Metadaten im Zeitalter der Digitalisierung

Methoden zur Erstellung von Content-Modulen, -Varianten … und digitaler Services

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tekom RG Berlin-Brandenburg,

October 26, 2020

Prof. Dr. **Wolfgang Ziegler**

- **Karlsruhe University of Applied Sciences, Germany „Communication und Media Management“ (HSKA)**
  - » Knowledge, Information, content, data modelling
  - » Information processes and systems in TC
- **Institute for Information and Content Management (I4ICM)**
  - » Research Transfer (**PI-Class, CVM, REx, CDP, CoReAn, microDocs/SCR**)
  - » System evaluation/introduction, process analysis/engineering, CMS/CDP optimizing, classification/content engineering

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Institute for Information
and Content Management

I4ICM

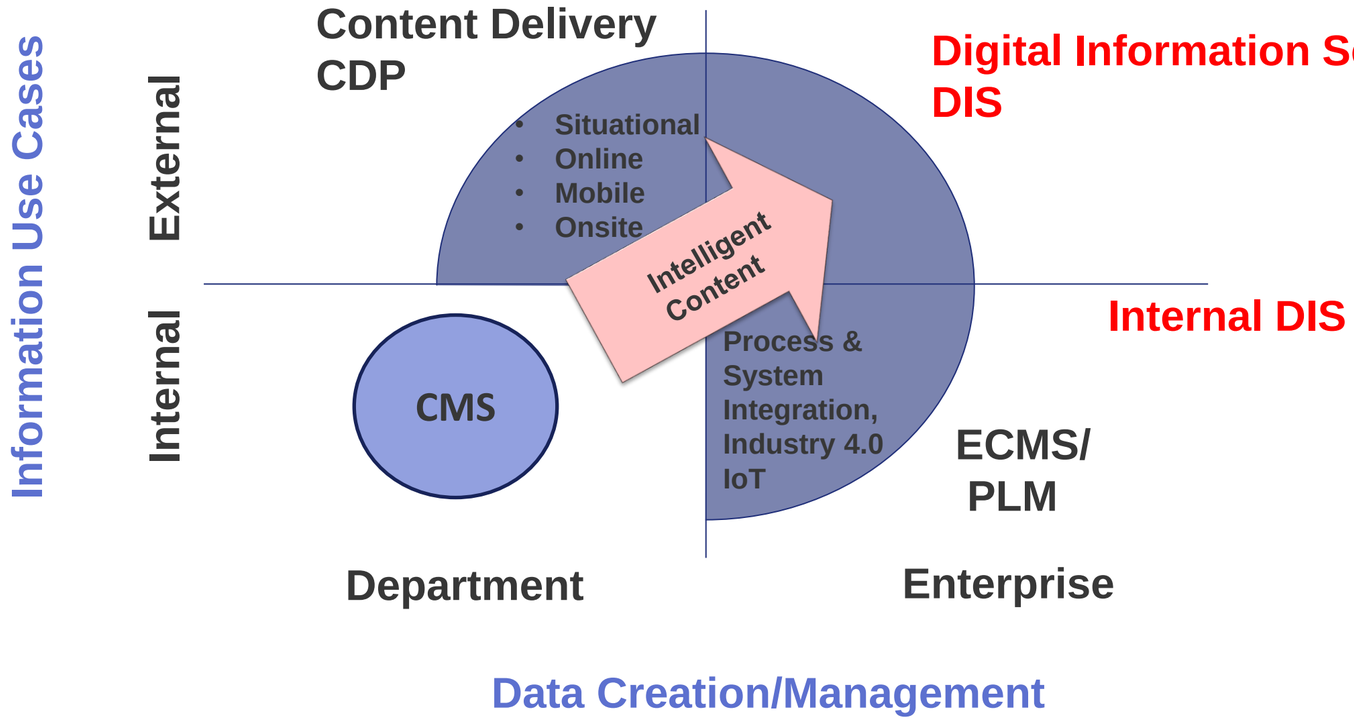
Agenda

- Introduction
- Content Management Concepts
- Content Delivery Concepts
- Digital Information Services

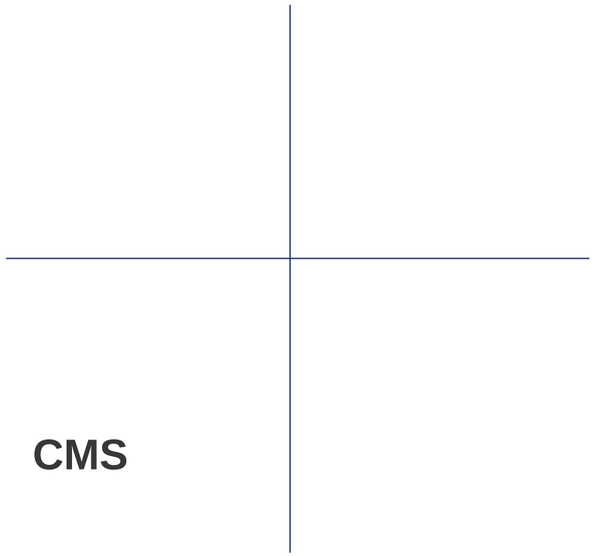
Introduction to Content Delivery and Digital Information Services

Introduction

Evolution of Perspectives on (Technical) Information



Introduction



What is the (recent) focus of content management and related technologies?

- Most granular Information (topic-based content)
- **Metadata enrichment (of topics) according to product variants**
- Automization of CMS processes (generating, publishing)
- Support search & delivery (interfaces, facets,)
- Definition of use-cases (user stories, customer journey, …) and target groups (personas)

Introduction

Lack of specific information...

CMS

Introduction

Manuals & data on configurable products

CMS

The depiction of the products may differ from the actual specific design.

Search

Downloads

All | All languages

Data Sheets

	説明	Filesize	Language / Country
PDF	Type 8139 data sheet | radar level measurement device	2 MB	EN / EU
PDF	Typ 8139 Datenblatt | Radar-Füllstandsmessgerät	2 MB	DE / DE
PDF	Type 8139 fiche technique | Niveaumètre radar	2 MB	FR / FR

User Manuals

	説明	Filesize	Language / Country
PDF	Operating Instructions Type 8139 | Level measuring device	6 MB	EN / EU
PDF	Quickstart Type 8139 | Level measuring device	1 MB	EN / EU
PDF	Bedienungsanleitung Typ 8139 | Füllstandmessgerät	6 MB	DE / EU

Web

Introduction

Manuals & data on configurable products

CDP

Application area

3.2 Principle of operation

LEVEL TRANSMITTER 8139 is a radar sensor for continuous level measurement of liquids.

The small process fittings offer particular advantages in small tanks or tight mounting spaces. The very good signal focusing ensures the use in vessels with many installations such as stirrers and heating spirals.

The LEVEL TRANSMITTER 8139 is available with different antenna systems:

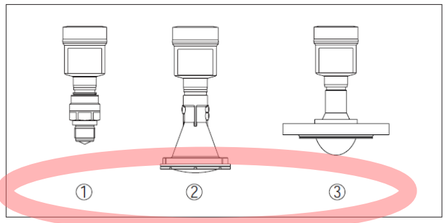


Fig. 2: Antenna systems LEVEL TRANSMITTER 8139

1 Thread with integrated horn antenna
2 Plastic horn antenna
3 Flange with encapsulated antenna system

You will find recommended values for socket heights in the following illustration or the tables. The values come from typical applications. Deviating from the proposed dimensions, also longer sockets are possible, however the local conditions must be taken into account.

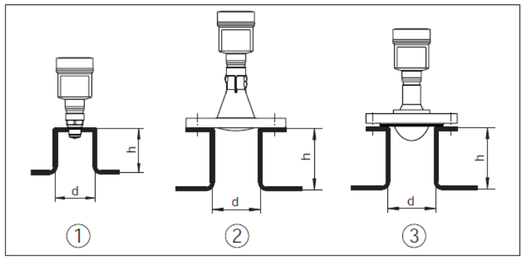


Fig. 17: Socket mounting with deviating socket dimensions with different versions of LEVEL TRANSMITTER 8139

1 Thread with integrated horn antenna
2 Plastic horn antenna
3 Flange with encapsulated antenna system

Thread with integrated horn antenna

Socket diameter d		Socket length h	
40 mm	1½"	≤ 150 mm	≤ 5.9 in
50 mm	2"	≤ 200 mm	≤ 7.9 in

58499-EN-190321

Version: - Status: RL (released | freigegeben) printed: 05.06.2019

Collection of variants depending on **parameters**

10 Supplement

Version	Material	Seal	Process temperature (measured on the process fitting)
Thread with integrated horn antenna	PEEK	FKM (SHS FPM 70C3 GLT)	-40 … +130 °C (-40 … +266 °F)
			-40 … +200 °C (-40 … +392 °F)
		FFKM (Kalrez 6230)	-15 … +130 °C (5 … +266 °F)
			-15 … +200 °C (5 … +392 °F)
		FFKM (Kalrez 6375)	-20 … +130 °C (-4 … +266 °F)
			-20 … +200 °C (-4 … +392 °F)
Flange with encapsulated antenna system	PTFE and PTFE 8 mm	PTFE	-40 … +130 °C (-40 … +266 °F)
			-40 … +200 °C (-40 … +392 °F)
			-196 … +200 °C (-320.8 … +392 °F)[8)]
	PFA	PFA	-40 … +130 °C (-40 … +266 °F)
			-40 … +200 °C (-40 … +392 °F)
Hygienic fitting with encapsulated antenna system	PTFE	PTFE	-40 … +200 °C (-40 … +392 °F)
		FKM (A+P 75.5/ VA/75F)	-20 … +130 °C (-4 … +266 °F)
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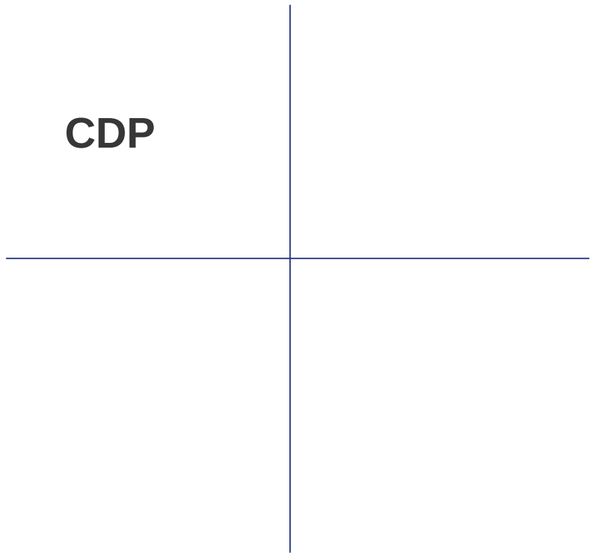
Derating, ambient temperature

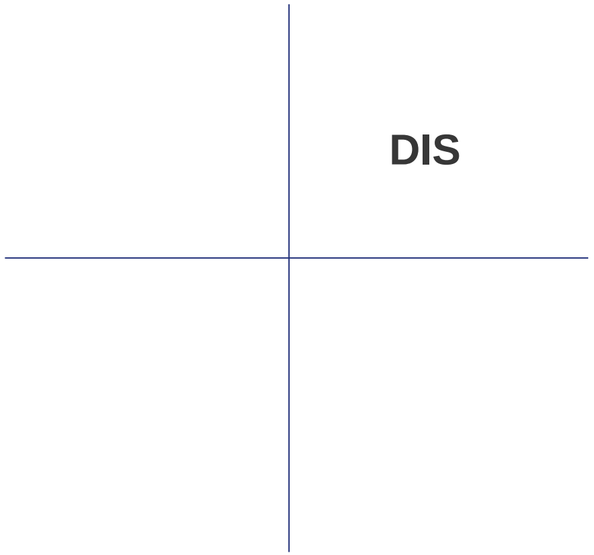
Introduction



Content Delivery Objectives (User side)

- Create and deliver more and better user-centered information:
  - situational (according machine and user situation)
  - case-based (following predefined use cases)
  - product-/variant-specific (as most as possible)
  - accessible (technically available and managed in the organization)
  - suitable media
- Create new business cases / Digital Information Services

Introduction



Use Case Dependencies & Requirements for Deliverables & Services

- **Sales process / Information & Product Search**:

– Overview data and summarized tables

– Specific: Data sheet, technical data, dependency information

- **Machine Planning**: specific envisaged configuration
- **Set-up /Installation**: specific context and configuration setting
- **Repair planning**: specific existing configuration
- **Operation/customer services**: Detailed information

Introduction

External Perspective

(regarding information)

What do we need to do…?

