# APiS North America, LLC

Chad M. Johnson, Vice President
Royal Oak, MI
USA

Ph: 248.227.7735
Chad.Johnson@apis-iq.com
www.apis-iq.com

APIS

# APiS Informationstechnologien GmbH

- IQ-Software market entry, 1992
- Leading vendor FMEA & Risk Analysis software
- >> 1000 customers
- Servicing **Europe**

# APiS North America, LLC

- Sales / support / moderation & training for IQ-software user levels
- Servicing **North & South America** as sole authorized distributor of IQ Products, training, consulting, and support

# IQ Design & Process FMEA

# +

# Risk Management Tools

# IQ-Software Risk Analysis

- FMEA
  - Design, Process, System, Machine, Logistics
- Functional Safety
  - ISO26262 (ASIL)
  - IEC61508 (SIL)
- P-Diagram (V7.0)
- Boundary Diagram (V7.0)
- Control Plan (IATF-16949)
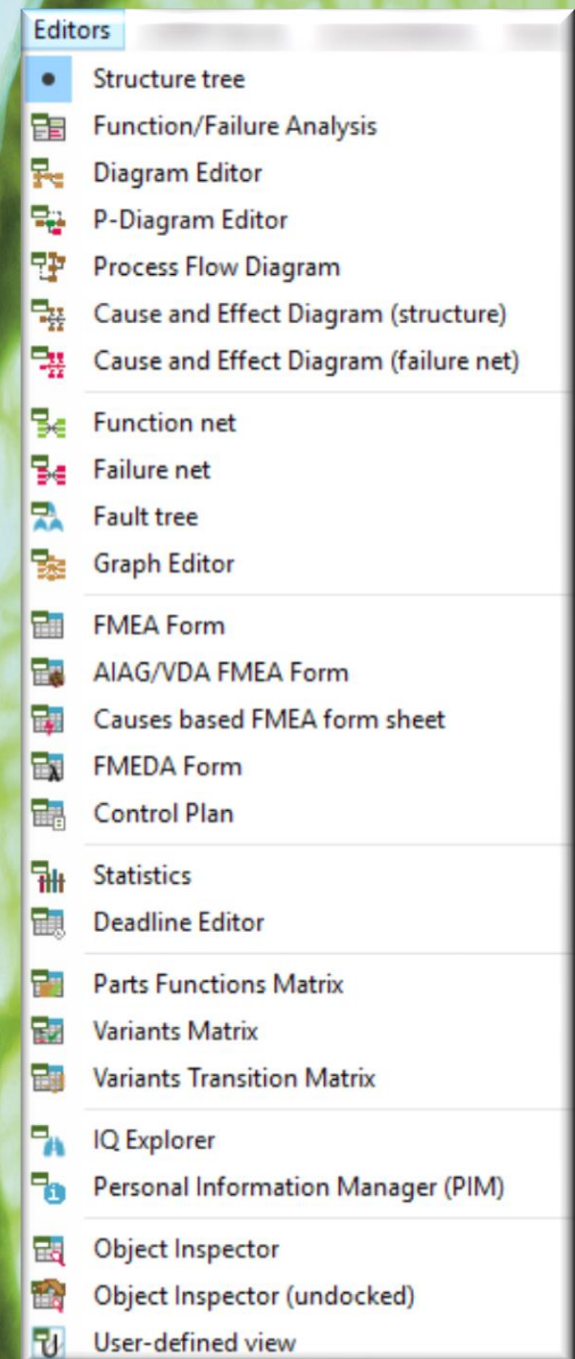- Process Flow Diagram
- DRBFM

# User Interface

- Versatile GUI (**Graphical** User Interface)
- "**Assistant**" available for unfamiliar users
- Guides "how we think…" w/functional model

- Identify & Prioritize risk
- Prioritize risk reduction activity
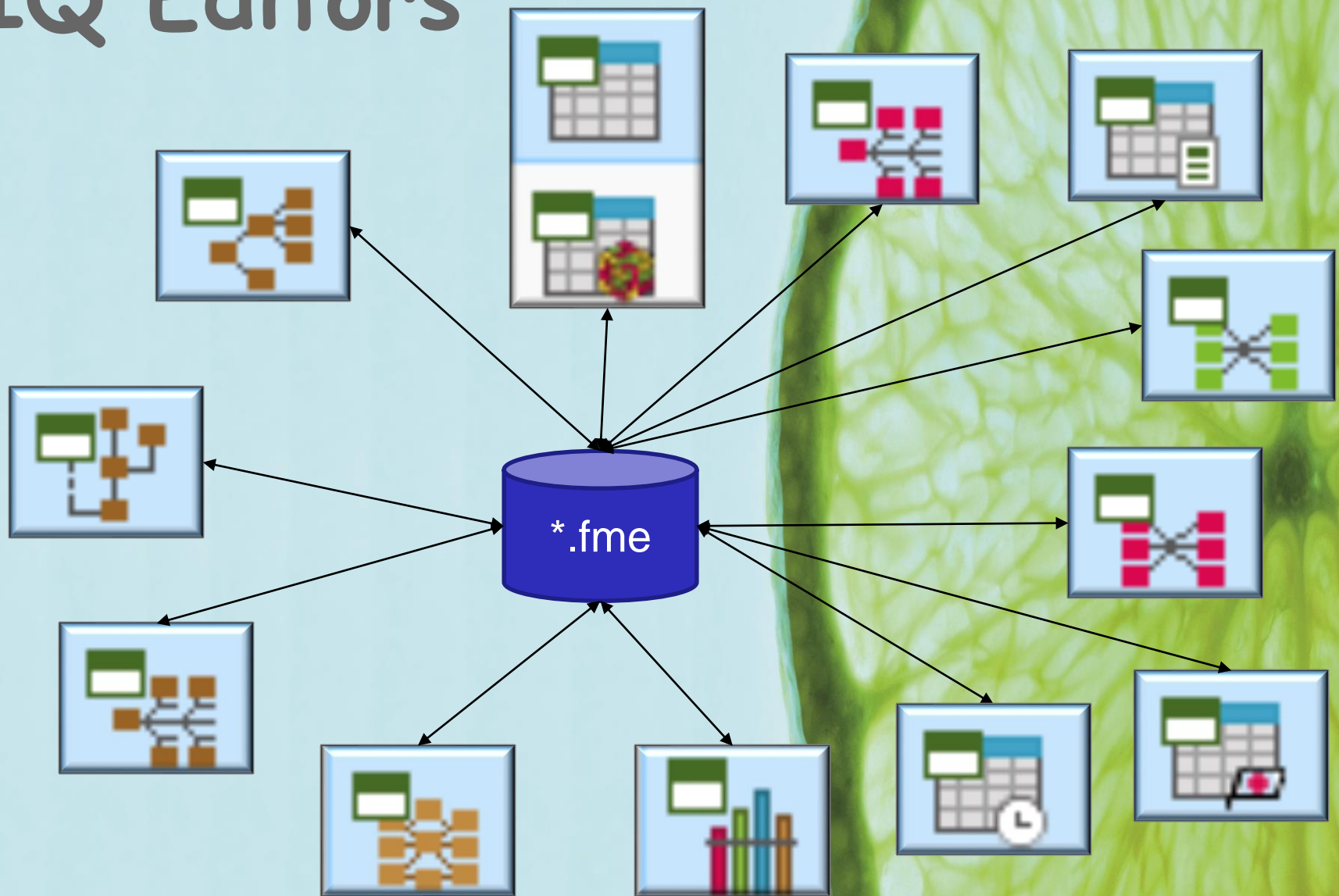- Communicate priorities
- Deliver value to organization!



© APIS North America, LLC 2019
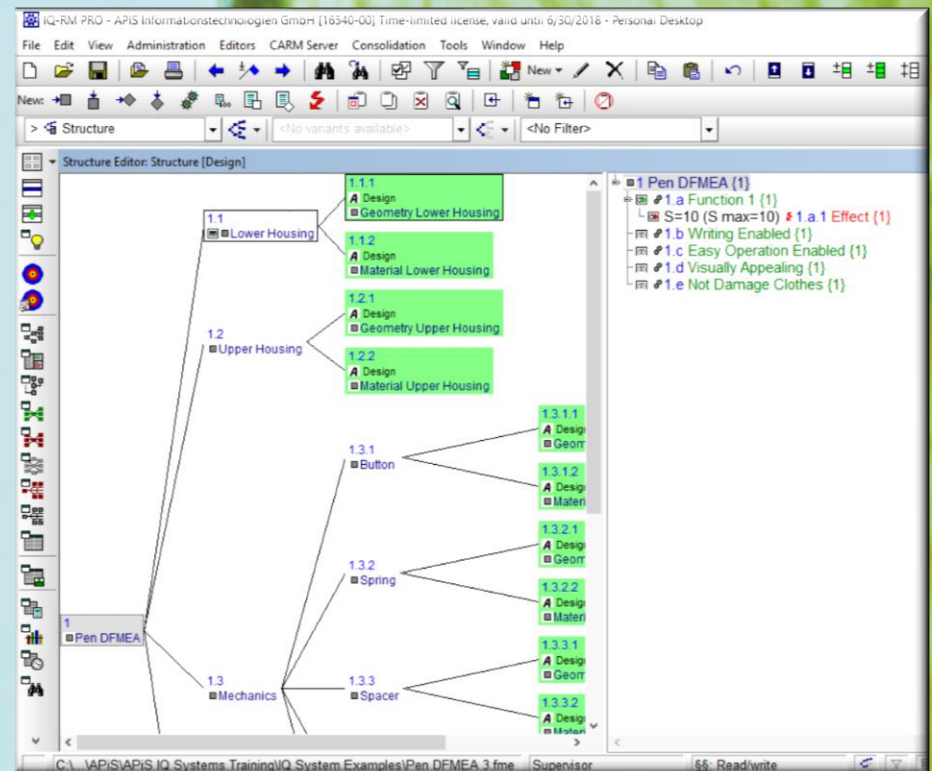
# IQ Editors

