded and methodological correctness is ensured for all complexity levels and safety requirements. Generation with subsequent editing of failure networks.
	html (Batch)	Output of all forms, all evaluations and results of the FMEA in HTML format. Possibility via storable batch job for intranet application.
	Integration into other management software	Integration capability in software (ERP, CAQ, FuSi, databases, document management systems, etc.)
	Ishikawa diagram	clearly understandable graphic. Optimized and differentiated. Hide and show additional information. Synchronized with all other views.
	Cost of the actions	Input of the estimated cost (comment, attribute) and evaluation to support the prioritization of actions and support of decision makers.
	Cost errors, risk costs	Input of the estimated risk costs (comment, attribute) and evaluation to support the prioritization of actions and support of decision makers.
	Mechatronic modelling	Correct and practicable handling of operating situations, error detection, error reactions and error sequences.
	Medical technology ISO 14971	Compliance of all requirements from ISO 14971 to risk analysis
	Batch processing to find pdf files	Possibility to store a freely definable batch job into a PDF file. Outputs of all forms, all evaluations and results of the FMEA in PDF format.
	Process flowchart handling	Process flowchart for efficient communication. Minimum requirement: annex to the FMEA to directly copy or link elements. Visible connections. Representation of workflows. Classification of modules.
	Test and control plan	Creation of test and control plan from FMEA (or vice versa). Common format of the output (e.g., product characteristic, process characteristic).
	Useful shortcuts for processing	Software should be operated quickly by the moderator also via keyboard. Operating aids and short cuts.

Linking possibilities from the outside	Target based injection coordinates (e.g., error, cause, or action from, for example, document or requirement management).
Other interfaces	Are there interfaces with other external or internal programs? For info!
Word interface	Results from the analyzes can be exported in Word format for further processing.

Rating scale

For the purpose of clarity and better differentiability, the rating scale of the new benchmark was slightly combined and graphically visualized. Thus, there are no more points (0-5), but smileys, which have the following meaning:

- 🙂 : Very good
- 😐 : Satisfactory
- ☹️ : Unsatisfactory
- ☒ : Not implemented

Evaluation of the software based on the criteria

Status		June, 2017													
Software designation		IQ-RM PRO V6.5-0140	Babtec.Q	CASQ-it FMEA	FMEA.Net	QS-1-2-3-4	Datalyzer FMEA	SOX2	GRIPS	QMS TC-FMEA	QMS FMEA	iqs FMEA	RQM.FMEA	SCIO + e1ns	SAP ERP FMEA
Manufacturer		APIS	Babtec	B & W	CAQ	CAT	Datalyzer	EnCo	GEWATEC	Siemens	Siemens	iqs	Pickert & P	PLATO AG	SAP
Criteria that must be met	7 steps	🙂	🙂	😐	😐	😐	☹️	🙂	😐	🙂	🙂	🙂	🙂	🙂	😐
	Requirement, characteristic, function, process characteristic	🙂	😐	🙂	🙂	😐	😐	🙂	😐	😐	😐	🙂	🙂	🙂	😐
	Special characteristics handling	🙂	😐	😐	🙂	🙂	🙂	🙂	😐	🙂	🙂	🙂	🙂	🙂	🙂
	Evaluation catalog	🙂	🙂	🙂	🙂	🙂	🙂	🙂	😐	🙂	🙂	🙂	🙂	🙂	😐
	BxA Matrix (impact level / e.g. medicine)	😐	☒	☒	☒	☒	☒	☒	☒	☒	☒	🙂	☒	🙂	☒
	Differential analysis (RPZ, RMR, …)	🙂	🙂	☒	🙂	😐	☒	☒	😐	😐	😐	🙂	☒	🙂	😐
	FMEA XML MSR interface	🙂	☒	☒	🙂	☒	☒	🙂	☒	☒	🙂	🙂	🙂	🙂	🙂
	VDA/AIAG/individual form	🙂	🙂	🙂	🙂	🙂	☹️	🙂	😐	🙂	🙂	🙂	🙂	🙂	🙂
	Graphical error analysis	🙂	🙂	🙂	🙂	🙂	☒	🙂	☒	🙂	🙂	🙂	🙂	🙂	☒
	Graphical function analysis	🙂	🙂	🙂	🙂	🙂	☒	🙂	☒	🙂	🙂	🙂	🙂	🙂	☒
	Graphical structure analysis	🙂	😐	🙂	🙂	😐	☒	🙂	☒	🙂	🙂	🙂	🙂	🙂	☒
	Hierarchical representation	🙂	🙂	🙂	🙂	😐	☒	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂
	Manual protocol option	🙂	🙂	🙂	🙂	😐	☒	🙂	🙂	🙂	😐	🙂	🙂	🙂	🙂
	Action management	🙂	🙂	🙂	🙂	😐	🙂	🙂	🙂	🙂	🙂	🙂	🙂	😐	😐
	Pareto analysis	🙂	🙂	☒	☒	🙂	☒	🙂	🙂	😐	🙂	🙂	🙂	🙂	🙂
	Risk matrices (root cause level)	🙂	🙂	🙂	🙂	😐	☒	😐	☹️	🙂	🙂	🙂	☒	🙂	😐
	Multi-structural cross linking	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂
	General team definition	🙂	🙂	🙂	🙂	😐	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂
	Variants handling	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	😐	🙂	🙂	🙂	🙂	☒
	Versioning	🙂	🙂	😐	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂

	Status						June, 2017								
	Software designation	IQ-RM PRO V6.5-0140	Babtec.Q	CASQ-it FMEA	FMEA.Net	QS-1-2-3-4	DataLyzer FMEA	SOX2	GRIPS	QMS TC-FMEA	QMS FMEA	iqs FMEA	RQM.FMEA	SCIO + e1ns	SAP ERP FMEA
	Manufacturer	APIS	Babtec	B & W	CAQ	CAT	DataLyzer	EnCo	GEWATEC	Siemens	Siemens	iqs	Pickert & P	PLATO AG	SAP
Criteria that should be met	3D- light factor/RMR	🙂	🙂	🙂	🙂	☒	☒	☒	☒	☒	😐	🙂	☒	🙂	😐
	Automatic protocol	🙂	🙂	😐	🙂	😐	☒	🙂	🙂	🙂	🙂	🙂	😐	🙂	🙂
	Operation during moderation	🙂	🙂	🙂	😐	😐	🙁	🙂	🙁	🙂	🙂	🙂	🙂	🙂	😐
	Drag and drop modeling	🙂	😐	🙂	☒	😐	☒	🙂	☒	🙂	🙂	🙂	🙂	🙂	🙂
	Excel interface	🙂	🙂	🙂	🙂	🙂	😐	🙂	☒	😐	🙂	🙂	🙂	😐	😐
	Focusing and info reduction in graphics	🙂	🙂	🙂	🙁	🙂	🙁	🙂	☒	🙂	🙂	😐	🙂	🙂	🙂
	Global actions	🙂	☒	🙂	🙂	🙂	☒	🙂	😐	😐	🙂	🙂	🙂	🙂	☒
	GRA (operating conditions)	🙂	☒	☒	☒	☒	☒	🙂	☒	☒	☒	☒	☒	🙂	☒
	Groups of actions	🙂	☒	😐	🙂	☒	☒	🙂	😐	🙂	🙂	😐	🙂	🙂	😐
	Offline processing	🙂	☒	☒	☒	😐	☒	🙂	☒	☒	😐	☒	☒	🙂	☒
	Simultaneous processing	🙂	🙂	😐	🙂	☒	☒	🙂	😐	🙂	🙂	🙂	☒	🙂	☒
	Language handling	🙂	🙂	🙂	🙂	😐	😐	😐	😐	🙂	🙂	🙂	🙂	🙂	🙂
	Symbolic persons and dates	🙂	🙂	😐	😐	☒	☒	🙂	😐	😐	🙂	🙂	😐	🙂	☒
	Merging/ separation (actions, characteristics)	🙂	☒	😐	🙂	☒	☒	☒	☒	☒	🙂	🙂	😐	🙂	😐
	Zooming	🙂	🙂	☒	☒	🙂	☒	🙂	☒	🙂	🙂	🙂	🙂	🙂	☒
Criteria that are to be met	Requirements management	😐	☒	😐	🙁	☒	🙁	🙂	☒	😐	😐	🙂	☒	🙂	🙁
	Assignment of the actions with cost estimate	🙂	🙂	🙂	🙂	☒	🙂	😐	🙂	😐	😐	🙂	🙂	🙂	😐
	Block diagram handling	😐	😐	☒	🙂	☒	🙁	🙂	☒	☒	☒	😐	🙁	🙂	😐
	CAD interface	😐	🙂	🙂	🙂	😐	😐	☒	😐	☒	🙂	🙂	🙂	🙂	😐
	ASIL decomposition	☒	☒	☒	☒	☒	🙁	🙂	☒	☒	☒	☒	☒	🙂	☒
	DOORS interface	🙂	☒	☒	☒	☒	☒	🙂	☒	🙂	☒	☒	☒	🙂	☒
	Automatic linking of errors (via function network)	🙂	😐	😐	☒	☒	🙁	🙂	☒	😐	🙂	🙂	🙂	🙂	☒
	Error costs in the field	🙂	🙂	🙂	😐	☒	😐	😐	😐	😐	😐	😐	😐	🙂	🙂
	Window technology, several monitors	🙂	🙂	☒	🙁	🙂	🙁	🙂	☒	🙂	😐	🙂	🙂	🙂	😐
	FMEDA	🙂	☒	☒	☒	☒	☒	🙂	☒	☒	☒	☒	☒	🙂	☒
	FTA (qualitative/quantitative)	😐	☒	☒	☒	☒	☒	🙂	☒	☒	☒	☒	☒	🙂	☒
	Html interface	🙂	😐	🙂	☒	☒	☒	☒	☒	😐	☒	😐	🙂	🙂	☒
	Integration into other Management Software	🙂	🙂	😐	🙂	😐	😐	🙂	🙂	🙂	🙂	🙂	😐	🙂	🙂
	Ishikawa diagram	🙂	☒	☒	🙂	🙂	🙁	☒	😐	☒	🙂	😐	☒	🙂	😐
	Mechatronic modeling	🙂	☒	☒	☒	☒	☒	🙂	☒	☒	☒	☒	☒	😐	☒
	Medical technology ISO 14971	🙂	😐	☒	🙂	☒	🙂	☒	😐	☒	😐	😐	🙂	🙂	😐
	pdf (Batch)	🙂	☒	😐	🙂	☒	🙁	😐	☒	😐	😐	🙂	🙂	🙂	☒
	Process flowchart handling	🙂	😐	🙂	🙂	🙂	😐	🙂	☒	😐	😐	😐	😐	🙂	😐
	Test and control plan	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	🙂	😐
	Useful shortcuts for processing	🙂	🙂	🙂	🙂	🙂	😐	🙂	☒	🙂	🙂	🙂	🙂	🙂	☒
	Link possibility from the outside	🙂	😐	😐	😐	😐	🙂	😐	😐	😐	🙂	🙂	🙂	🙂	🙂
	Other interfaces	🙂	😐	🙂	😐	😐	☒	🙂	☒	🙂	😐	😐	😐	🙂	🙂
	Word interface	☒	🙂	🙂	😐	☒	☒	☒	🙁	☒	😐	🙂	🙂	🙂	☒