- … improve customer satisfaction
- … provide information more specific to variants/configuration
- … integrate information into IoT processes
- … use modern electronic media (Apps, Search, Delivery)
- … make information exchangeable on a electronic basis
- … offer new product services

Content Management

Creating (native-) intelligent content

CMS drivers and demands from industry

Products from industrial engineering and manufacturing are characterized by „mass customization“ and „globalization“ :

- Short-time development cycles
- Many changes within development phase
- Often changes within time of use
  (servicing for manufacturing/machines) and reuse of parts
- Use of standard parts & components (mass production)
- Adapting products to customer needs (customization)
- Adapting products to all addressed markets
  (globalization issues for export-oriented industries)
- Comply with regulations and standards

Software similar; but less components, less standardization, more software variants (branches), in many cases more individual customizing;

CM Methods

Basic CM Concepts in TC

- **CMS principles**

  Controlled reuse of content modules (topics) in multiple delivery structures, documents or media using metadata

- **CMS offer technologies for**

– Variant management (product & media variants, configuration)

– Version management (change Management)

– Translation management (internationalization, globalization)

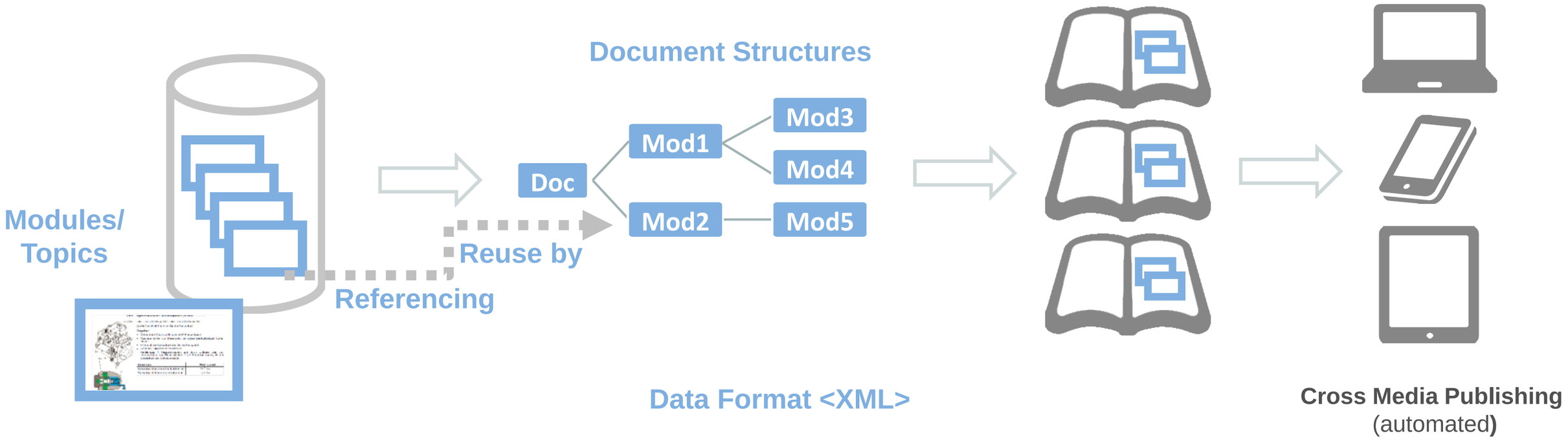
– Cross media & publishing management

CM Methods

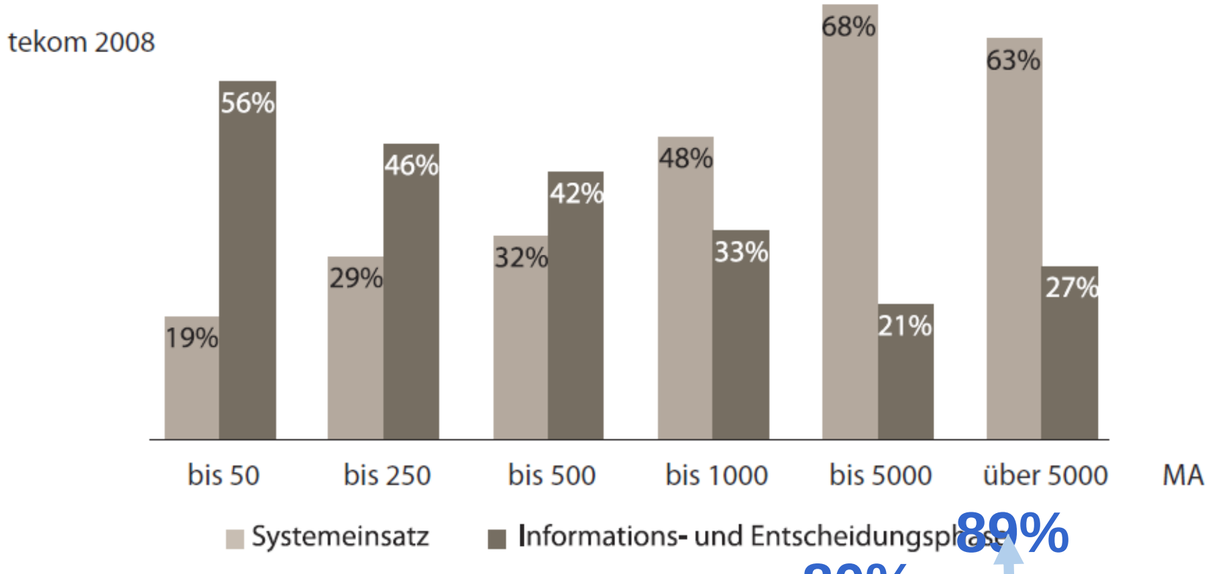
Referencing modules/topics

- permits controlled processes
- avoids uncontrolled redundancies
- defines and populates document structures by topics

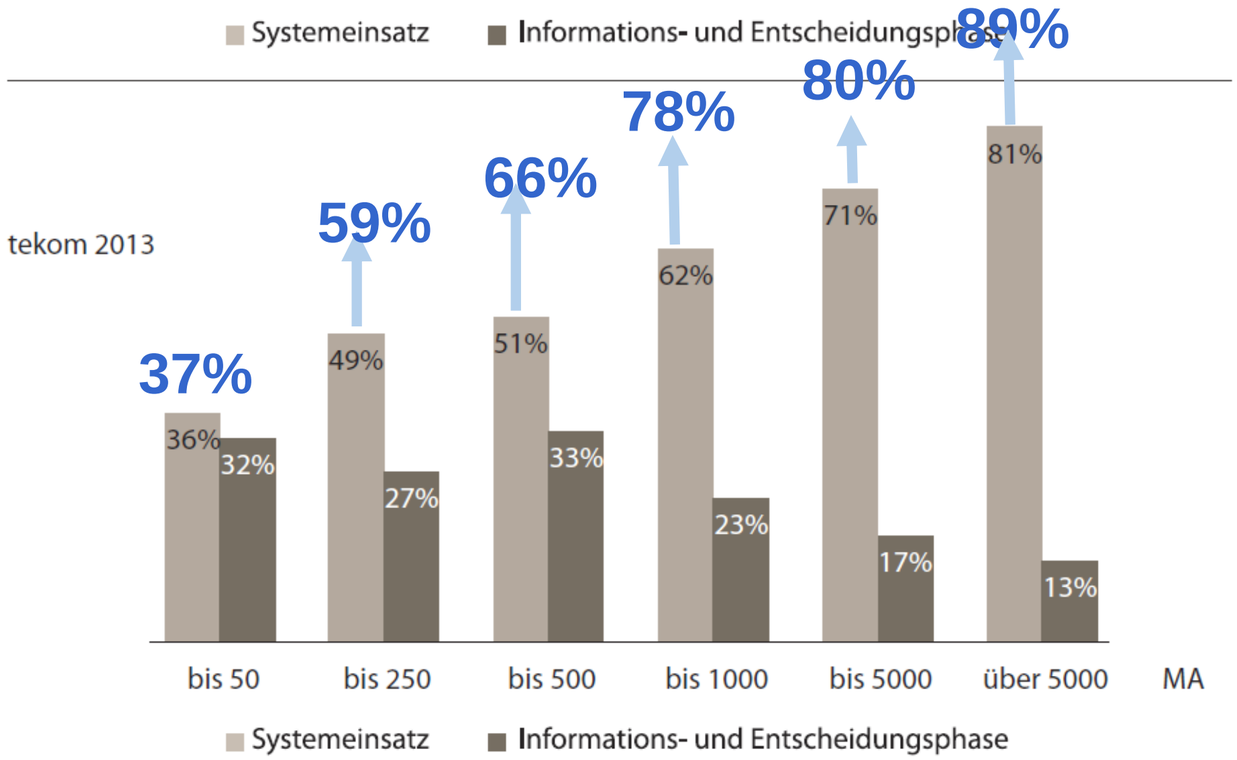
Reuse, Aggregation and Publishing



2008



2013



Increasing Use of CMS

(Central Europe/DACH)

Evolution of CMS distribution in German speaking countries for various company sizes

Small and mid size companies started to use CMS for improving efficiency of document creation and for creating new media

©tekom/tcworld

Straub/Ziegler 2008/2013

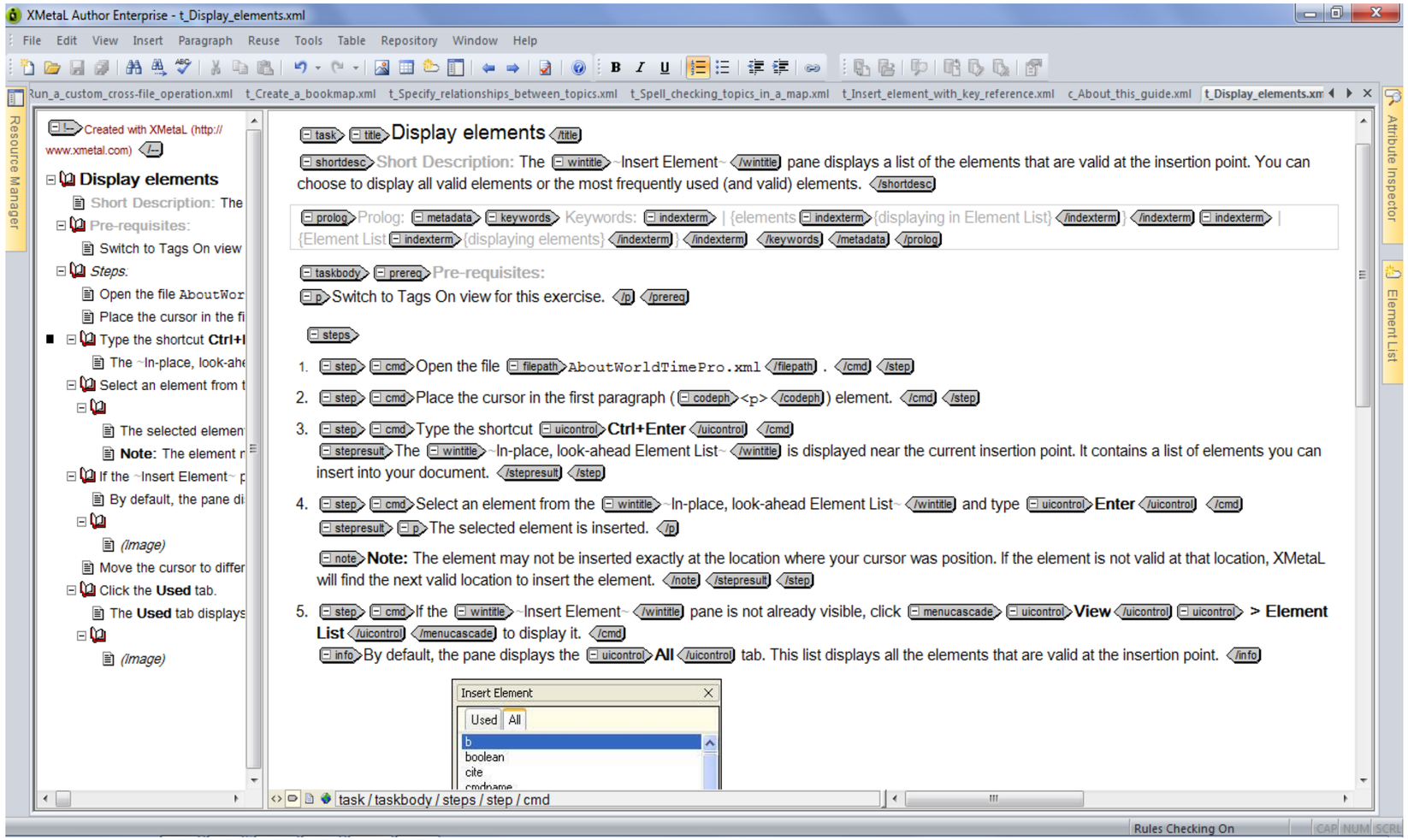
CM Methods

What is TC focussing for authoring & linguistics?

- Comprehensive writing
- Rules-based writing
- Consistent terminology
- Writing for international markets (translation, localization)
- Self-contained information: topic-based writing
- Definition of target groups (personas) and use cases (user stories, customer journey, …)

CM Methods

XML Authoring environments (for content creation)



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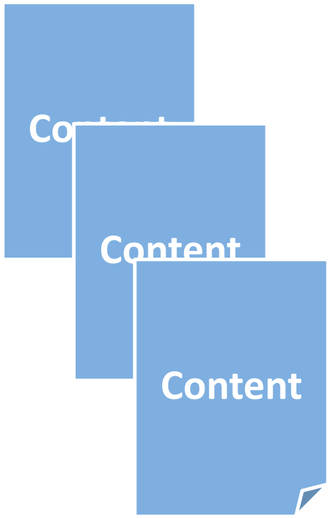
CM Methods

Metadata Enrichment by Semantic Metadata for Modular Content (PI-Class®)

Product Classes

Physical & Virtual Objects
(Product Components)

Content Objects
(Modular Topics)

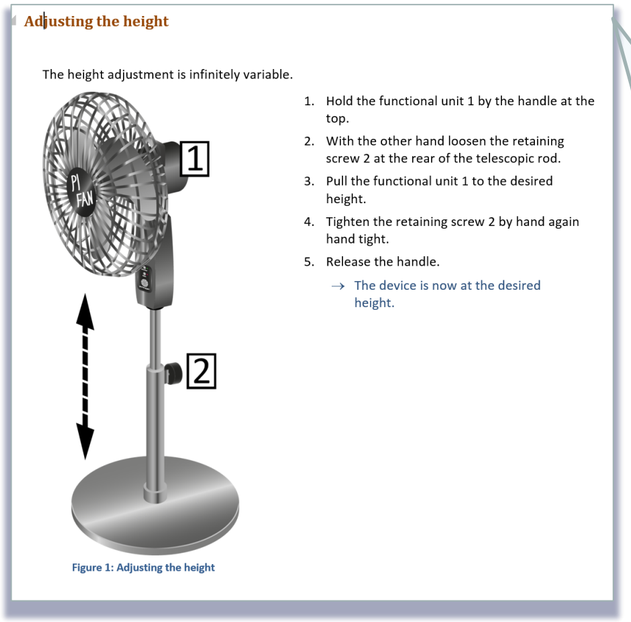


Information Classes

- Operation
- Dismount
- Repair

CM Methods

Basic Dimensions of Module Classification (PI-Class®)



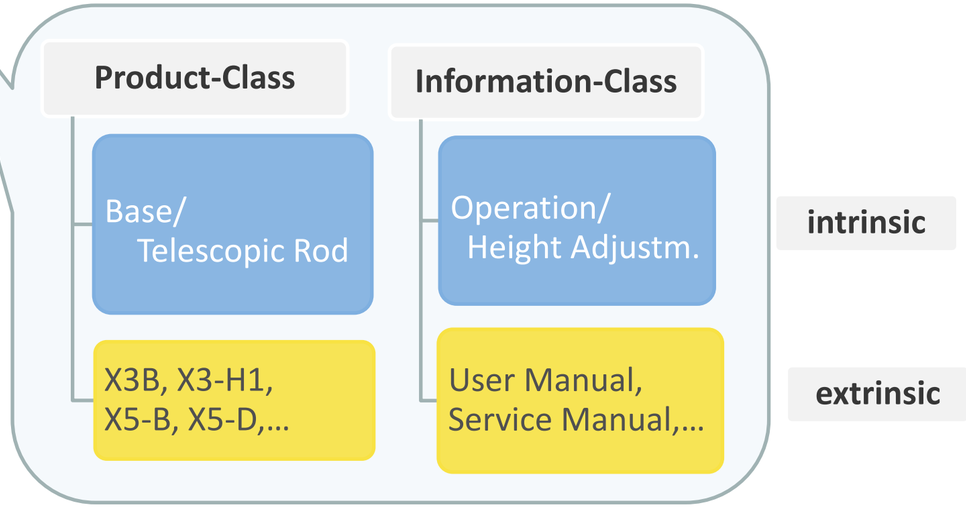
Adjusting the height

The height adjustment is infinitely variable.