- Data is **strongly** interrelated

- All editors/viewers are **fully integrated**... Up-dates and changes are simultaneous

- **No re-entry of data**

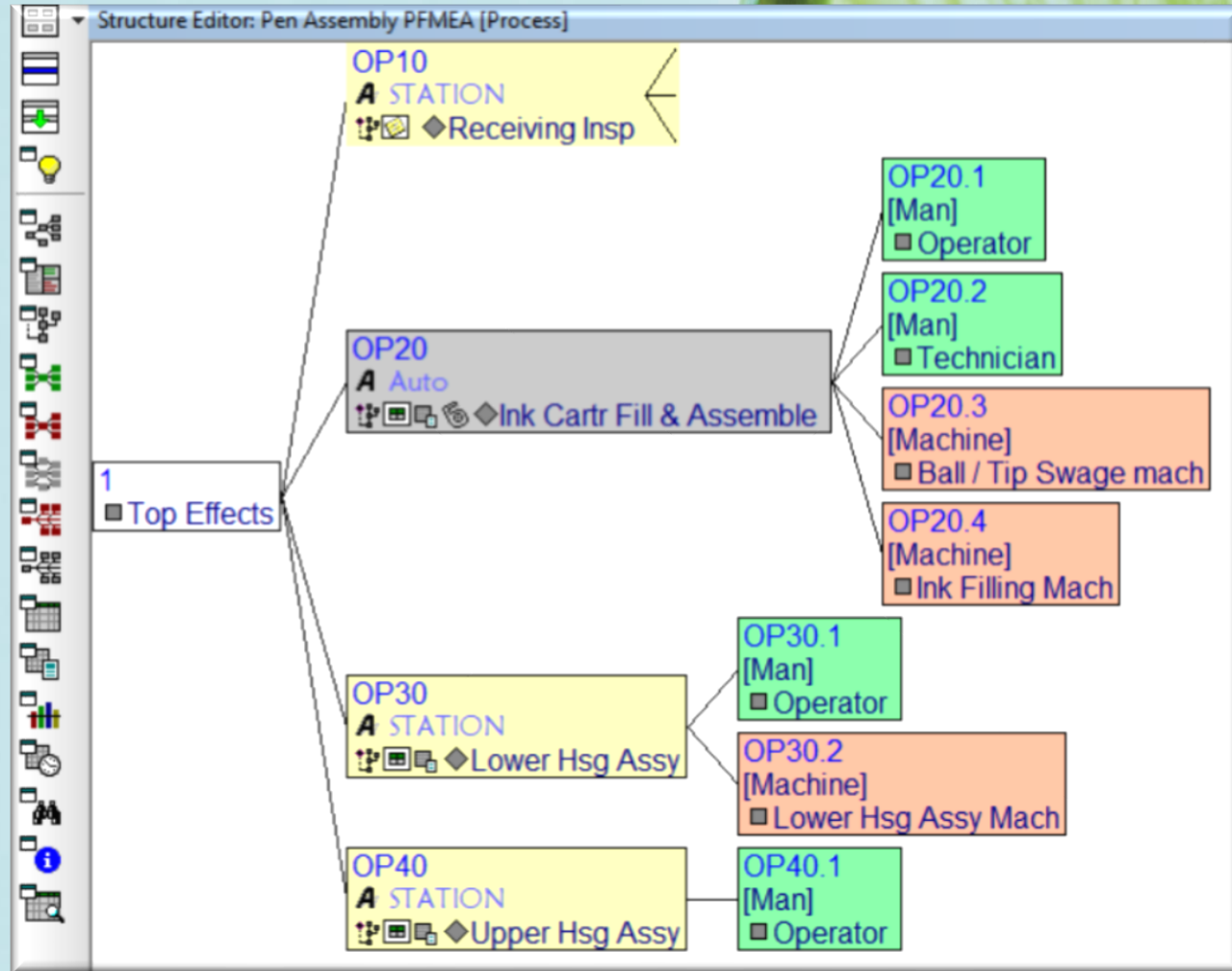- All editors/viewers allow the user to input data directly
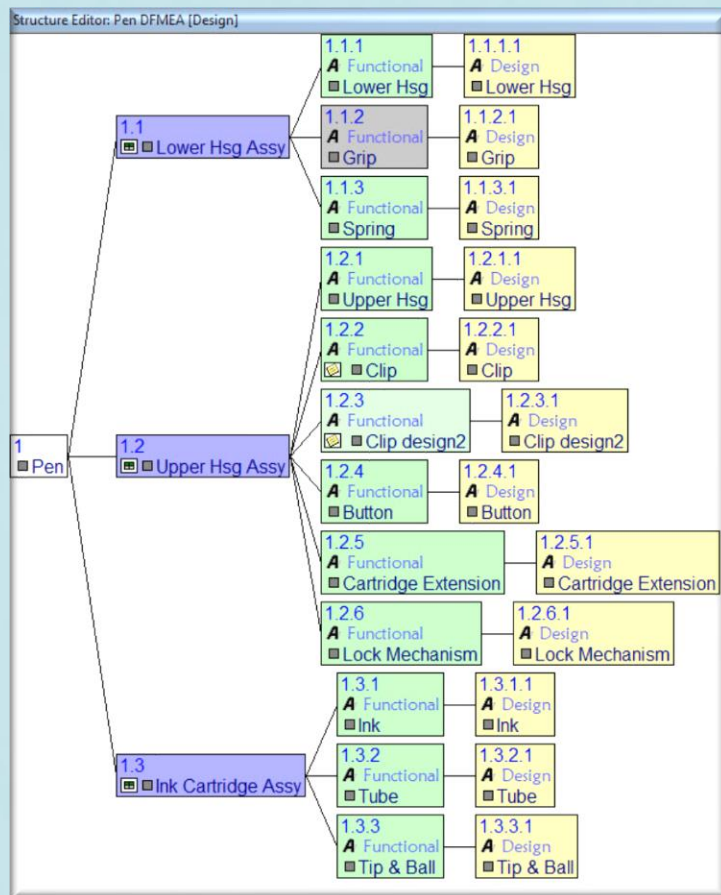
Editors

- Structure tree
- Function/Failure Analysis
- Diagram Editor
- P-Diagram Editor
- Process Flow Diagram
- Cause and Effect Diagram (structure)
- Cause and Effect Diagram (failure net)
- Function net
- Failure net
- Fault tree
- Graph Editor
- FMEA Form
- AIAG/VDA FMEA Form
- Causes based FMEA form sheet
- FMEDA Form
- Control Plan
- Statistics
- Deadline Editor
- Parts Functions Matrix
- Variants Matrix
- Variants Transition Matrix
- IQ Explorer
- Personal Information Manager (PIM)
- Object Inspector
- Object Inspector (undocked)
- User-defined view