Excerpt from the FMEA Software Benchmark, published by FMEAplus in FMEA Konkret Issue 09/2017

PLATO (SCIO™ and e1ns jointly)

Manufacturer self-representation

PLATO FMEA connected - Create FMEAs in team work - worldwide and easy.

"Integrated into methods and development processes through web technology

The FMEA software of the PLATO e1ns technology is currently one of the most efficient and effective FMEA software solutions. This is achieved through the systematic and practical implementation of the FMEA methodology with web technology and a high-performance database. The FMEA may be optimally integrated into other methods and development processes. Data from the risk analyzes are used together by Control Plan, DVP & R, SysML Editor and other quality methods. Integration into existing IT landscapes also uses PLM, MES and requirements management data.

As an outstanding innovation, e1ns includes a method building kit which perfectly adapts development methods to customer requirements and processes. Centralized response management and the storage of risk management files in a document management system complete the risk management process.

Connected

- *The notification concept informs the team*
- *Users immediately learn relevant changes to B evaluations*

Easy

- *Intuitive operation - like "in Excel®"*

Available

- *Work via web at any time and from any location*

Affordable

- *No local installation required*
- *Reduced IT and training costs"*

Impression FMEAplus

The combination of the PLATO software, consisting of SCIO™ and e1ns, currently available on the market, is an FMEA-focused software, which has an integrated SysML editor, integration of FuSi aspects and meaningful and impressive processing possibilities of the results and automatic forwarding of all alterations to an FMEA to the affected persons. Working on the web is also a great advantage. Thus, for example, a link can be created at any point in the FMEA through which third parties, to the extent authorized, can jump directly to the FMEA's required position. Installing the software is also unnecessary. The vision that PLATO is pursuing with its new software is moving in the right direction and corresponds to our expectations, taking into account future requirements.

The main advantage of e1ns is the web-based operation and the future freely definable links. However, on closer inspection and use of the still young software "e1ns" still open points are determined. A methodically clean linking between the design and the process and the simultaneous creation of the PLP could not be shown until now, but it may be possible in the new release in August 2017. The fact that actions can only be inserted and edited in the form is, in our opinion, inappropriate, since this entails a considerable increase in the number of tasks and, in the case of large FMEA, it quickly leads to lack of clarity. A VDA form is available in SCIO™ and is also implemented for the web-based version in accordance with the VDA/AIAG alignment. PLATO e1ns will only be initially recommended by us in collaboration with SCIO™. The outlook given to us in the development of the web technology is, however, very promising.

Comment from the manufacturer on the evaluation

e1ns is a web application optimized for business use. Therefore, apart from the moderator, another important target group is the engineer. It is ensured an easy access to the system for it. In addition to the moderation, e1ns also provides for the distribution of knowledge via special communication

mechanisms such as a rule-based notification concept (notification / "bell"). As a result, the development community receives all relevant information (e.g., valuation changes) and can thus monitor the progress of the FMEA and its changes. Through the modular concept for forms, analyses, notifications, etc., PLATO provides almost all the special requirements of the users. PLATO believes it is well represented by the benchmark and its special orientation. For future studies, we would like a stronger consideration of the benefit of a software that integrates company-wide processes.