1. Hold the functional unit 1 by the handle at the top.
2. With the other hand loosen the retaining screw 2 at the rear of the telescopic rod.
3. Pull the functional unit 1 to the desired height.
4. Tighten the retaining screw 2 by hand again hand tight.
5. Release the handle.

→ The device is now at the desired height.

Figure 1: Adjusting the height



Topic: self-contained information unit;

topic concept and content is defined by (intrinsic) PI-classes

www.pi-fan.de

CM Methods

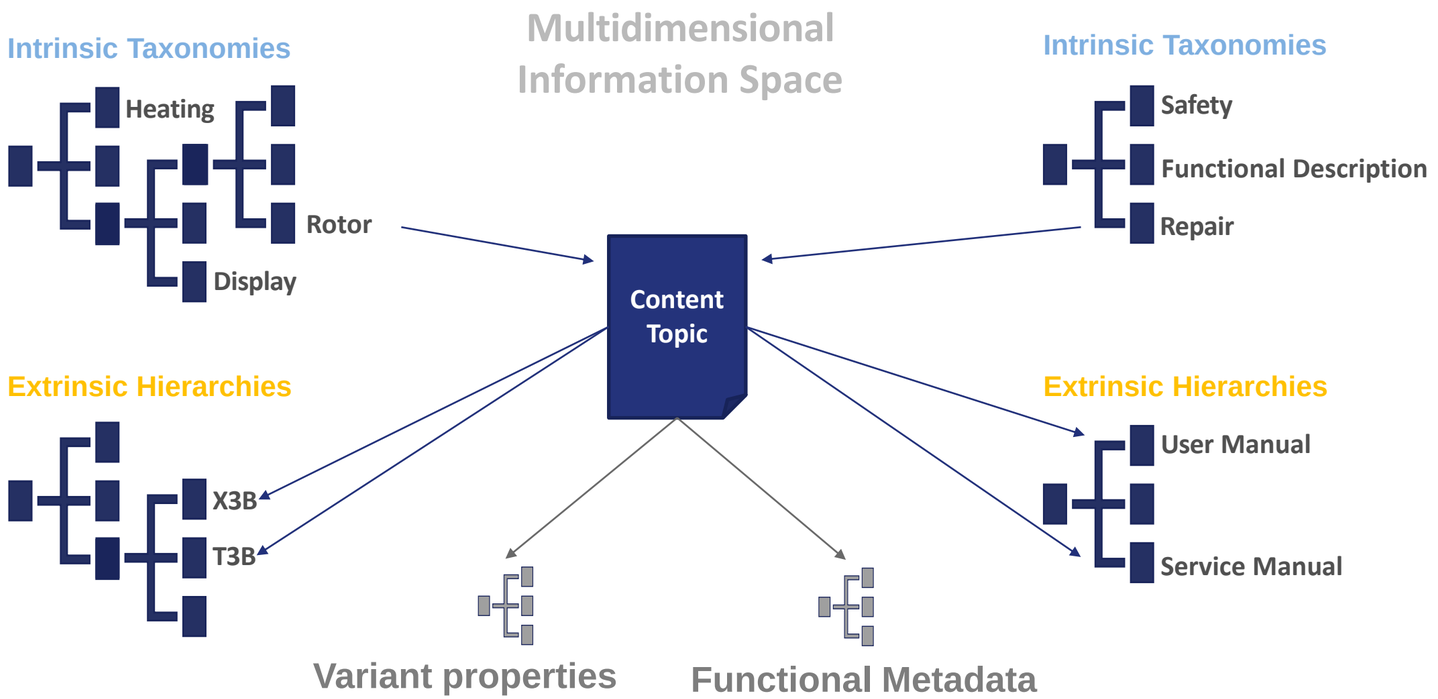
Metadata

for identifying

and addressing

modules/topics

CMS „Taxonomies“ from Topic Classification



Hierarchies, Taxonomies, List, …

CM Methods

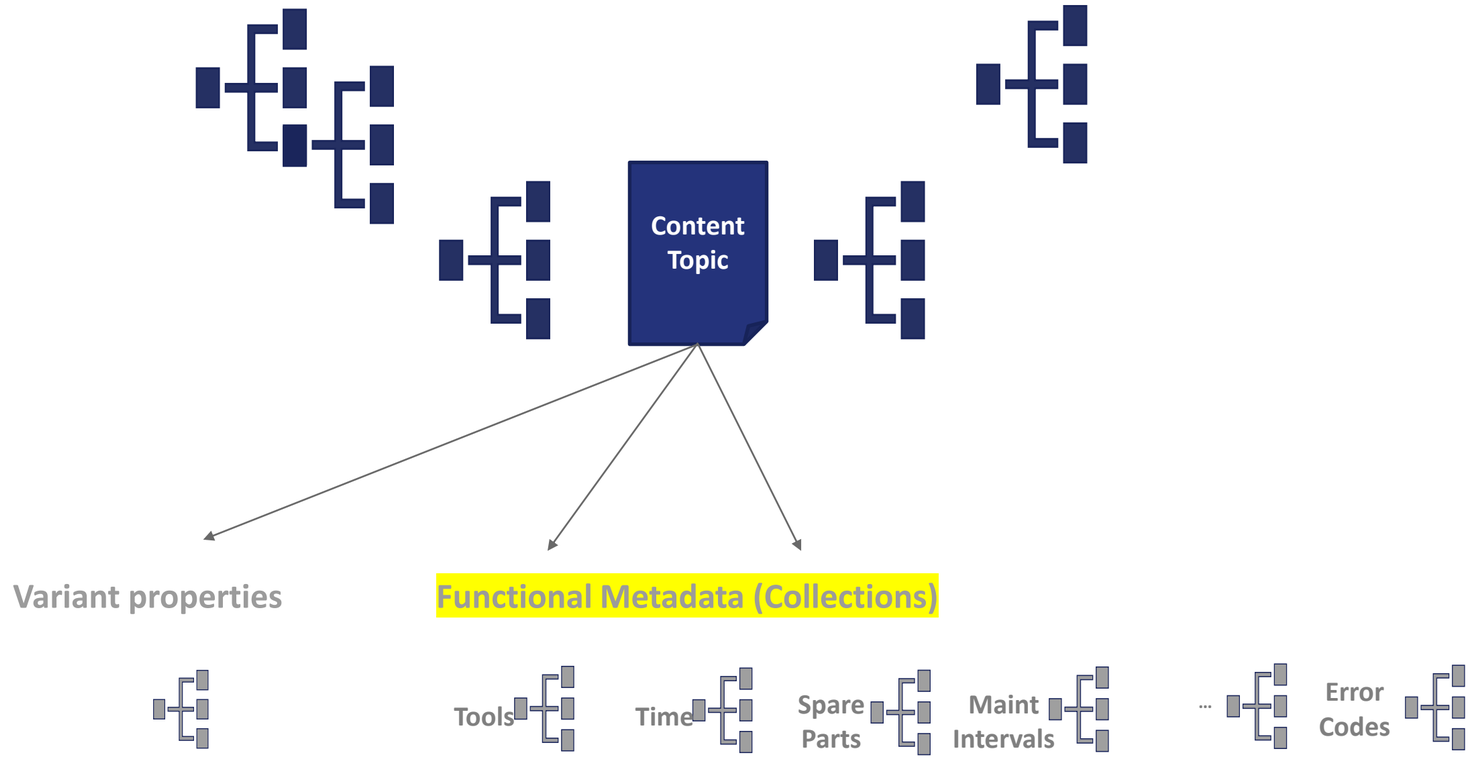
Use of (semantic) metadata for CMS

- Definition of topic content (module concept)
- Content planning (workflow, content development)
- Automized document creation (rules based)
- Variant management

CM Methods

CMS „Taxonomies“ from Topic Classification

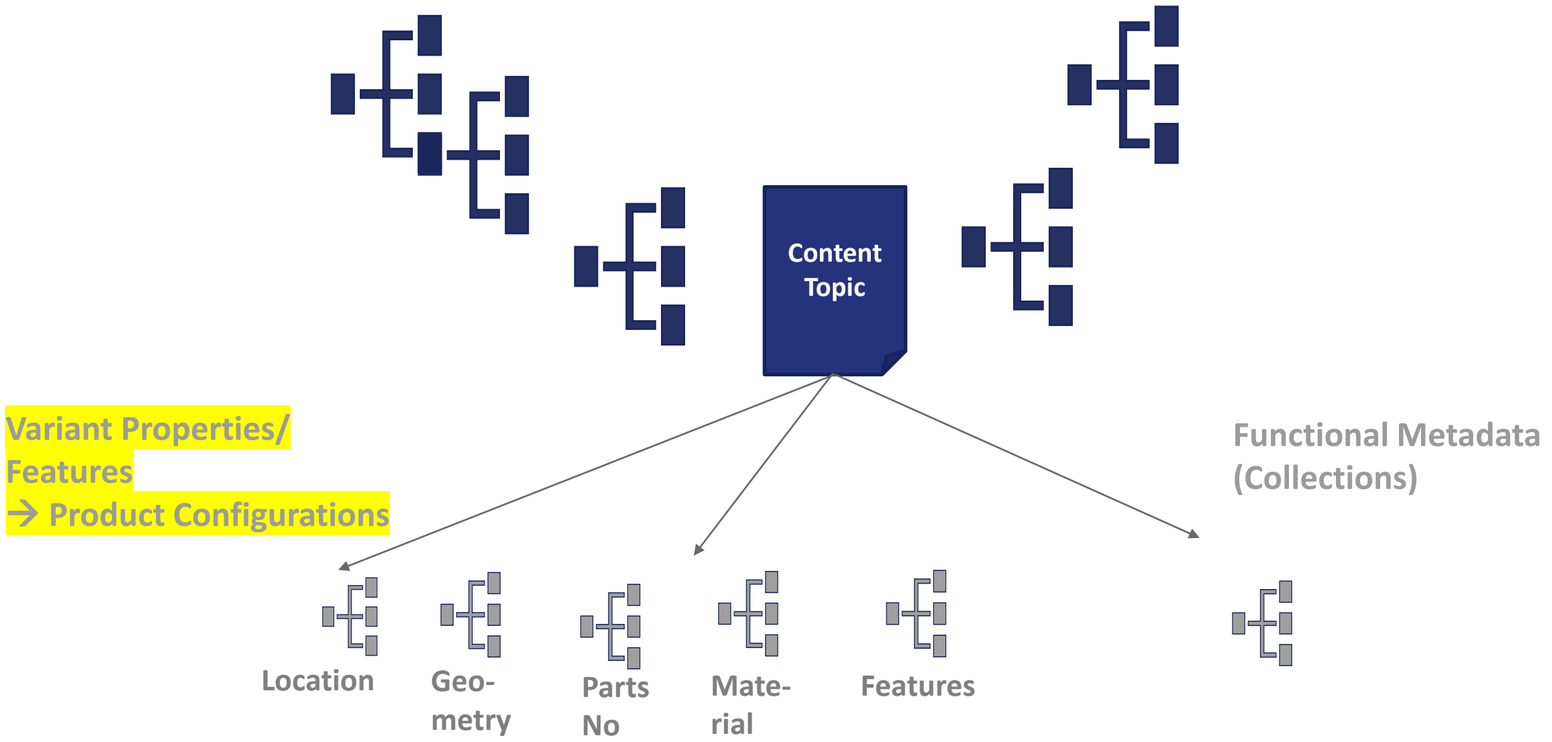
Extended PI-Class: Multidimensional Information Space



CM Methods

CMS „Taxonomies“ from Topic Classification

Extended PI-Class: Multidimensional Information Space



CM Methods

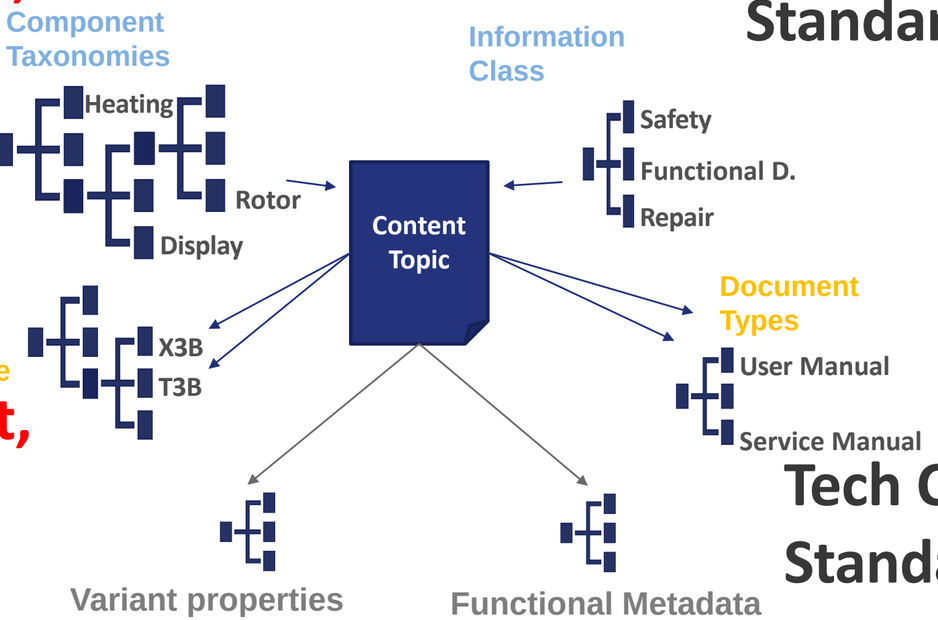
Depency on:

- Stake Holder
- Process Owner & Driver
- Information Sources & Systems

Information Environment and Dependencies

Engineering, Development, PLM, ERP or TC

Tech Comm. Standards, iiRDS



Prod. Management, Sales or Tc

Tech Comm. Standards, VDI 2770

ERP, Engineering, PLM, PIM/PDM

Service, Production, Software Dev., … IoT!