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# IQ Editors

# Structure Editor PFMEA

# Structure Editor PFMEA

Structure List contains information about objects in the Structure

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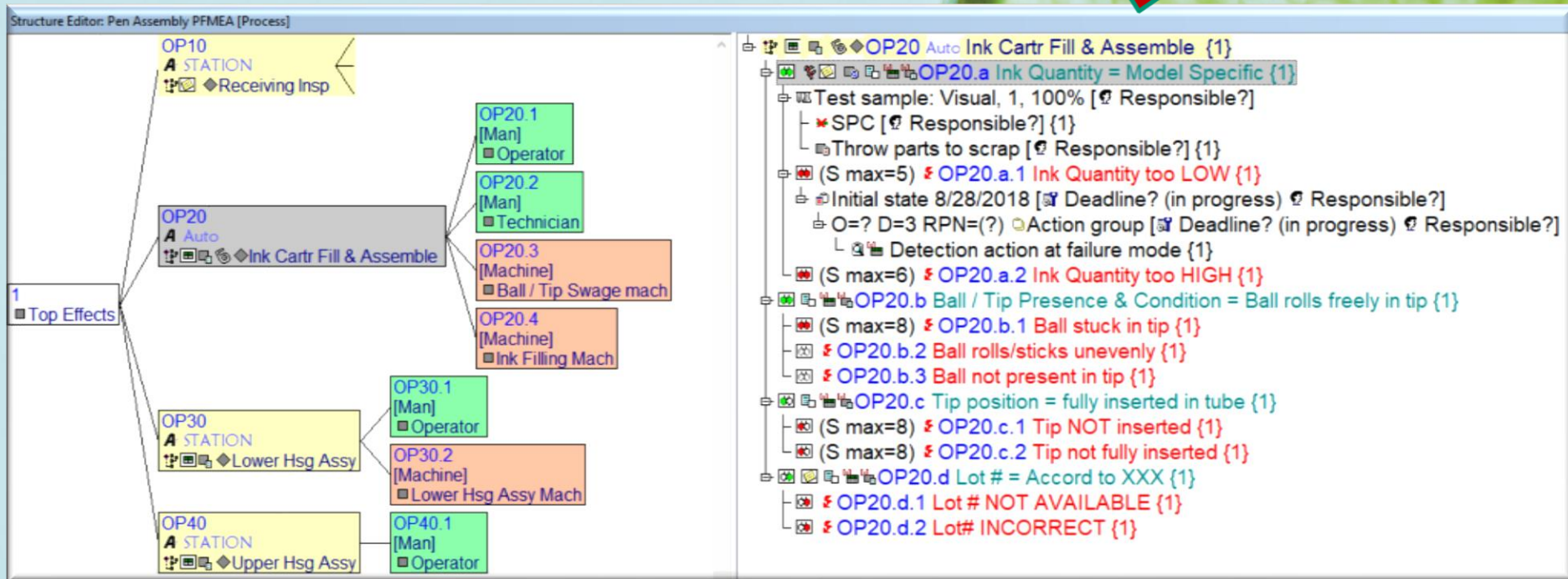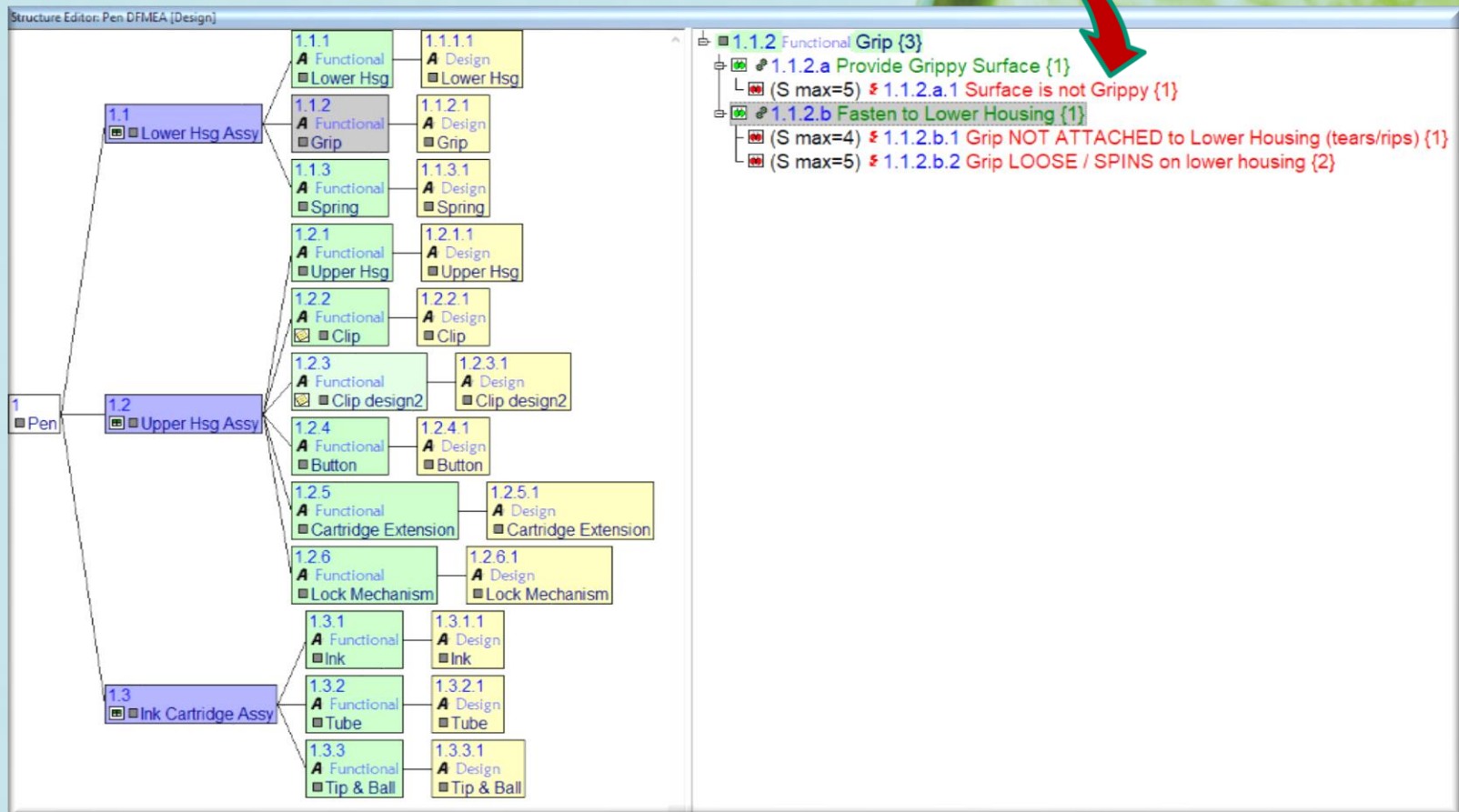
# Structure Editor DFMEA

Structure Tree provides organization of Structure elements

# Structure Editor DFMEA

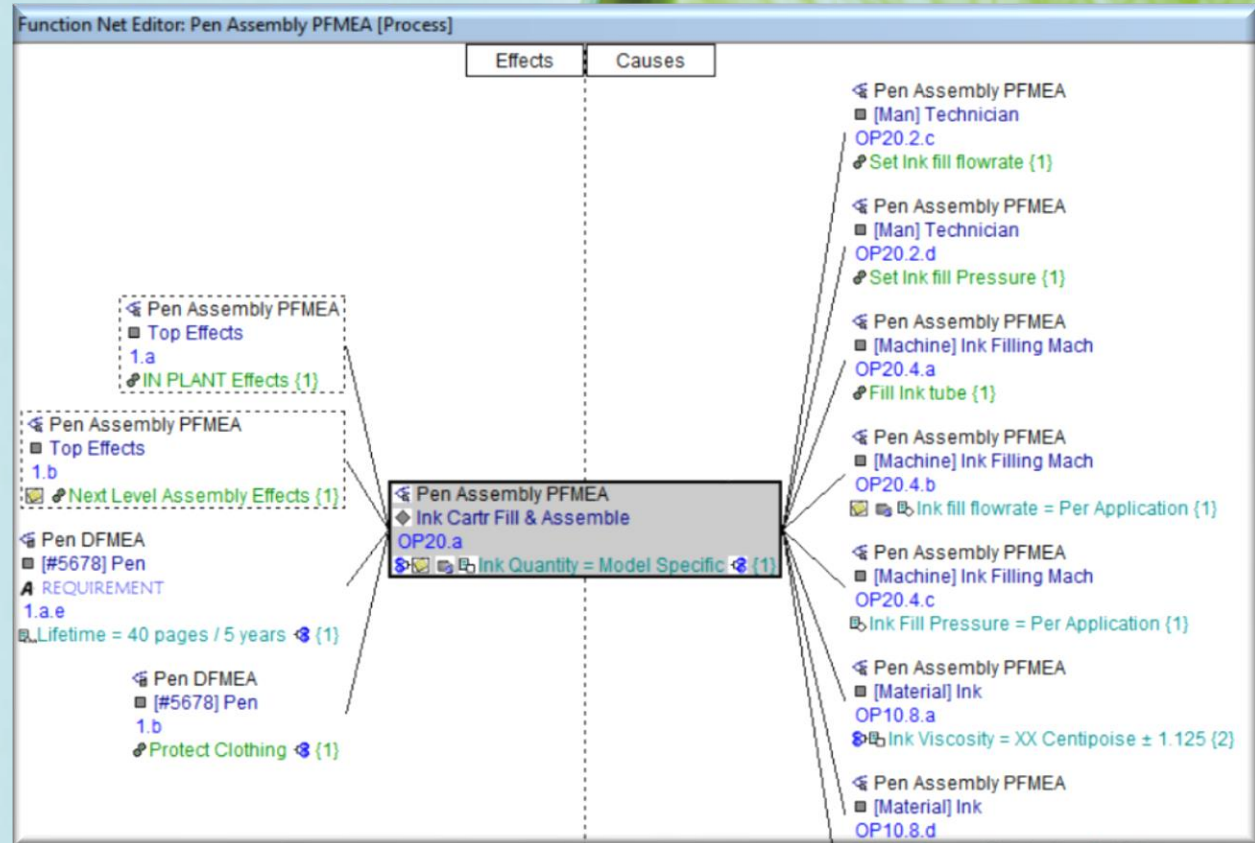Structure List contains information about objects in the Structure
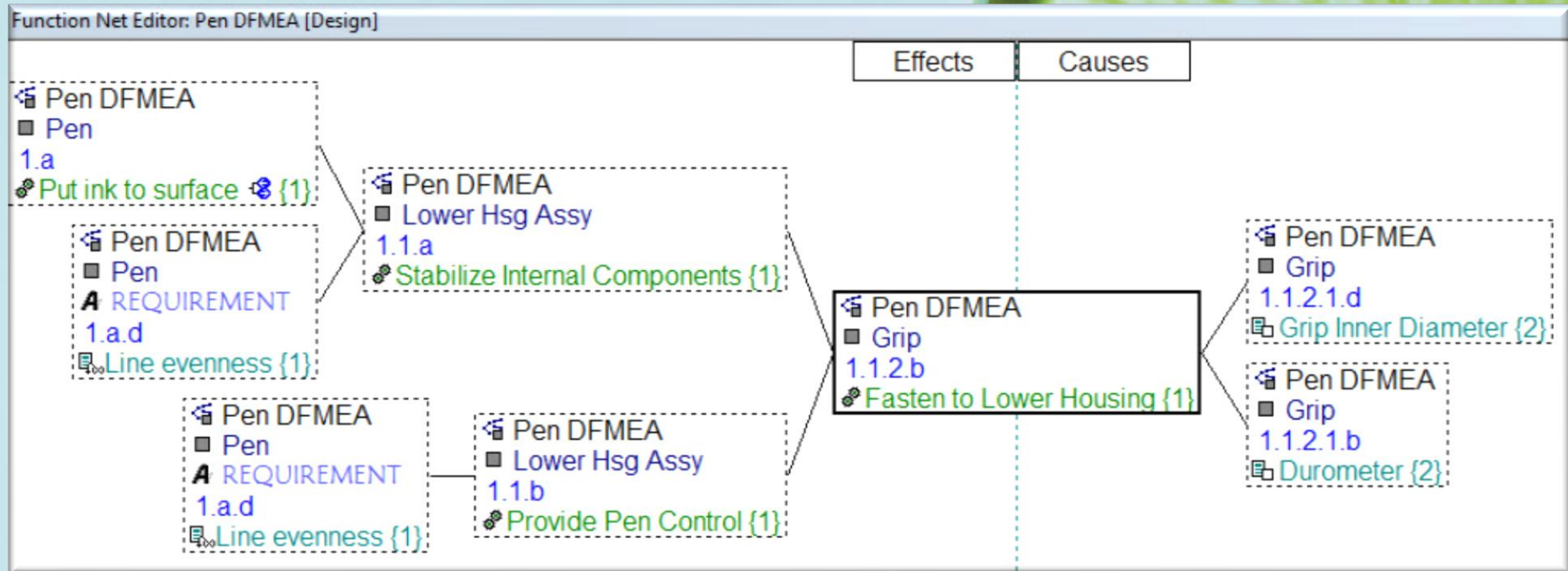
# Function Net Editor