Content Management

Summary I (CMS)

- Technology and methods are available in CMS for topic-based and configuration-specific information creation, document assembling, publishing and provisioning (packaging). They rely strongly on taxonomic classification.
- Limiting factors are often data quality / process integration within companies and human factors (complexity of information structures; „lost in metadata“ of different configurations) as well as a lack of information planning! (Therefore, also analytics is needed…)
- Planning, analysis and management of processes (like variant management) depend on metadata quality

Content Management

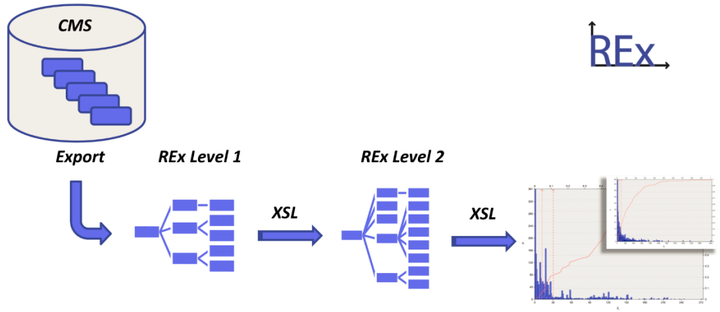
Summary /Vision II (CMS)

- Highly structured content, enriched by semantic metadata has been created, but often only used for (automated) PDF/print production. (Even though CMS can produce all types of media)
- Latest delivery technologies benefit from and require such structured content packages
- New media (e.g. chatbots, training, animations, AR/VR/MR) demand additional or new types of information structures and content

CM Methods

Report Exchange (REx)

Method



Analyzing CMS processes and use of CM methods

- System development & improvement can be proven by KPI

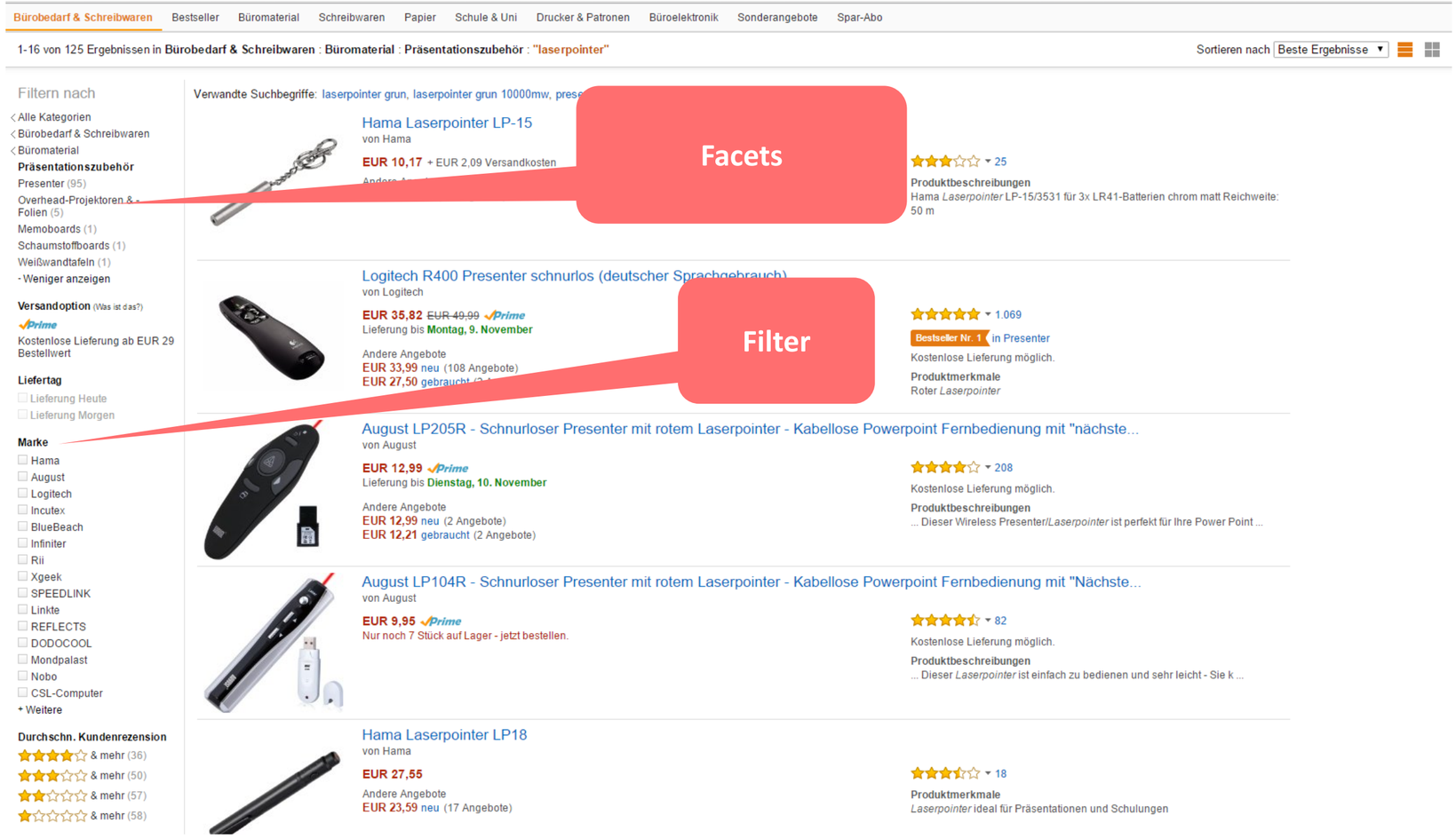
- Reuse numbers of modules, fragments, media, …
- Reuse rates of deliverables (documents, …)
- Efficiency / cost indicators (Sharing factors per publication)
- Change rates and new content rates (per publication)
- Document fingerprints (module reuse rates from doc‘s)
- Variant managment (number of variants, complexity ….)

Intelligent
Content Delivery

Making use of native intelligence of content

CD Methods

Webshops as CDP



Content Delivery Portals

(Definition 2013)

Basic definition and functionalities

Systems offering web based access to modular, aggregated content or other information for various user groups by related retrieval mechanisms.

Basic functionalities

- Access or import content from relevant data sources and corresponding systems
- Manage and update content within the content lifecycle
- Retrieval functionalities including user interfaces for content searching
- Web-based display of content on a modular or document-based level
- Web services handling requests from other applications and events.

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CD Methods

Facetted search/request and topic delivery

Component

- Hydraulic system
- Oil Pump

Information

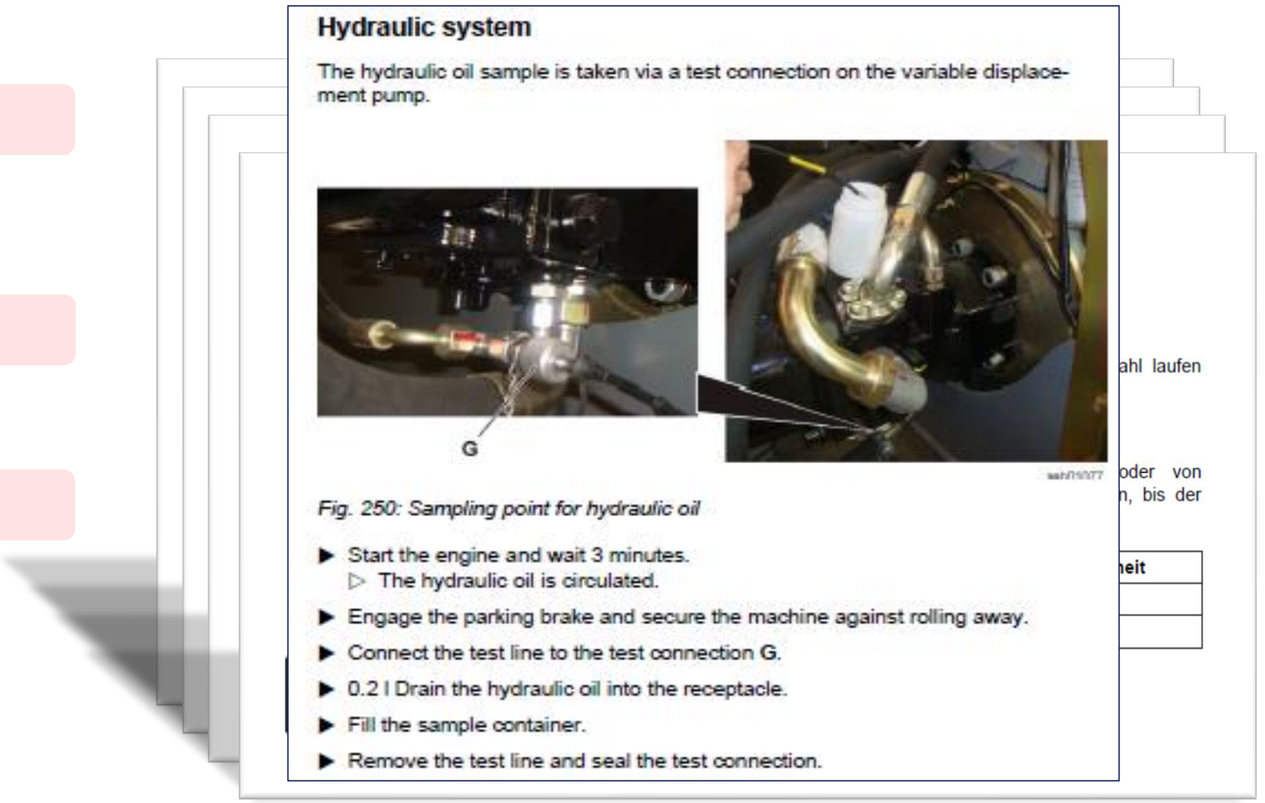
- Procedure
- Testing

Machine

- Z-006

Document

- Service



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CD Methods

Facetted search/request and topic delivery

Customer-dependent Configuration !

Component

Hydraulic system

Oil Pump

Information

Procedure

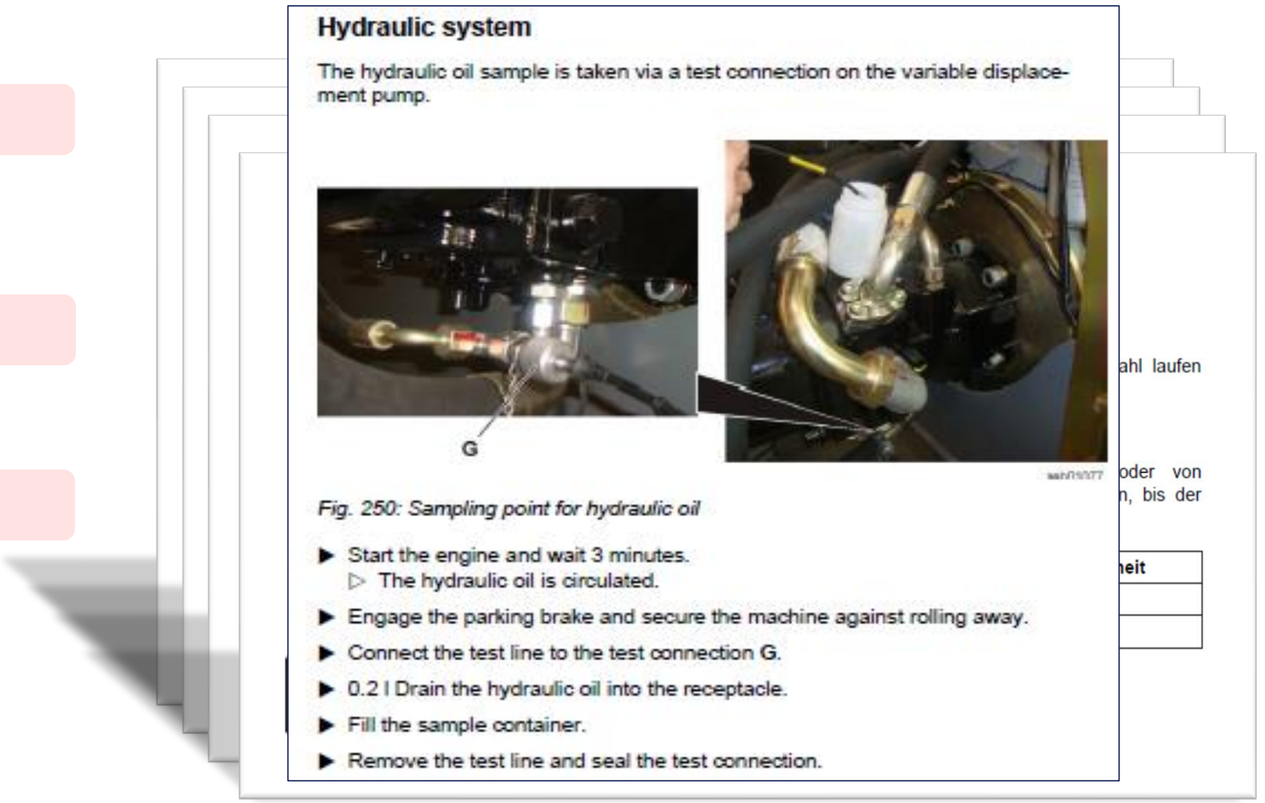
Testing

Machine

Z-006

Konfiguration

$a_1 | b_3 | \dots | x_5 | y_1 | z_5$



CD Methods

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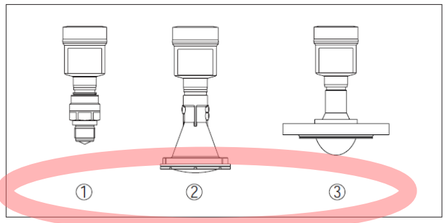