Creation via Drag & Drop

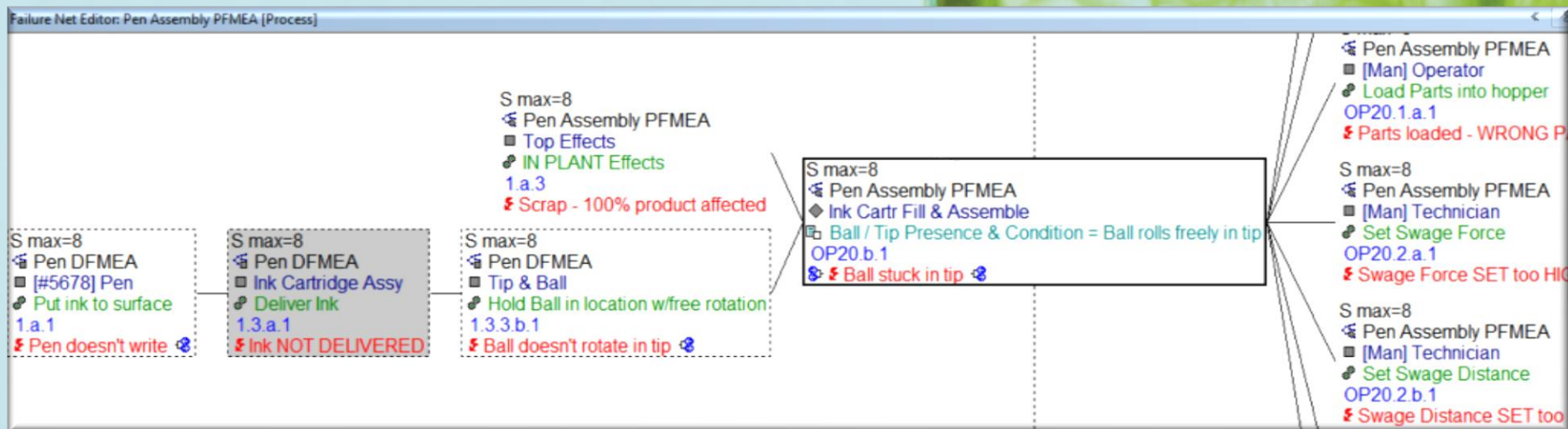Butterfly shaped icons indicate **functional** relationships



Function Net Editor: Pen Assembly PFMEA [Process]

# Function Net Editor

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# Failure Net Editor

Butterfly-shaped icons indicate failure cause/effect relationships

Function Net connections leveraged for Failure Net creation

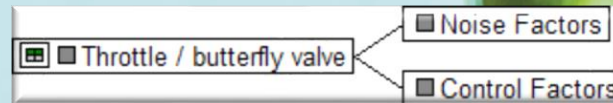# Failure Net Editor
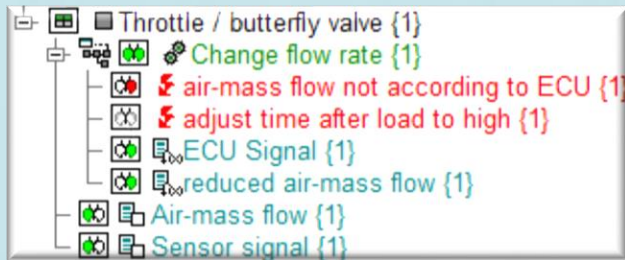
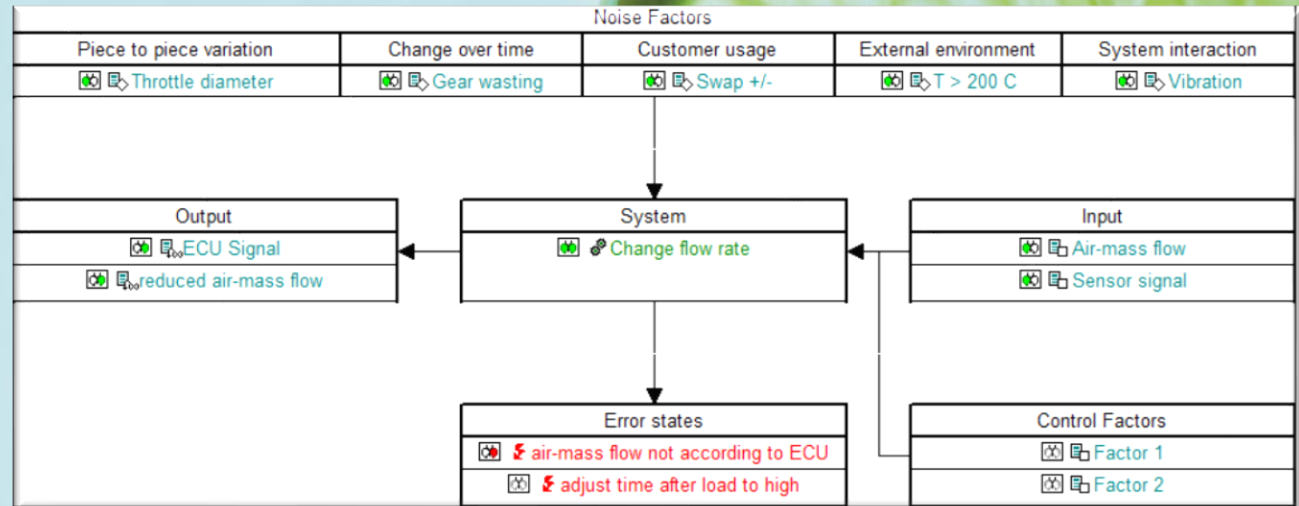Graphical display of failure relationships