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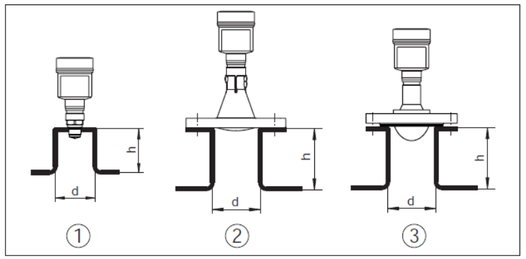

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Thread with integrated horn antenna

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58499-EN-190321

LEVEL TRANSMITTER 8139 • Two-wire 4 … 20 mA/HART

Version: - Status: RL (released | freigegeben) printed: 05.06.2019

Selection/Generating of publication depending on parameters

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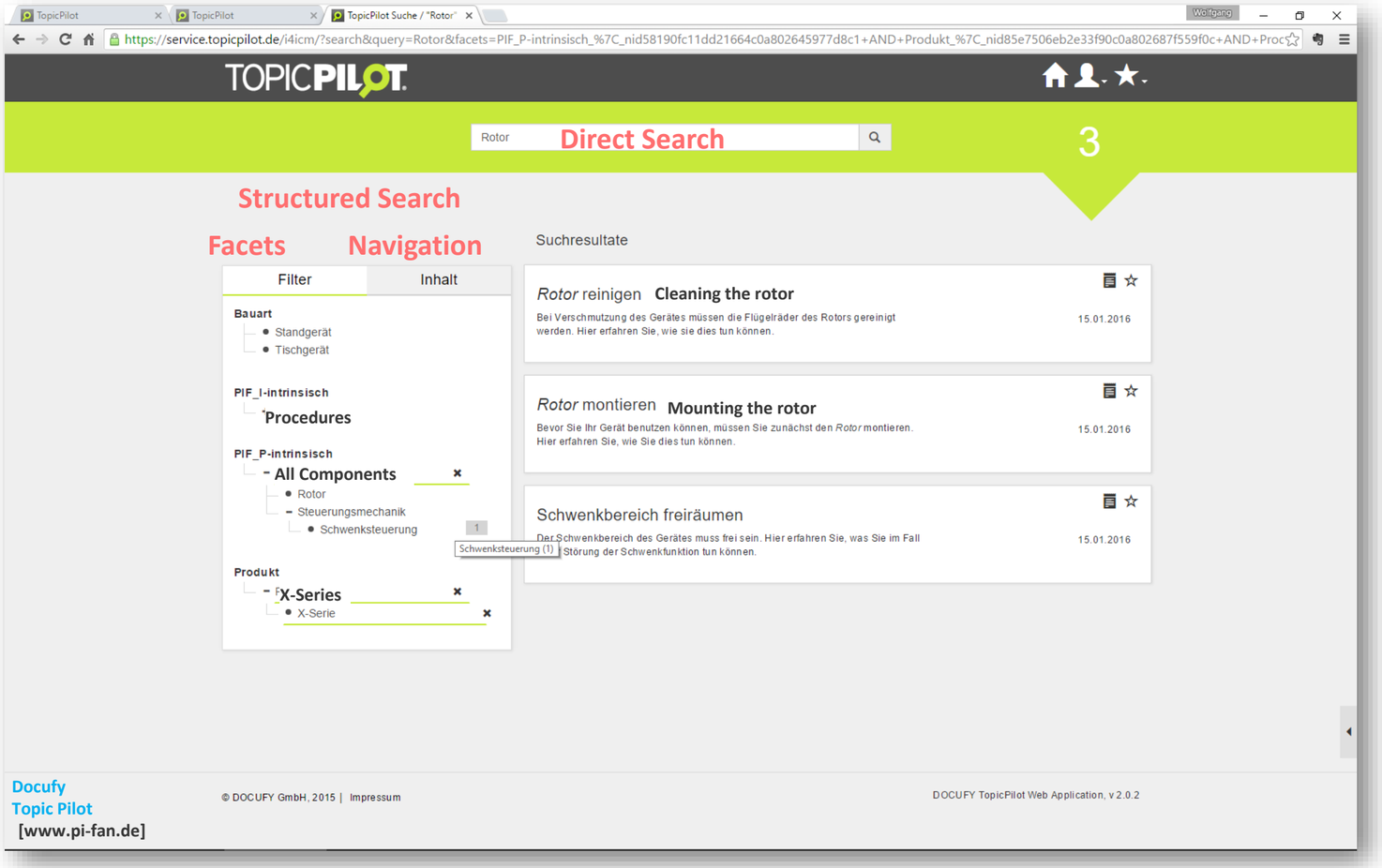
Derating, ambient temperature

CD Methods

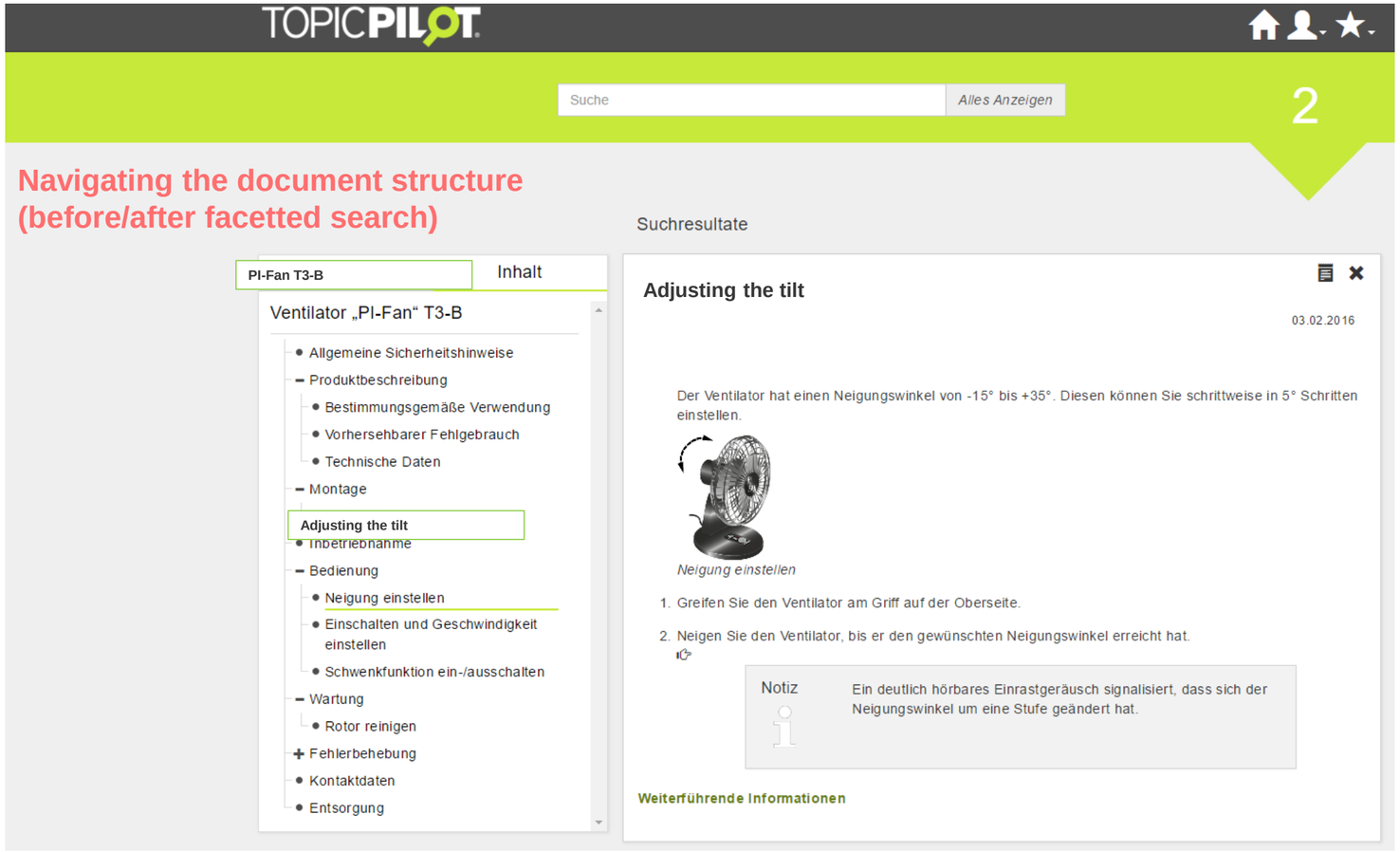
Content Delivery Portal (PI-Fan)



Docufy
Topic Pilot
[www.pi-fan.de]

CD Methods

Content Delivery Portal (PI-Fan)



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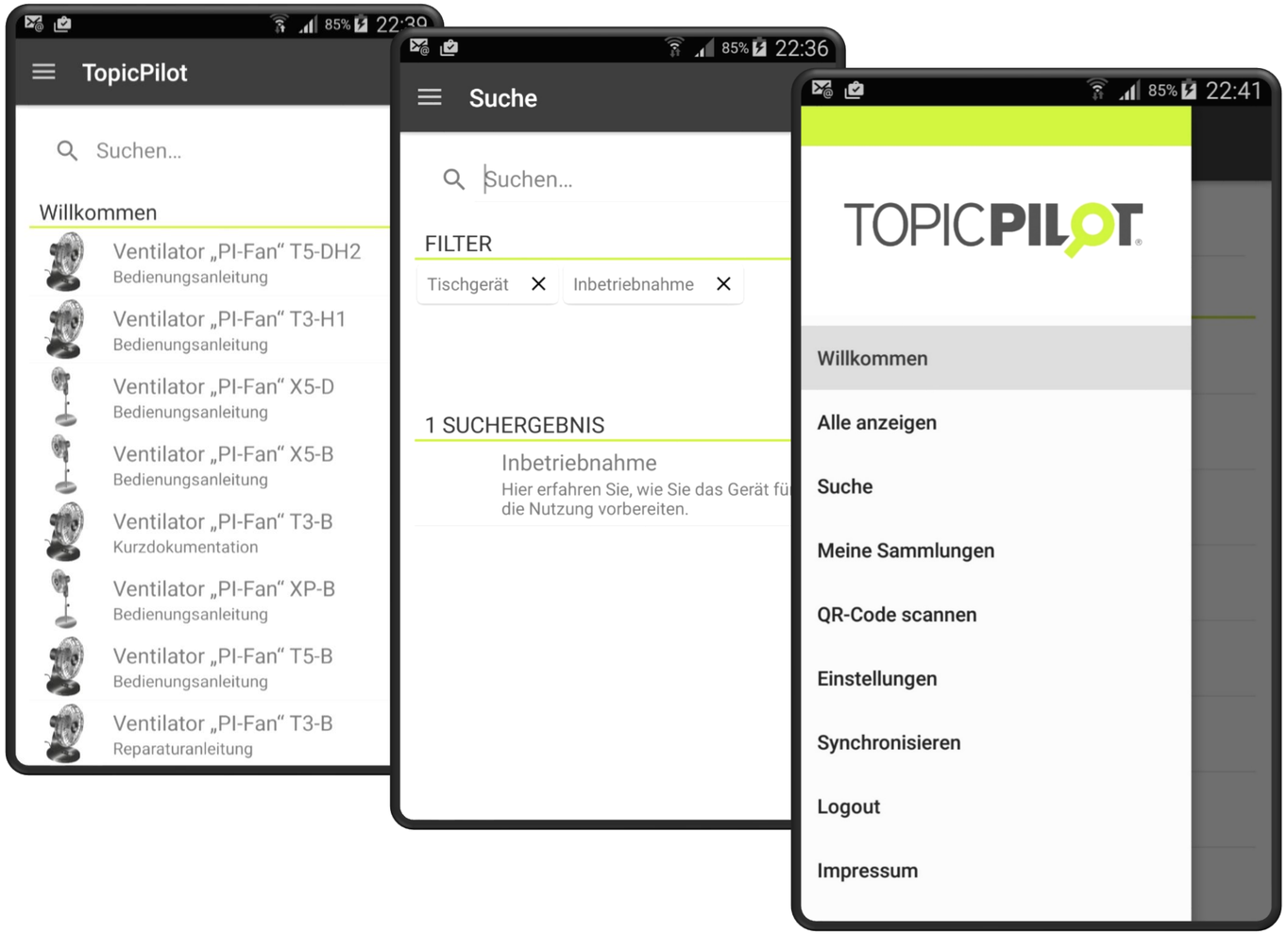
CD Methods