Relationships translate to completion of cells in the **FMEA Form sheet**
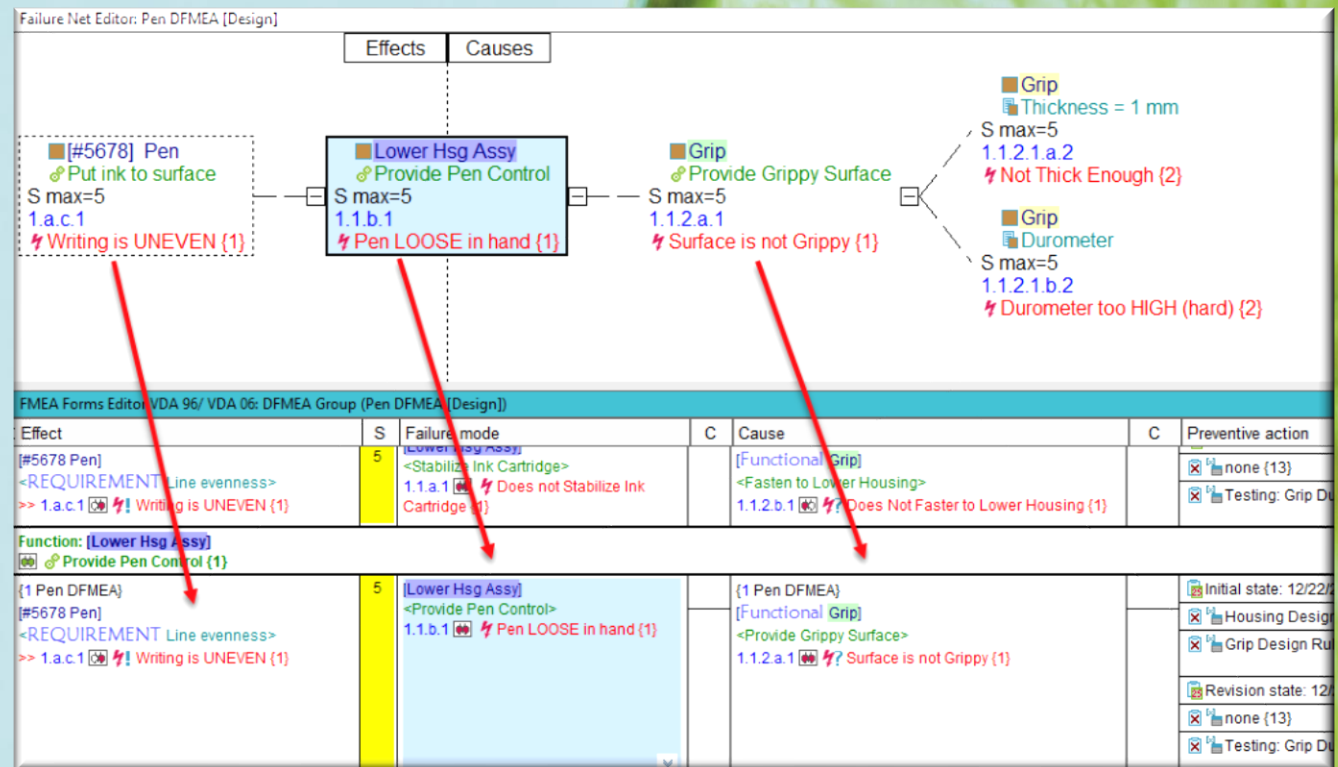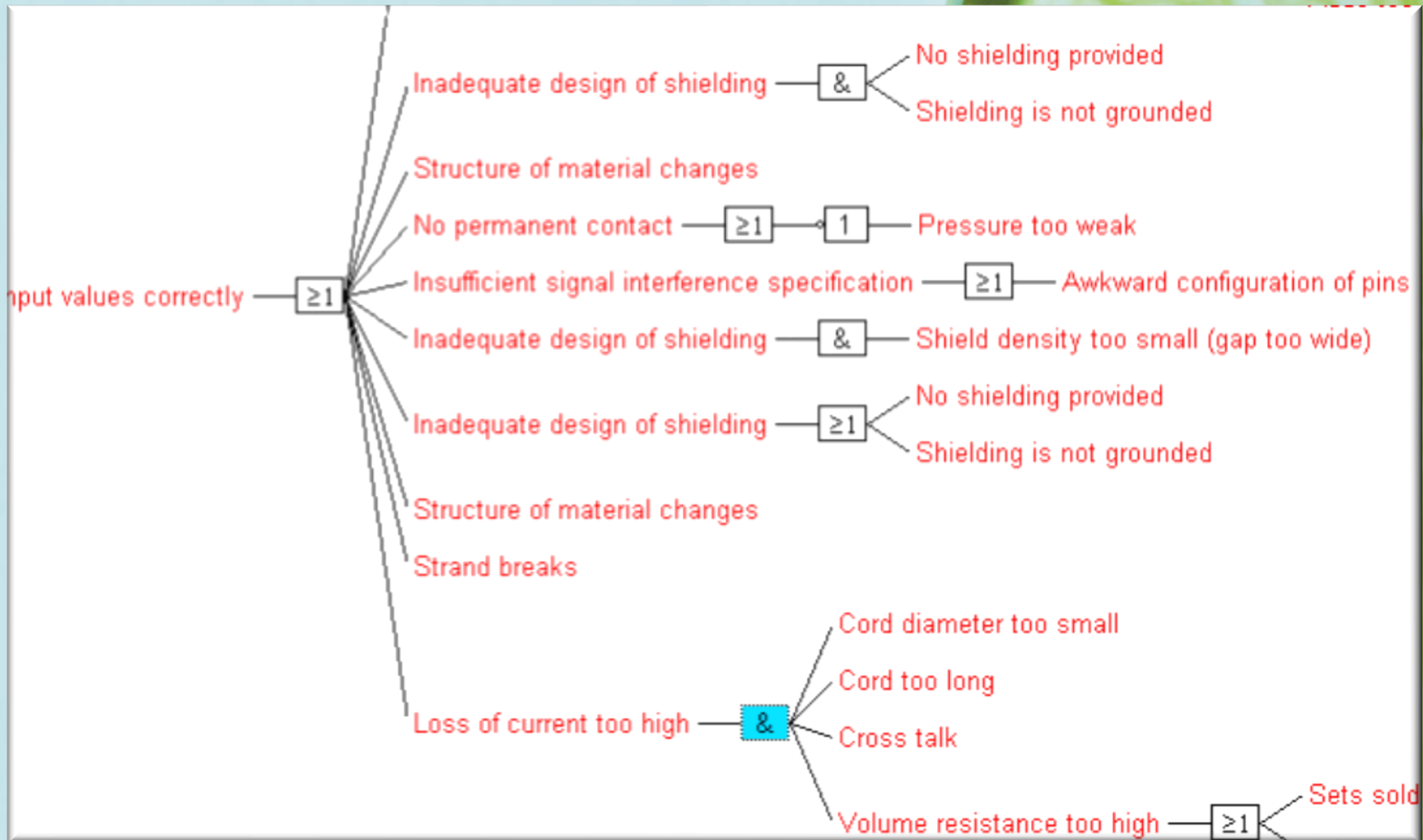
# P-Diagram Editor (v7.0)

Applied to function

Ensures complete coverage of factors affecting function robustness
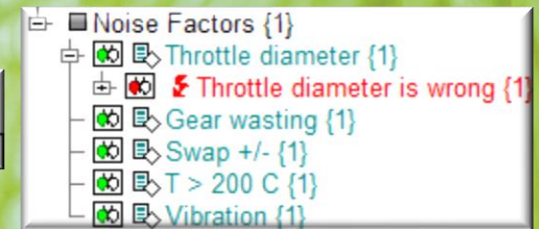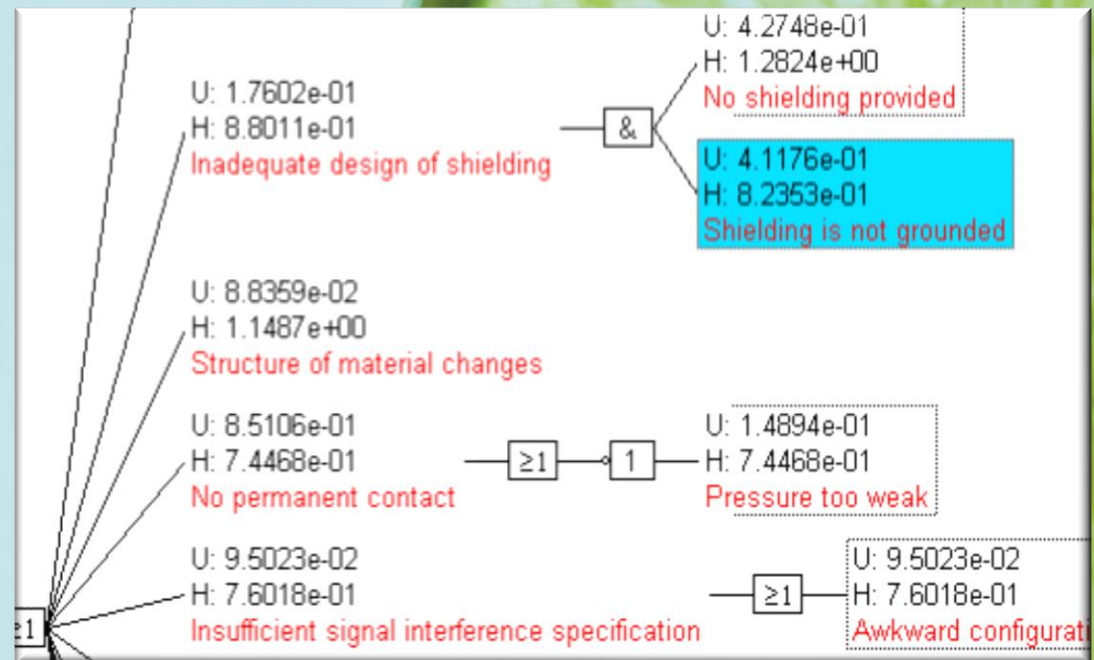
# Fault Tree Analysis

Fault Trees augmented from initial "OR-Gating" of FMEA
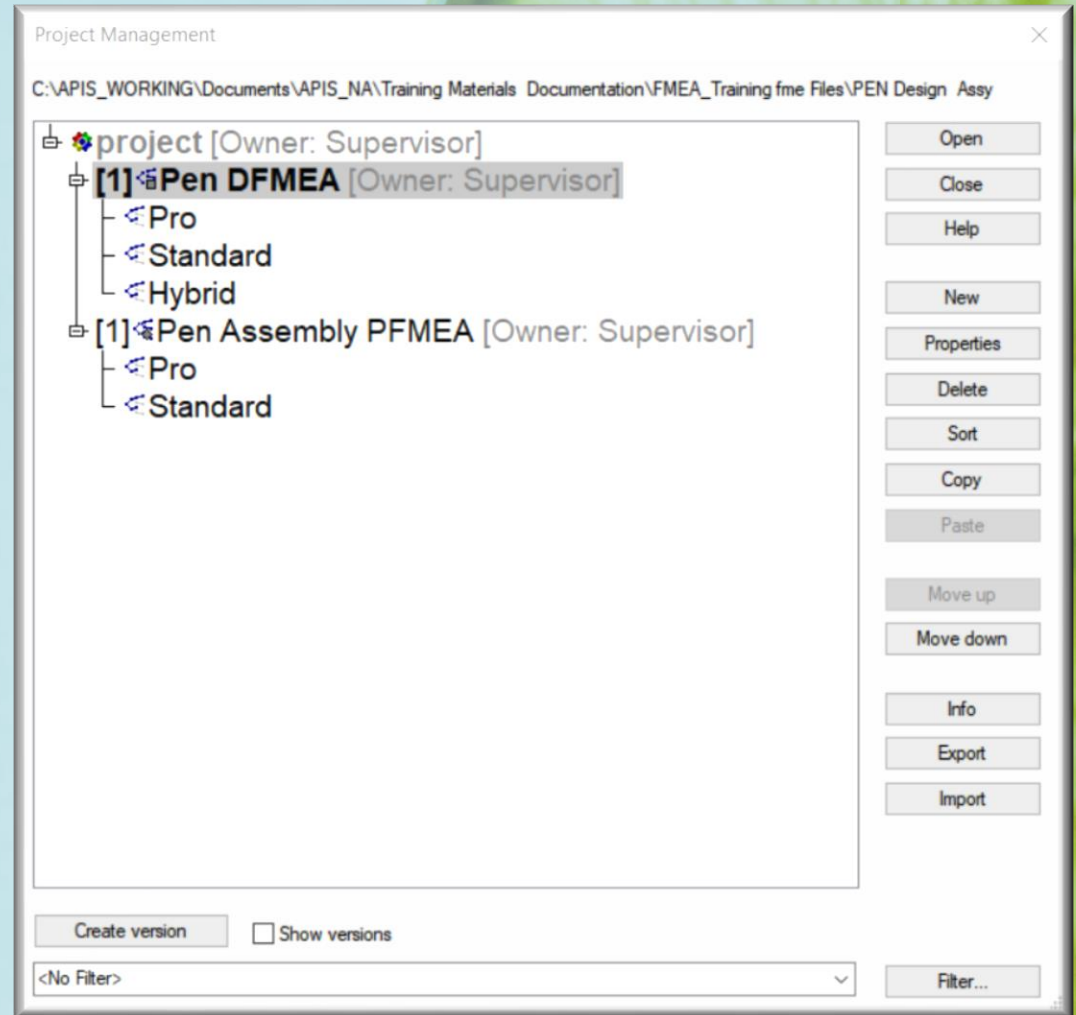
# Fault Tree Analysis

- Ability to modify / add operators

- Augment Failure Nets

- Auto-calculation of Unavailability and Frequency of Failure
  - algorithm based on Fault Tree Values assigned to failures (Alpha, Beta, Lambda, Mu)

# Structure Variants

- Design / Process variants maintained in **same file**

- Common objects reside in one/more variants so changes can read-across one/more variants

- Variants can be linked / synchronized

- Variants able to maintain different attribute data

Project Management

C:\APIS_WORKING\Documents\APIS_NA\Training Materials  Documentation\FMEA_Training.fme Files\PEN Design  Assy

- project [Owner: Supervisor]
  - **[1] Pen DFMEA** [Owner: Supervisor]
    - Pro
    - Standard
    - Hybrid
  - [1] Pen Assembly PFMEA [Owner: Supervisor]
    - Pro
    - Standard

Open
Close
Help
New
Properties
Delete
Sort
Copy
Paste
Move up
Move down
Info
Export
Import

Create version    ☐ Show versions

<No Filter>    Filter...

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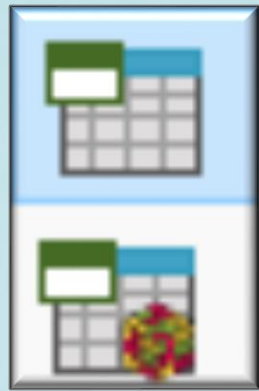# Forms Editor

**Supports multiple layouts**

Direct import / export available from / to other FMEA file formats

**Direct updates** between DFMEA, PFMEA, Control Plans + ensuring direct read-across of changes

| | |
|---|---|
| VDA 96 / VDA 06 | Ctrl+1 |
| VDA 86 | Ctrl+2 |
| PSC | Shift+Ctrl+2 |
| QS-9000 (2nd edition) | Ctrl+3 |
| QS-9000 (3rd edition) | Ctrl+4 |
| AIAG (4th edition, D - Design) | Ctrl+5 |
| AIAG (4th edition, E - Process) | Shift+Ctrl+5 |
| TI (with root causes) | Ctrl+6 |
| Bosch | Ctrl+7 |
| GKN | Ctrl+8 |
| M2010 | Shift+Ctrl+9 |
| Renault 01-33-200 | Shift+Ctrl+0 |
| Ondal | Shift+Ctrl+6 |
| MIL Task 101 | Ctrl+9 |
| MIL Task 102 | Ctrl+0 |
| MIL Task 102 (Causes) | Shift+Ctrl+1 |

Forms Editor QS-9000 (3rd edition): Electrical con...

| Function | Failure Modes | Effects |
|---|---|---|

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Type/Model/Fabrication/Load:
CC 2042 - Construct Electric Connections

FMEA/System Element:
Electrical connections

| Function | Failure Modes | Effects | S | C | Causes | |
|---|---|---|---|---|---|---|

**Process Element: Electrical connections**

| Transport signals from receiver to control unit | Signal does not represent the input values correctly | Drive control is out of spec | 9 | | Loss of current too high | 4 |

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# Forms Editor – AIAG/VDA (V7.0)

# Forms Editor

Simultaneous **Translations** in FMEA

*Translations performed manually (catalogued data)

Data: 29 languages!

GUI: 11 languages



**APIS**

# Valuation Catalogs

Provides (13) Catalogs… VDA, QS-9000, AIAG
all catalogs **customizable!**



Valuation catalogs:

Catalog

| Catalog | ! | # | Name | Description |
|---------|---|---|------|-------------|
| Catalog: AIAG 4th Edition (June 2008) - Design FMEA (34 items) | | | | |
| Catalog: AIAG 4th Edition (June 2008) - Process FMEA (34 items) | | | | |
| Catalog: AIAG 4th Edition (June 2008) - Product FMEA (34 items) | | | | |
| Catalog: Design (34 items) | | | | |
| Catalog: Process (34 items) | | | | |
| Catalog: QS-9000 3rd edition (April 2001) - Design-FMEA (34 items) | | | | |
| Catalog: QS-9000 3rd edition (April 2001) - Process-FMEA (34 items) | | | | |
| Catalog: Standard (34 items) | | | | |
| Catalog: VDA (34 items) | | | | |
| Catalog: VDA 2. Ausgabe (März 2007) - Produkt-FMEA mit Fehlerraten (34 items) | | | | |
| Catalog: VDA 2. Ausgabe (März 2007) - Prozess-FMEA mit Fehlerraten (34 items) | | | | |
| Catalog: VDA 2nd revised edition (updated reprint 2009) - Process FMEA with failure rates (34 items) | | | | |
| Catalog: VDA 2nd revised edition (updated reprint 2009) - Product FMEA with failure rates (34 items) | | | | |

Valuation catalogs:

Catalog

| Catalog | ! | # | Name |
|---------|---|---|------|
| AIAG 4th Edition (June 2008) - Design FMEA | D | 1 | Almost C... |
| AIAG 4th Edition (June 2008) - Design FMEA | D | 2 | Very high |
| AIAG 4th Edition (June 2008) - Design FMEA | D | 3 | High |
| AIAG 4th Edition (June 2008) - Design FMEA | D | 4 | Moderate |
| AIAG 4th Edition (June 2008) - Design FMEA | D | 5 | Moderate |
| AIAG 4th Edition (June 2008) - Design FMEA | D | 6 | Low |
| AIAG 4th Edition (June 2008) - Design FMEA | D | 7 | Very Low |

prior to design freeze using **pass/fail** testing (e.g. acceptance criteria for performance, function checks, etc.).

**Post Design Freeze and prior to launch**
Product verification/validation after design freeze and prior to launch with **degradation** testing (Subsystem or system testing after durability test, e.g., function check)

Post Design Freeze and prior to launch
Product verification/validation after design freeze and prior to launch with **test to failure** testing (Subsystem or system testing until failure

# Filters

**Auto-Filters**
Created to show or highlight the chosen criteria based on causal information

**Default filters** are available in the filter dialog

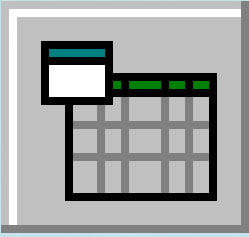**Customized** extensive filters may be created manually



**\* Filtering / highlighting available in ALL editor contexts**
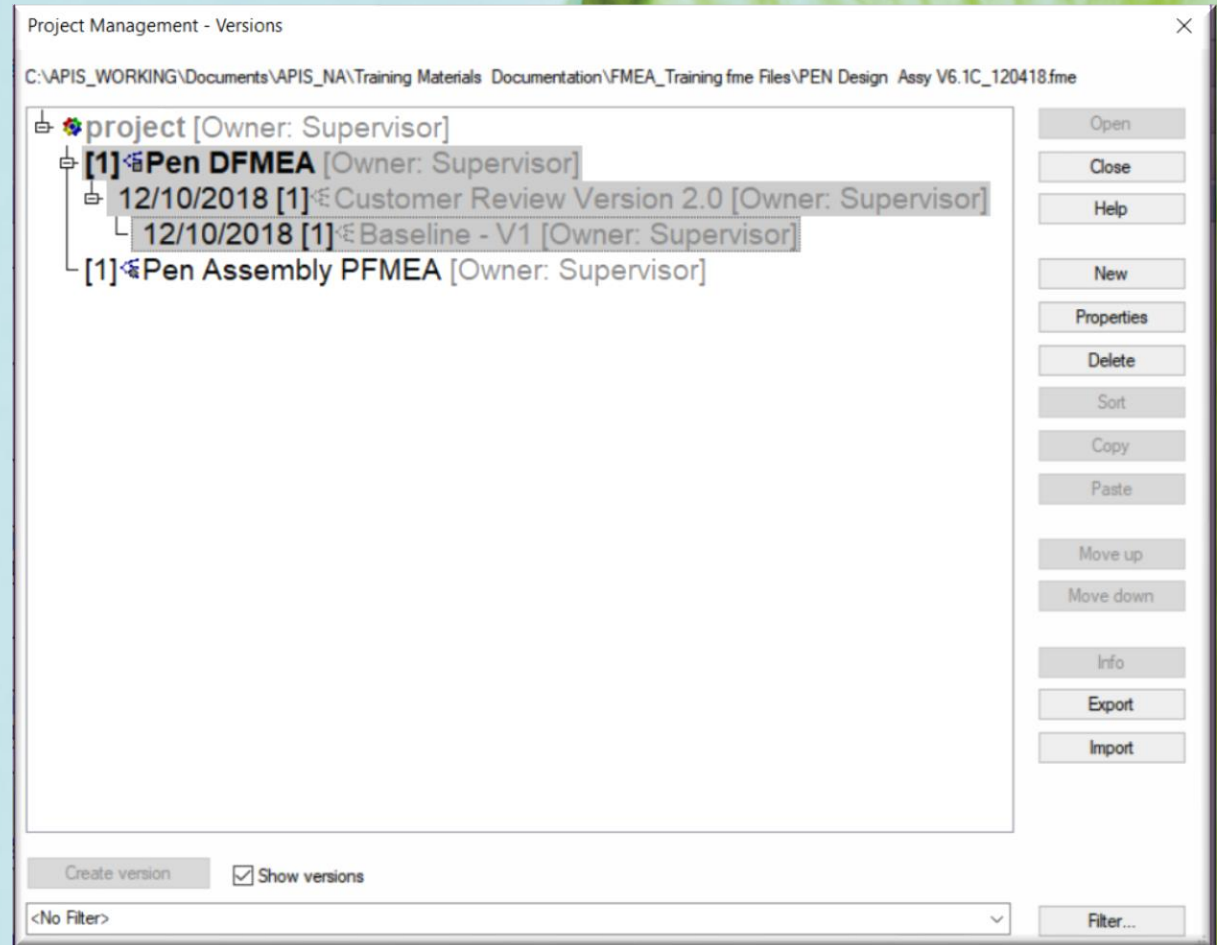
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# Versioning