App Delivery Application including Search

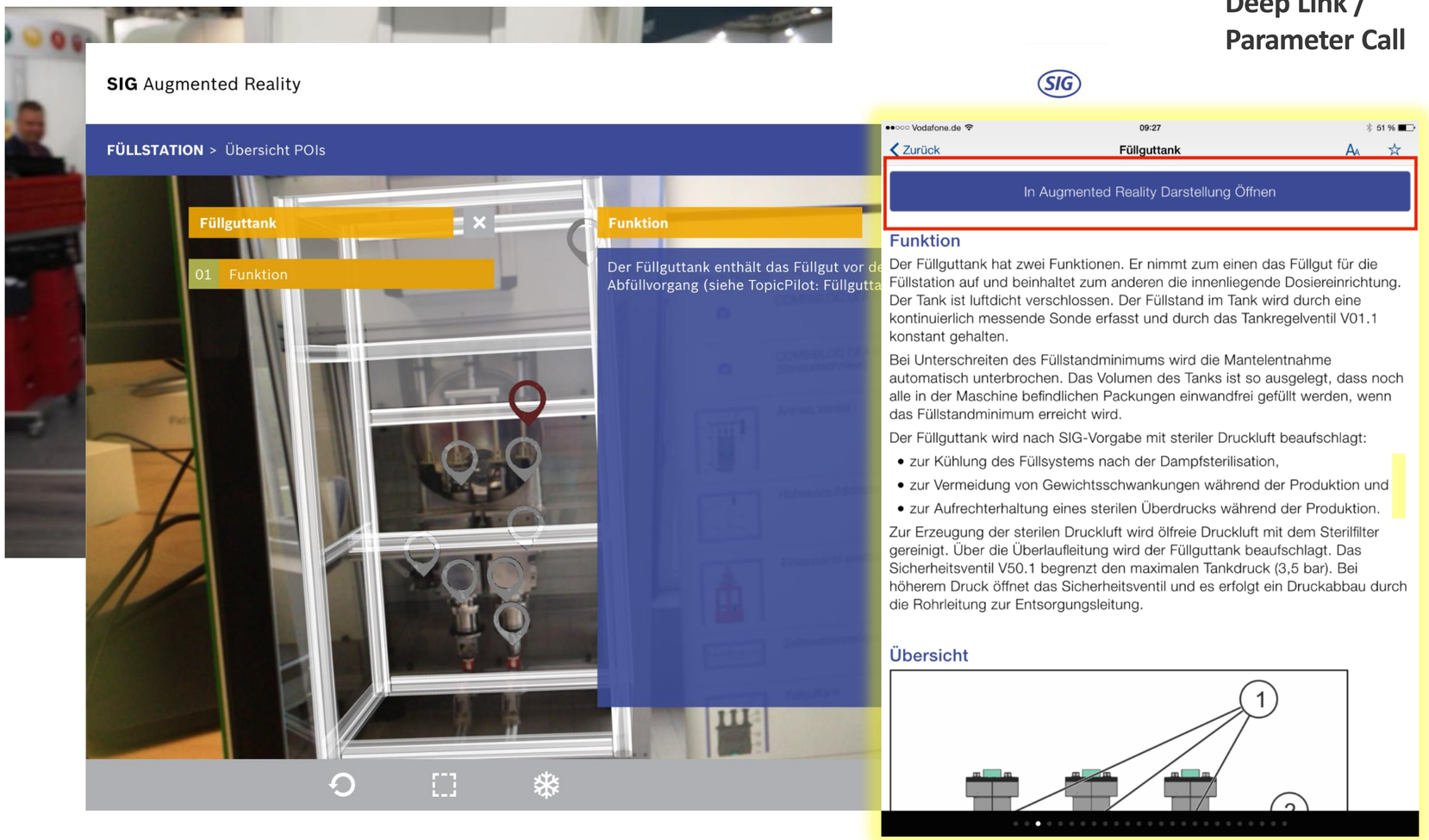


CD Methods

Content Request & Delivery

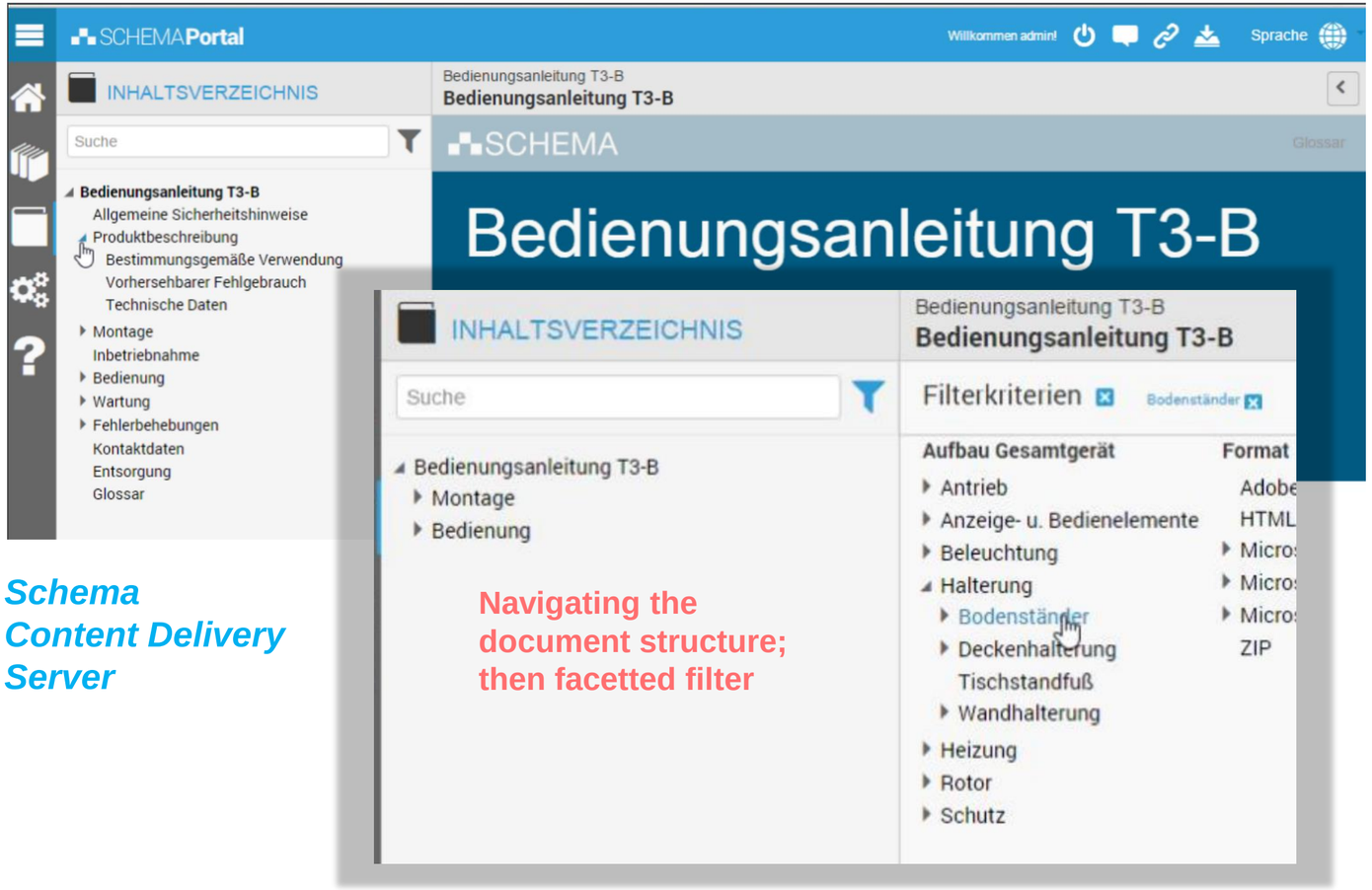
Object Recognition and CDP

CDP Request: Deep Link / Parameter Call



CD Methods

CDP: Facets in Documents



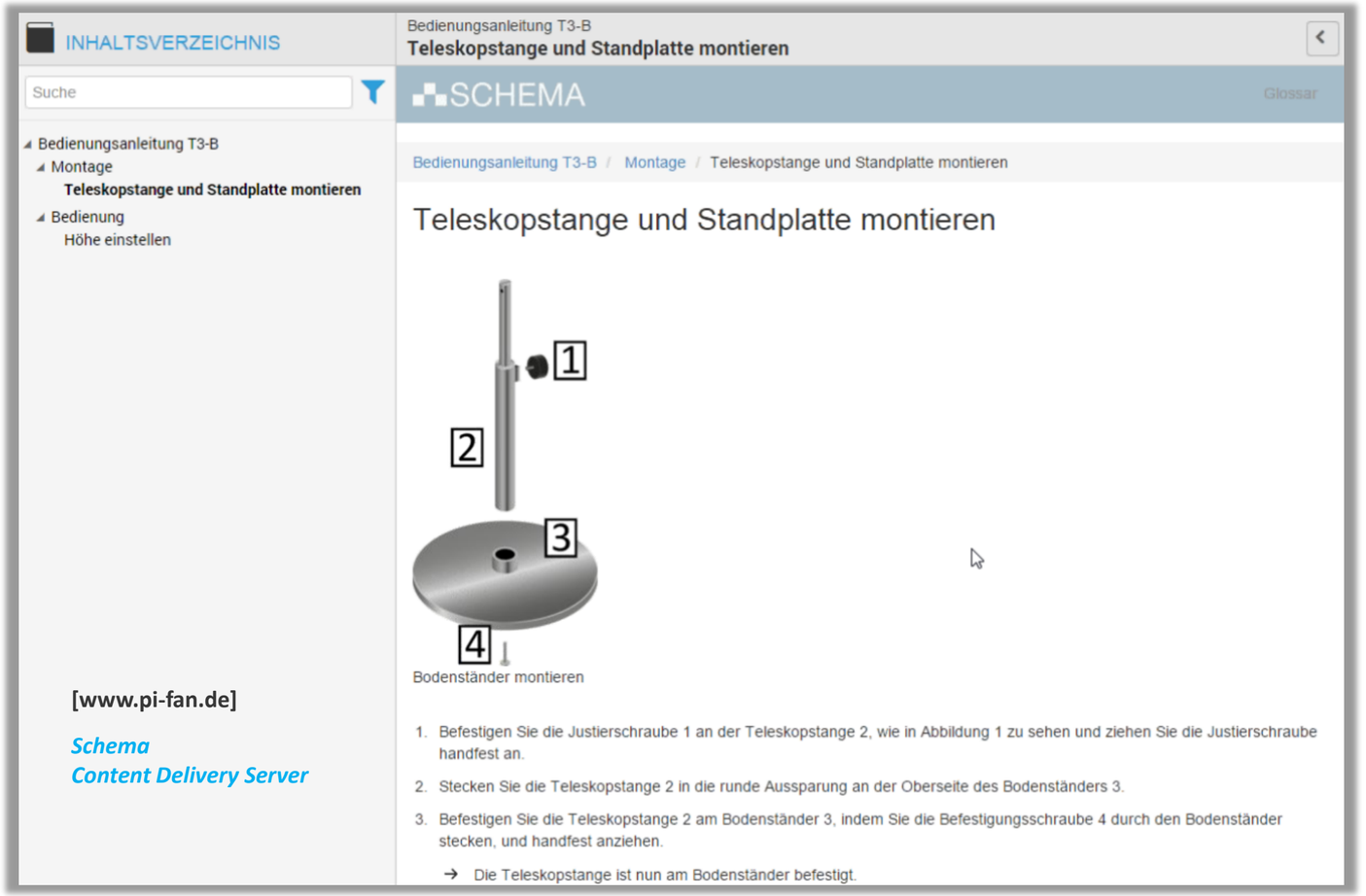
Schema Content Delivery Server

Navigating the document structure; then facetted filter

www.pi-fan.de

CD Methods

Content Delivery Portal (PI-Fan)

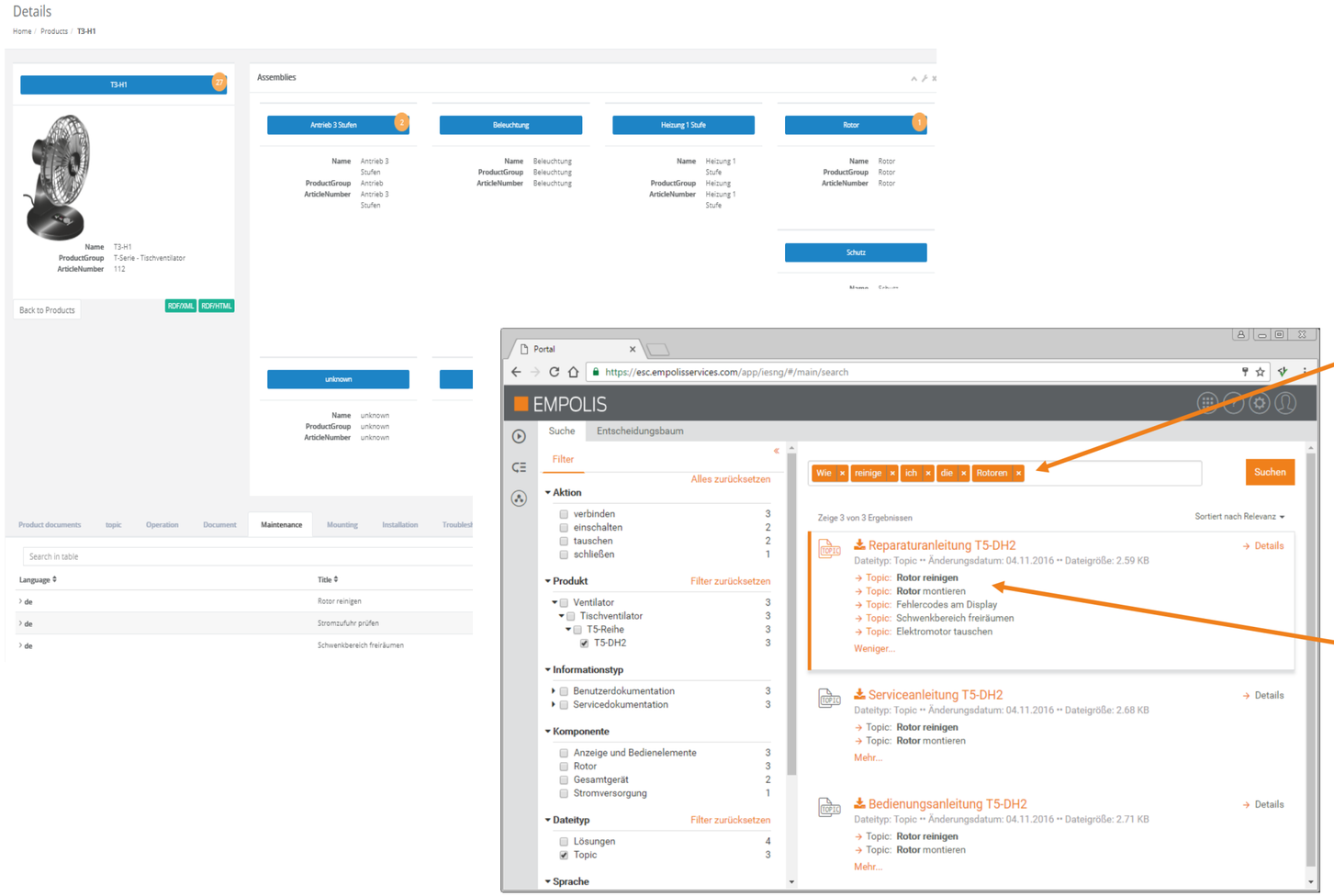


[www.pi-fan.de]