Data can be "Versioned"

- Whole Structure
- FMEA Formsheets
- Control Plans
- Process Flows

Historical record of actions taken in previous versions

Offers comparisons of current version to earlier revisions



Project Management - Versions

C:\APIS_WORKING\Documents\APIS_NA\Training Materials  Documentation\FMEA_Training fme Files\PEN Design  Assy V6.1C_120418.fme

- project [Owner: Supervisor]
  - [1] Pen DFMEA [Owner: Supervisor]
    - 12/10/2018 [1] Customer Review Version 2.0 [Owner: Supervisor]
      - 12/10/2018 [1] Baseline - V1 [Owner: Supervisor]
  - [1] Pen Assembly PFMEA [Owner: Supervisor]

Open | Close | Help | New | Properties | Delete | Sort | Copy | Paste | Move up | Move down | Info | Export | Import

Create version | ☑ Show versions

<No Filter> | Filter...

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# Meeting Log

Tracks data changes made during session

Contents "searchable" w/ IQ-Explorer

Printable as report to package with FMEA after session / meeting (similar to cover sheet)



| Object type | Object | Action | Notes |
|---|---|---|---|
| APiS Informationstechnologien GmbH QUALITY ASSURANCE | Meeting Log C:\Program Files\Apis\training\Data\EXAMPLE.FME | | |
| Location: | | 8/1/2005 | Begin: | End: |
| Team: Supervisor | | | |
| Notes: | | | |
| Object type | Object | Action | Notes |
| Control Plan | Control-Plan | Add | New CP created for Sept. 05 Audit |
| FMEA Form | Connector Cable | Add | New form created as per customer request |
| Inspection | Inspection | Add | |
| System Element | Setter | Add | |
| User Defined Attribute | End User affected | Add | |
| User Defined Attribute | Process related | Add | |
| System Element | Jack | Delete | this component was eliminated from the design.  Rev - 234-8976B |
| Characteristic | Assignment of pins to cable strands | Modify | |
| Characteristic | Color coding in soldering appliance | Modify | |

# Deadline Editor

Summary of all Deadlines & Responsible Persons
Sort & filter "action" information from FMEA form sheet



Team members can be notified via email for required updates

Fully configurable data table to allow for user needs
Email notification to responsible person to notify of upcoming actions

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2/12/2019

# Control Plan

Core elements created Automatically
Machine & Inspection Equipment catalogues
Ties directly into the PFD and PFMEA
**Conforms to IATF-16949, VDA, AIAG**

# Process Flow Diagram

Classification of Process Steps/Elements

Auto-populated & synchronized with PFMEA & CP

# Process Flow Diagram

Illustrate Process Steps

Insert rework/inspection loops

Extensive (customizable) Symbols Palette
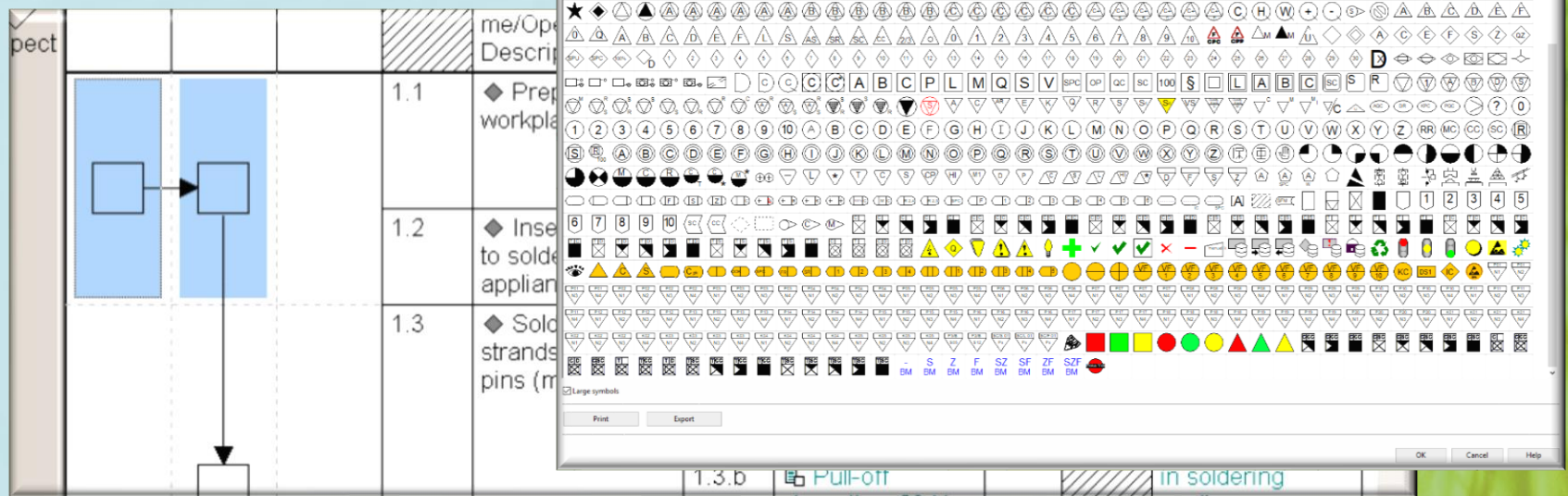
# DRBFM Editor

## Design Review Based on Failure Mode

- Fully comprehensive **DRBFM** & **Impact Analysis** worksheets

- DRBFM built manually or *based on changes across FMEA versions*

- Use for risk management tracking without addressing RPN

- Changes can be made in the DRBFM that do not effect your FMEA, yet  analysis integrated & maintained with FMEA data

# Statistics Editor

Automatic analysis of data

Focuses analysis discussions!

**Pareto Analysis**

Schemes
* Pareto Analysis

OK
Close
Help
New
Copy...
Name...
Edit...
Save
Delete

Filter
<No Filter>

Administration...

Forms
(1) Form: bearing housing
(1) Form: drive shaft
(1) Form: properties for race: gasket ring
Structure: filter example
(3) Form: Group
Structure: grinding process for seat of ball bearing
Structure: process manufacturing/assembly drive shaft
(1) Form: grinding process seat of ball bearing and raceway sealing ring
Structure: process sample structure
(1) Form: shorten tube

# Statistics Editor



Results show in graph & table format

User Defined Analysis Scheme

Print results separately or combined

\* Action Priority (AP) – v7.0

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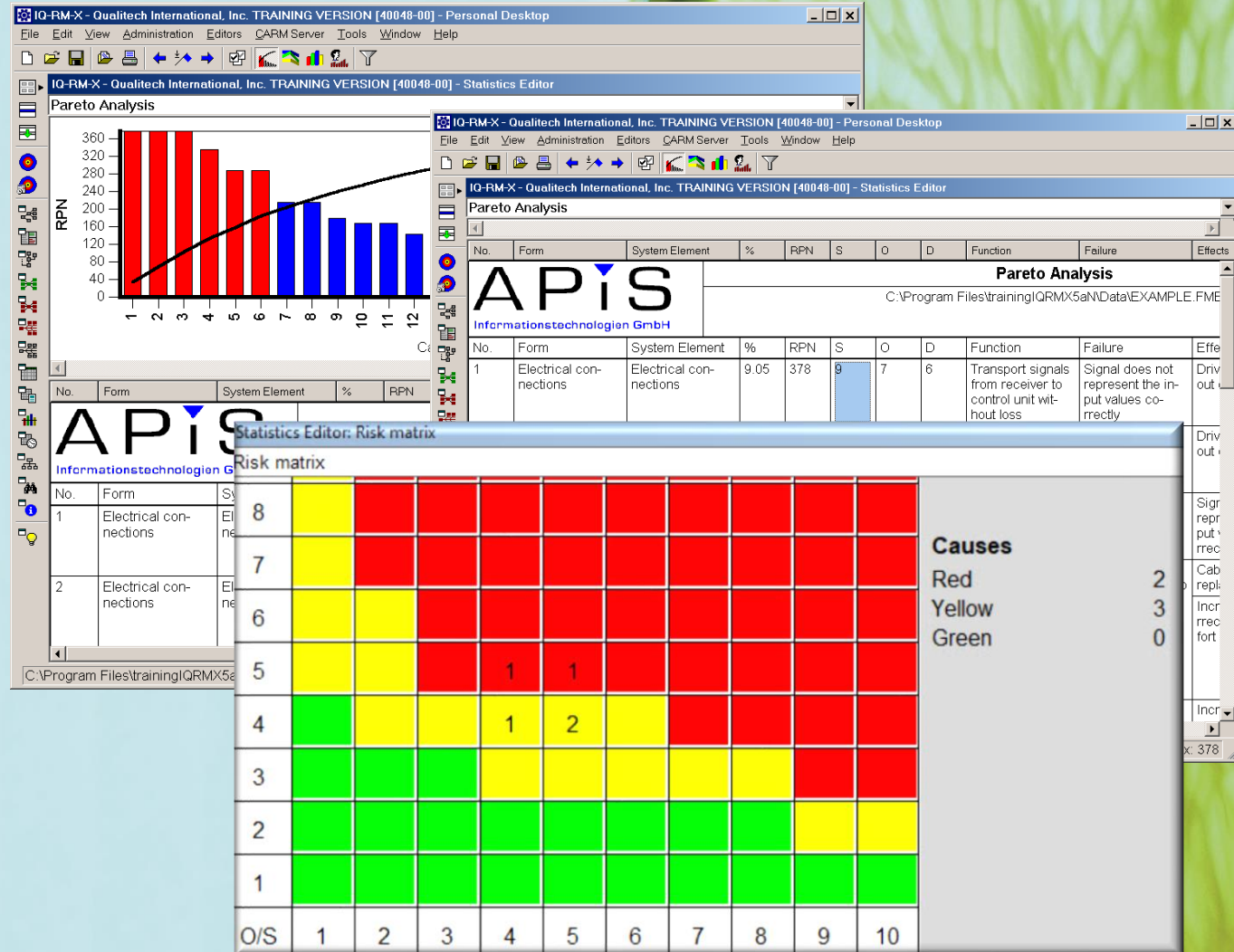
# Management Report

- Customizable table based layouts to create status reports of analysis
- Include Statistics editor charts
- Apply key dashboard results based on filters, quality rules, placeholders, formulas, etc.
- Conditionally format key figure colors
- Standardize report templates across files
- "Version" reports to track progress
- Include in Presentation Print batches for reference
- Push results into worksheet software

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# Management Report

## Phase-1 FMEA: Architecture (VDA step 1-3)

| Step | Description | Filter Name: Actual | Filter Result | Filter Name: Target | Filter Result | Ratio |
|---|---|---|---|---|---|---|
| Structure / Function Content | System elements with functions vs. all relevant system elements.* | System elements with functions | 9 | focus system elements: | 21 | 43% |
| System Level Failures | System Level Functions with failures vs. all functions on all levels (excluding from first and last level) * | System Level: functions with failures | 13 | functions on system level | 16 | 81% |
| Effect Level Failures | Top-Level: Functions with failures / all functions | Effect Level: functions with failures | 3 | functions on effect level: | 3 | 100% |
| Cause Level Failures | Last-Level: Functions with failures /all functions | Cause Level: functions with failures | 6 | functions on cause level: | 7 | 86% |
| Failure Net connections | System Level: Failures with causes & effects / all failures | System level: failures with net connection | 6 | failures on system level: | 21 | 29% |

## Phase-2 FMEA: Evaluation & Optimisation (VDA step 4,5)

| Step | Description | Filter Name: Actual | Filter Result | Filter Name: Target | Filter Result | Ratio | Filter Result |
|---|---|---|---|---|---|---|---|
| Initial state: First evaluation of all risks | Failures on the last level with Initial state including O and D-Rating and actions vs. number of all failures on last level. | cause level failures with initial state: | 8 | failures on cause level: | 11 | 73% | |
| Optimisation of O-rating with S/O-risc matrix | Number of rated causes in green area of S/O risk matrix vs. number of all causes. | cause level failures S/O risc matrix = RED | 5 | cause level failures S/O risc matrix = YELLOW | 0 | cause level failures S/O risc matrix = GREEN | 0 |
| Optimisation of D-rating with O/D-risc matrix | Number of rated causes in green area of O/D risk matrix vs. number of all causes. | cause level failures O/D risc matrix = RED | 6 | cause level failures O/D risc matrix = YELLOW | 0 | cause level failures O/D risc matrix = GREEN | 3 |
| Completion of Actions | Number of completed actions vs. number of all actions. Actions in initial state are not considered. | open deadlines: | 3 | complete: Difference: | 7 | 70% | |
| | | | | actions not in initial state: | 10 | | |

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# IQ-Explorer

Extensive
search of
objects

Within file
or across
directory

Text
patterns
or filters

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# Presentation of Output

- Direct Print
- Presentation Print - batch
- **Web Publisher – batch HTML**
- Bookmarking
  – FMX external
  – PIM
- Print Preview

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# Web Publisher

Open & navigate with web-browser

Expand reach of analysis results!

Search features located on home page



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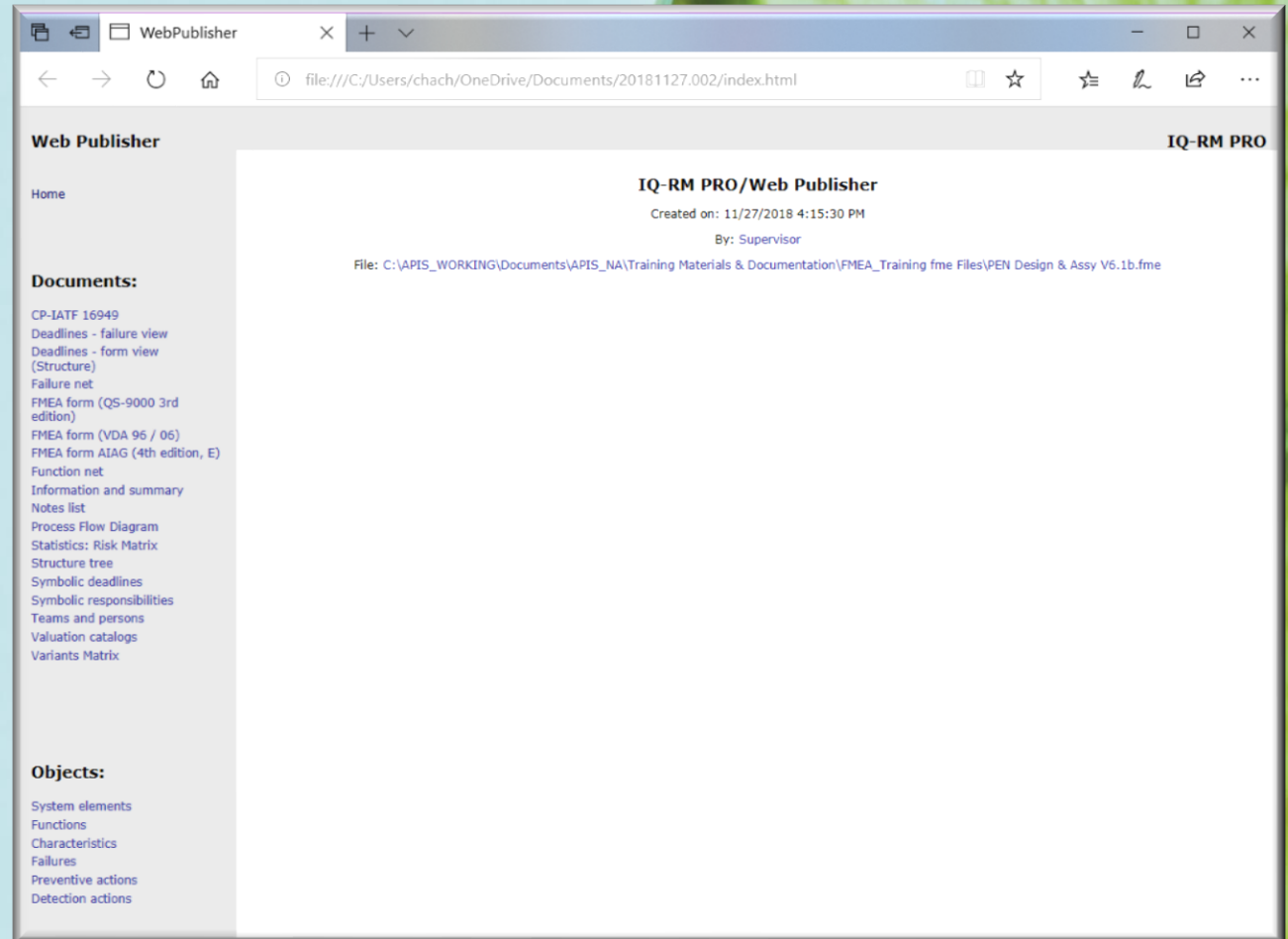
# Data Interfaces

- HTML
- **XML**
- SGML
- ODBC
- Excel

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# Configuration and Settings

- Document templates for company standardized settings

- Forms, column widths, fonts, field labels, column labels transferred with file

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# IQ Risk Management Tools

# Training & Consulting

Suzanne Radulovic

# IQ Training

- Caters to **all** levels of users from basic to expert usage – **emphasis on capability**

- Participants work with **hands-on** examples to allow for maximum understanding of concepts

- Experienced Trainers
  - Basic Introductory 2-day training available in English or Spanish

- Available on/off -site

# APiS

# FMEA Consultation & Moderation

- Consulting done on a contract basis

- Adaptable to specific needs

- Includes conversion from other FMEA packages

- Experienced consultants

- Available on/off -site

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# Thank you
# for your interest,
# time,
# and attention!