Schema
Content Delivery Server

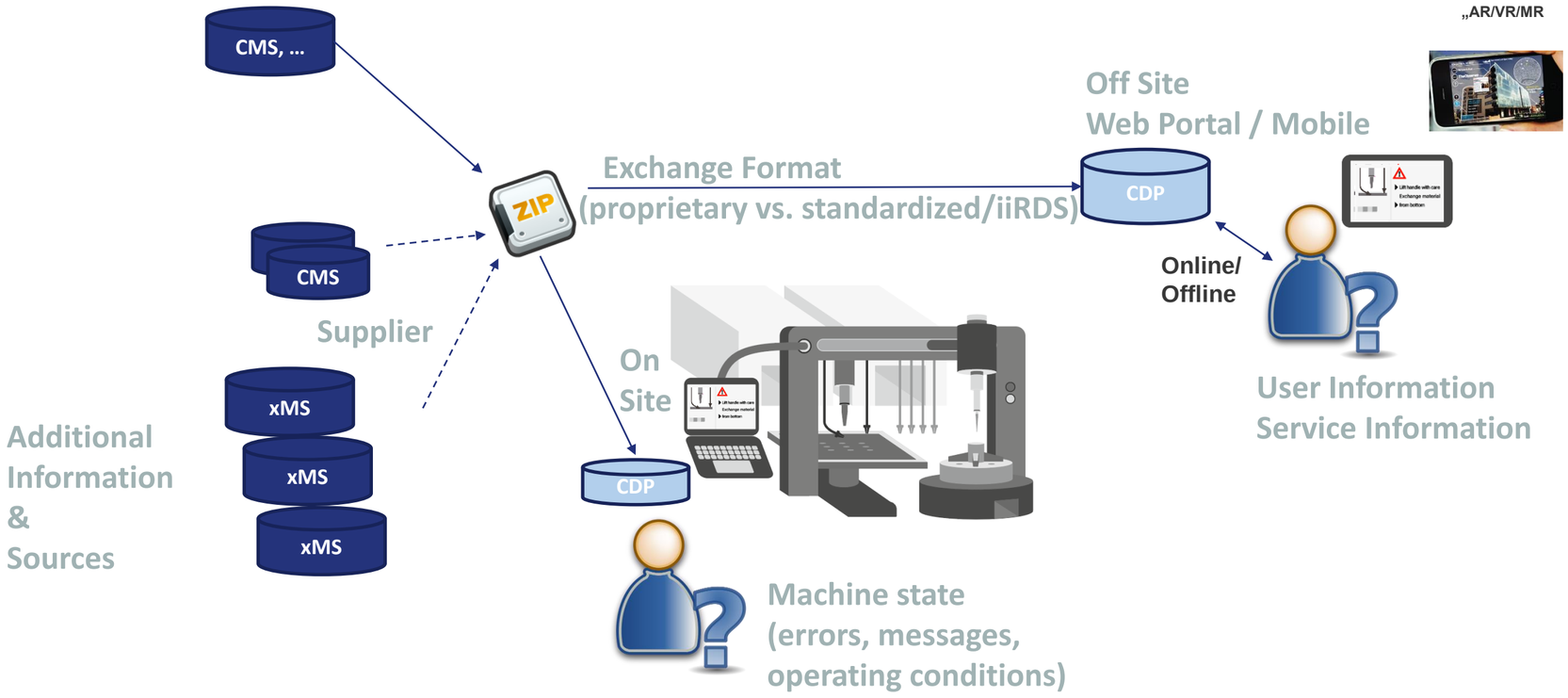
CD Methods

Content Delivery Portal (PI-Fan)



CD Methods

CDP environments in industrial applications

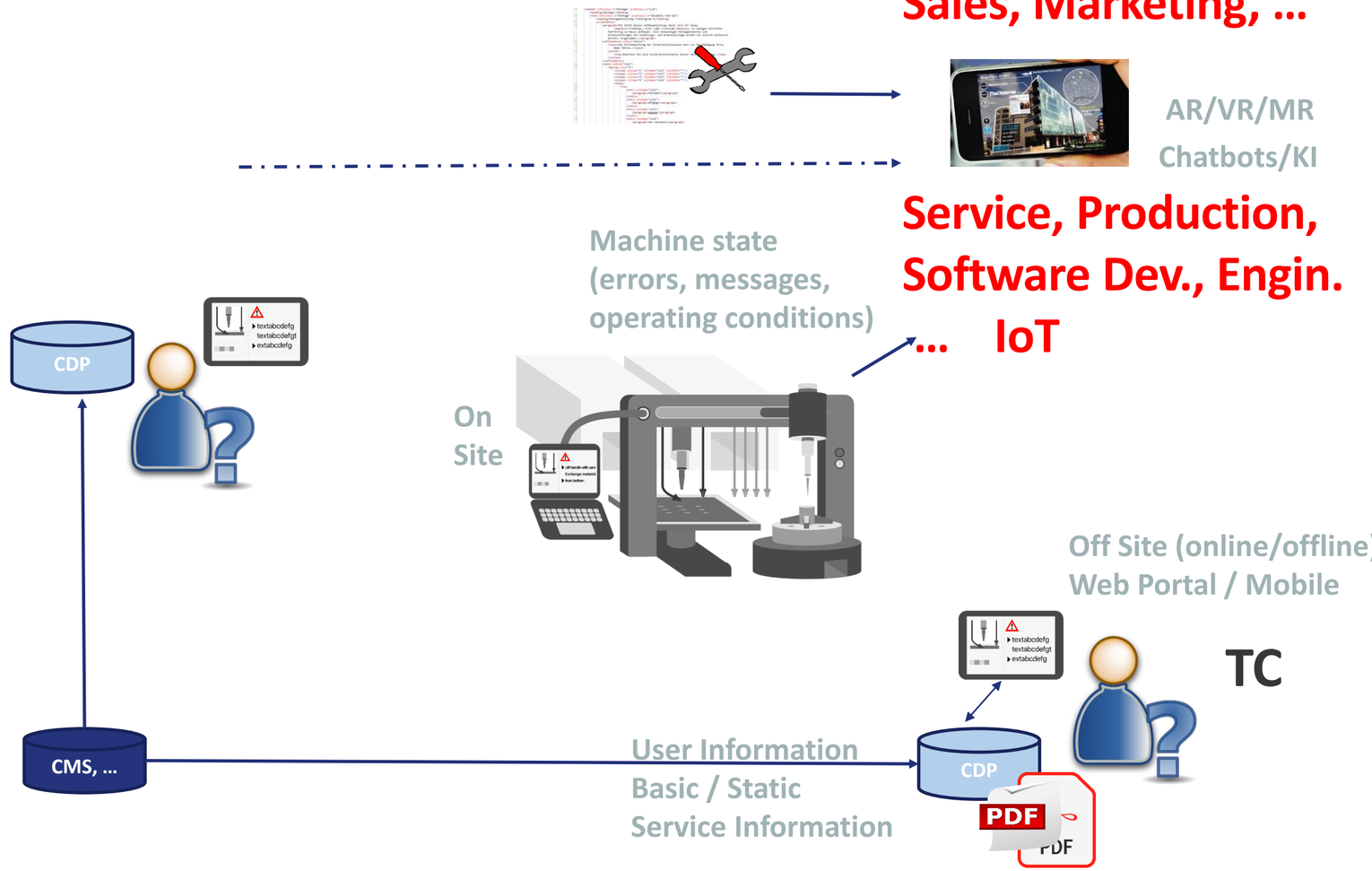


CD Methods

Digital Services by different

- Projects
- Show cases
- Departments

What ist the (recent/real) role of TC in digitization?

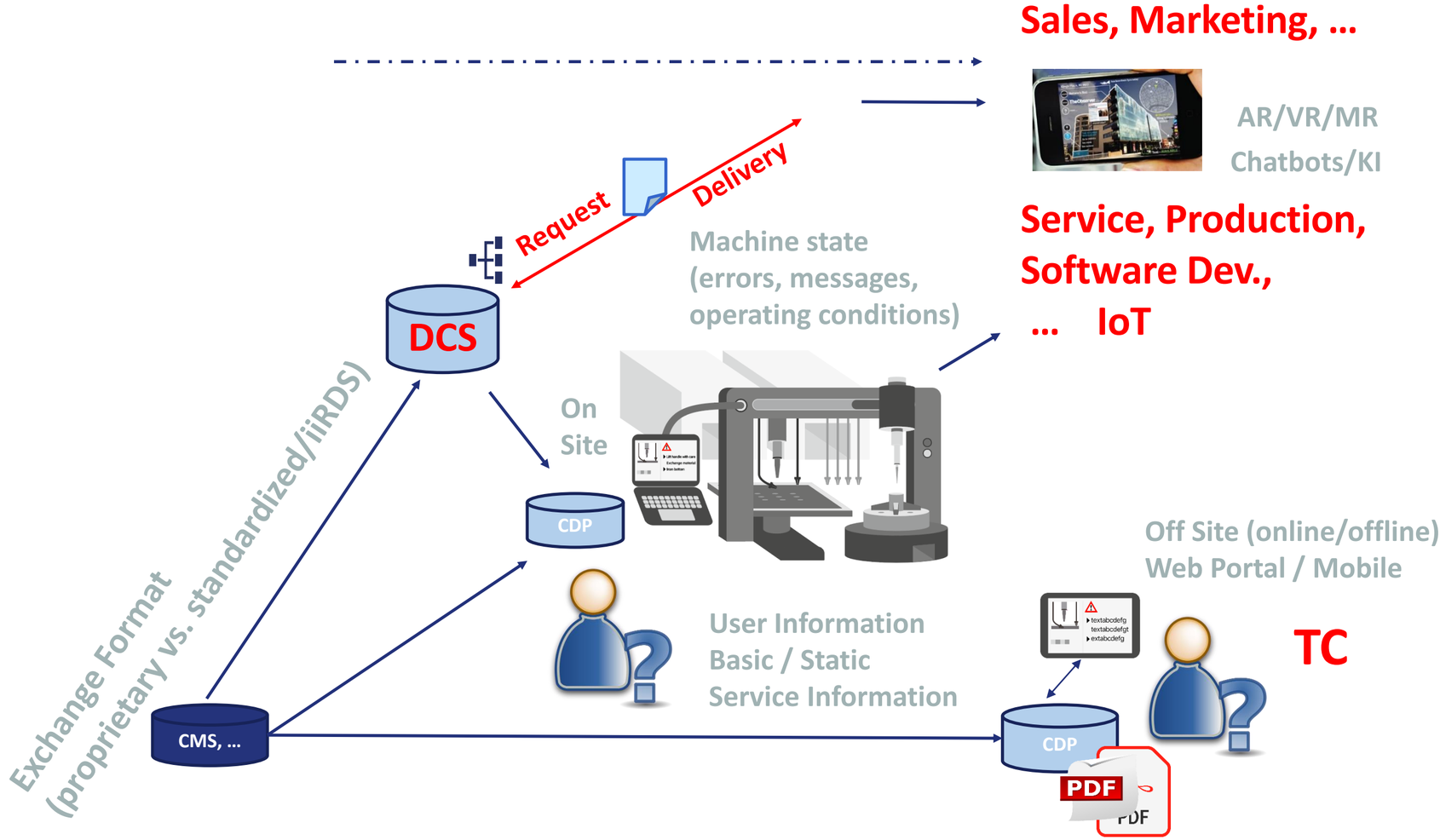


CD Methods

CDP as Digital Content Service

- Content provisioning for data integration
- Web interfaces /API
- Standard Formats (XML, HTML, PDF, iiRDS)
- Requires classified topic based on variants and configurations!

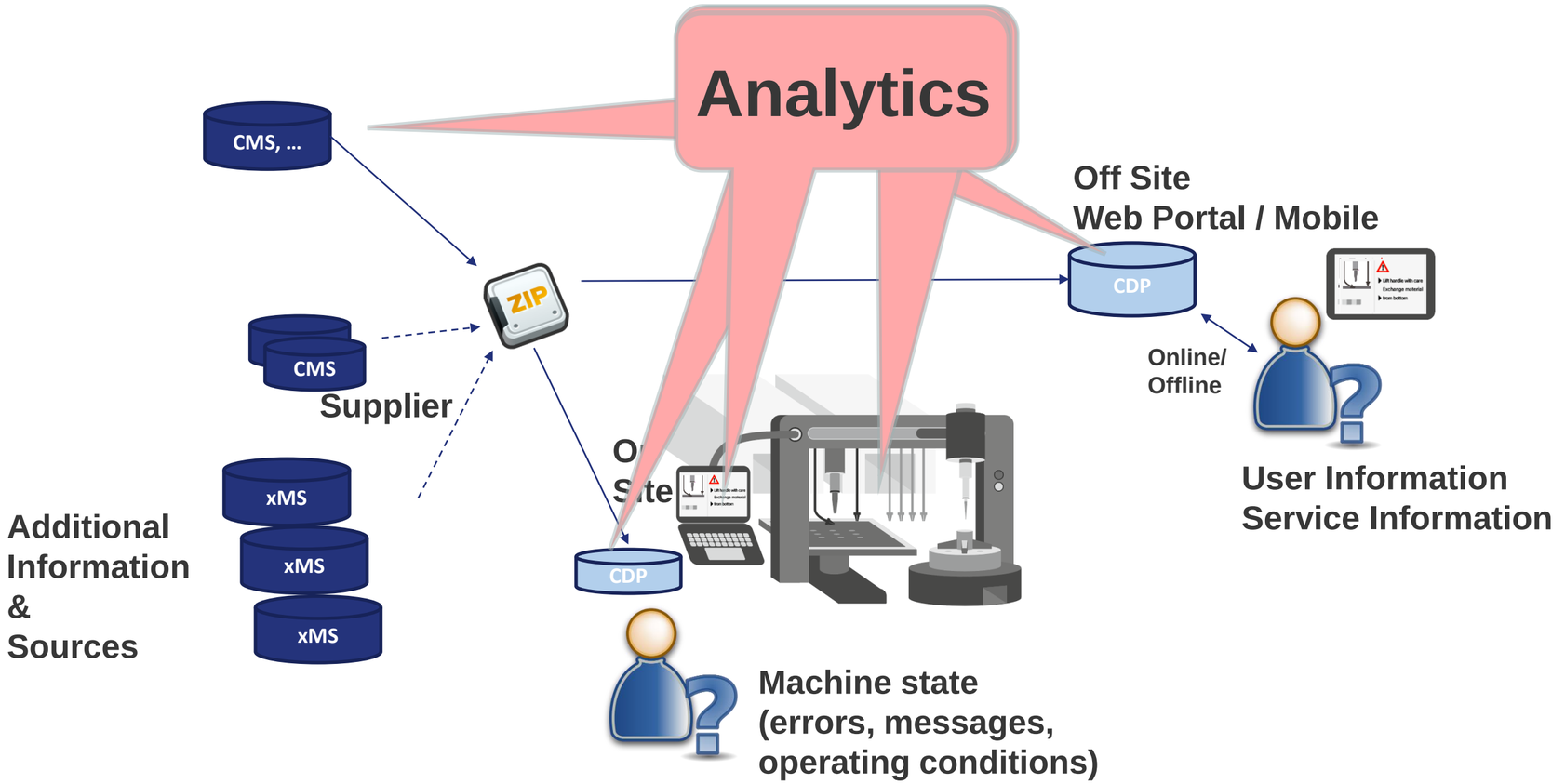
Delivery of TC content: Digital Content Service



CD Environment

Analytics

CDP and analytics in industrial applications



CMS & CDP Analytics

Analytics

Overview of Content System Analytics

CMS Analytics (REx)

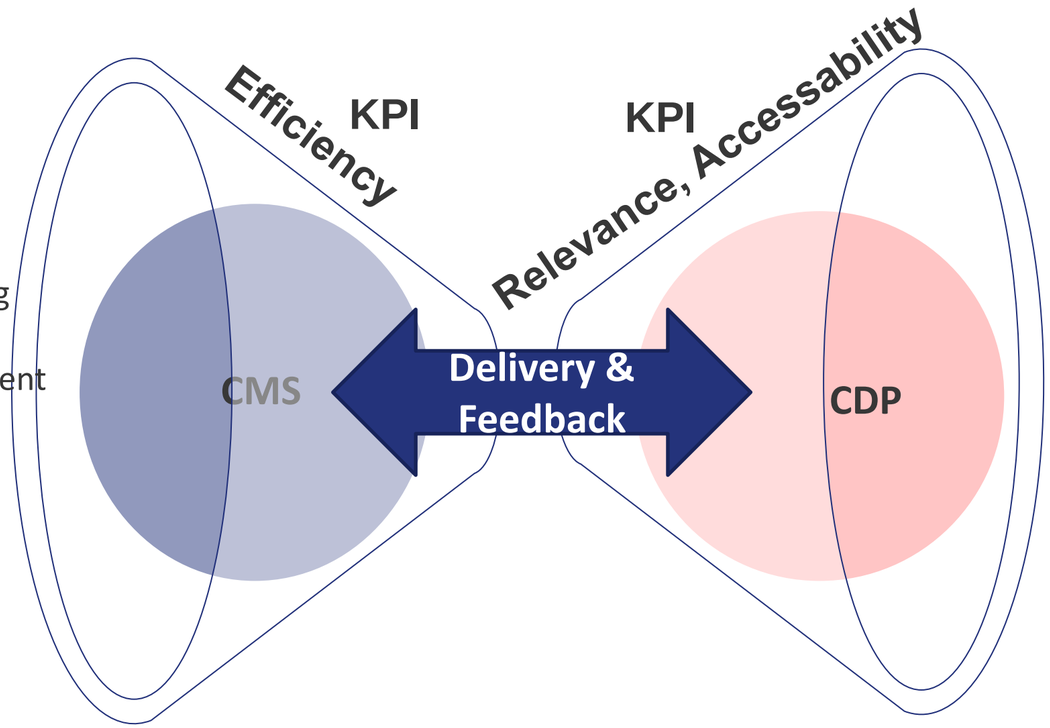
→ Metrics:
- Reuse Rates (Abundancy)
- Redundancy
- Document Sharing factor
- Variant management
- Correlations; Distributions

…

Artificial Intelligence

→Quality assurance:
- Similarity analysis
- Classification quality

…



CDP Analytics (CoReAn)

Indirect feedback

→ Metrics:
- visiting time,
- Visit frequency
- search behaviour
- search terms
- …

Direct feedback
- Rating
- Satisfaction

→ Improve:
- Product
- Information
- Terminology (Harvesting)

Content Delivery

Summary (CDP)

- Technology of CDP is available mostly for delivery of document packages and facetted search for contained topics and documents; Source of **facets are mostly taxonomies** from **CMS**
- Remark**:Dynamic aggregation, **variant management** is (at the moment) mostly done in CMS, not in CDP; **configuration management** needs new approaches because of its more dynamic and complex structure
- Delivery use cases for successful applications have to be clearly explored and defined
- Delivery can be developed in addition as **Digital Content Service** (DCS) for various external and internal applications and media

Content Delivery

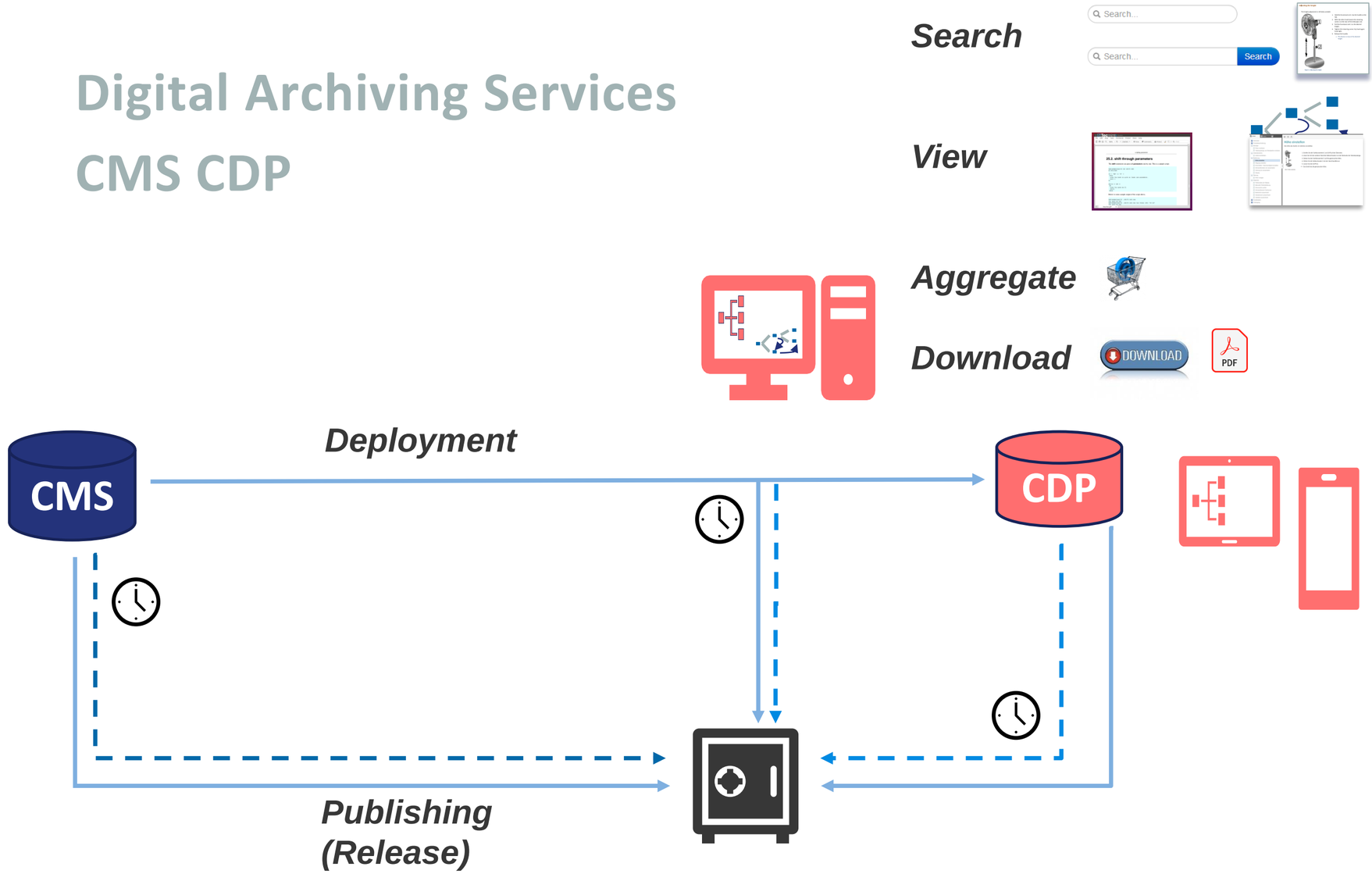
Summary II (CDP)

- Technology of CDP is available mostly for delivery of document packages and facetted search for contained topics and documents; **Source of facets are mostly taxonomies from CMS**
- Dynamic aggregation and variant management is (at the moment) mostly done in CMS, not in CDP
- iiRDS is an evolving format standard for the exchange of packages; it is based on PI-Class
- Use cases have to be clearly defined for successful applications
- Delivery can be developed as Content Service for various appl.

CMS – CDP

Digital Archiving Services

CMS CDP



Digital Information Services

Business and Use Cases for Content Delivery

Bayer Crop Science
16.132 Abonnenten
ABONNIEREN
Teilen
We are shaping agriculture
for farmers
WEITERE VIDEOS

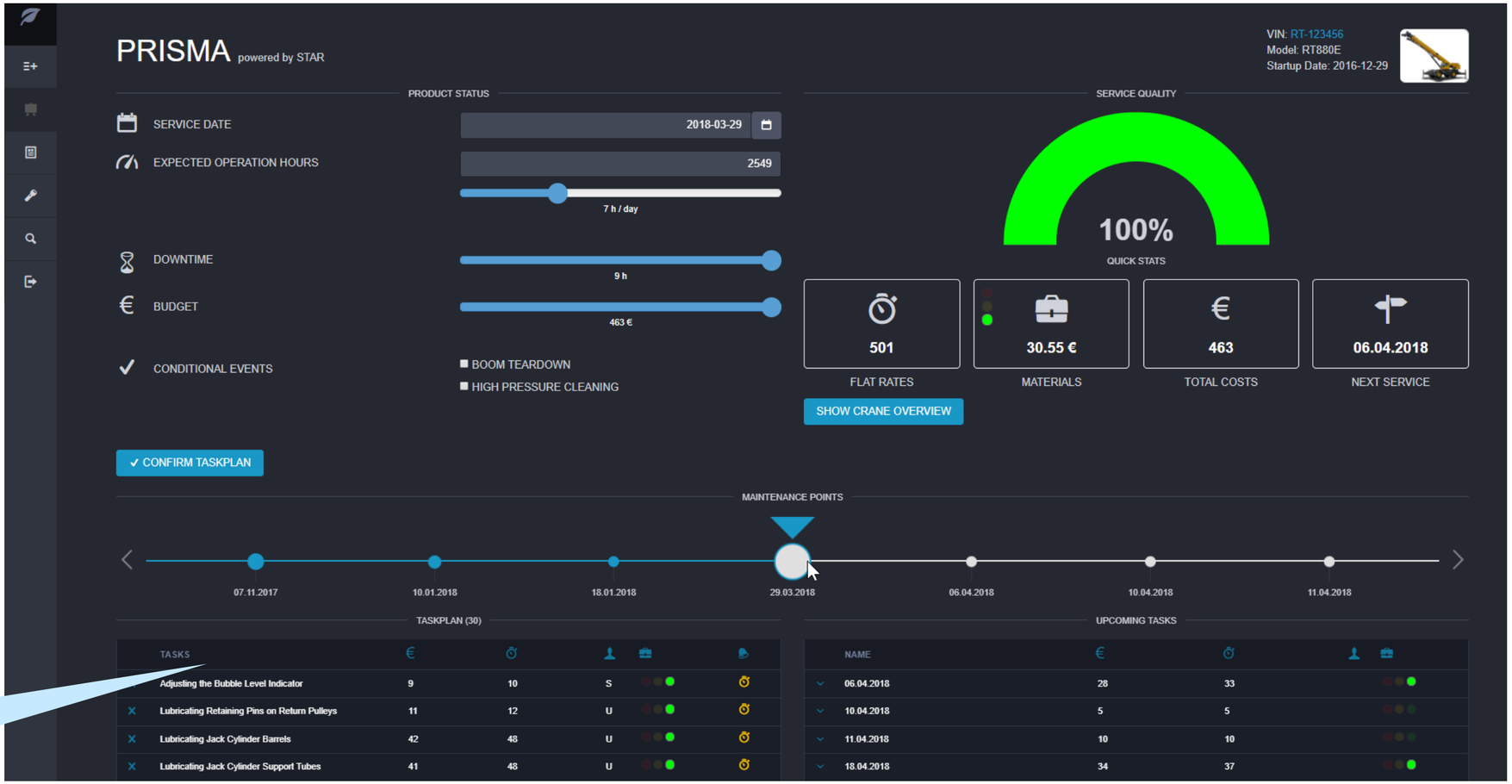
Smart Fields

Digital Information Service (for machine service)

CDP and CMS information is connected to service processes

Retrieval/request by (PI-)Classification

Service planning and tracking



Source: STAR AG

DIS
as extended product portfolio

Source: Voith Hydro

Service Information and AR (Hololens)

https://www.youtube.com/watch?v=nyDZ7Q4AFu8

Digital services as an extended product portfolio

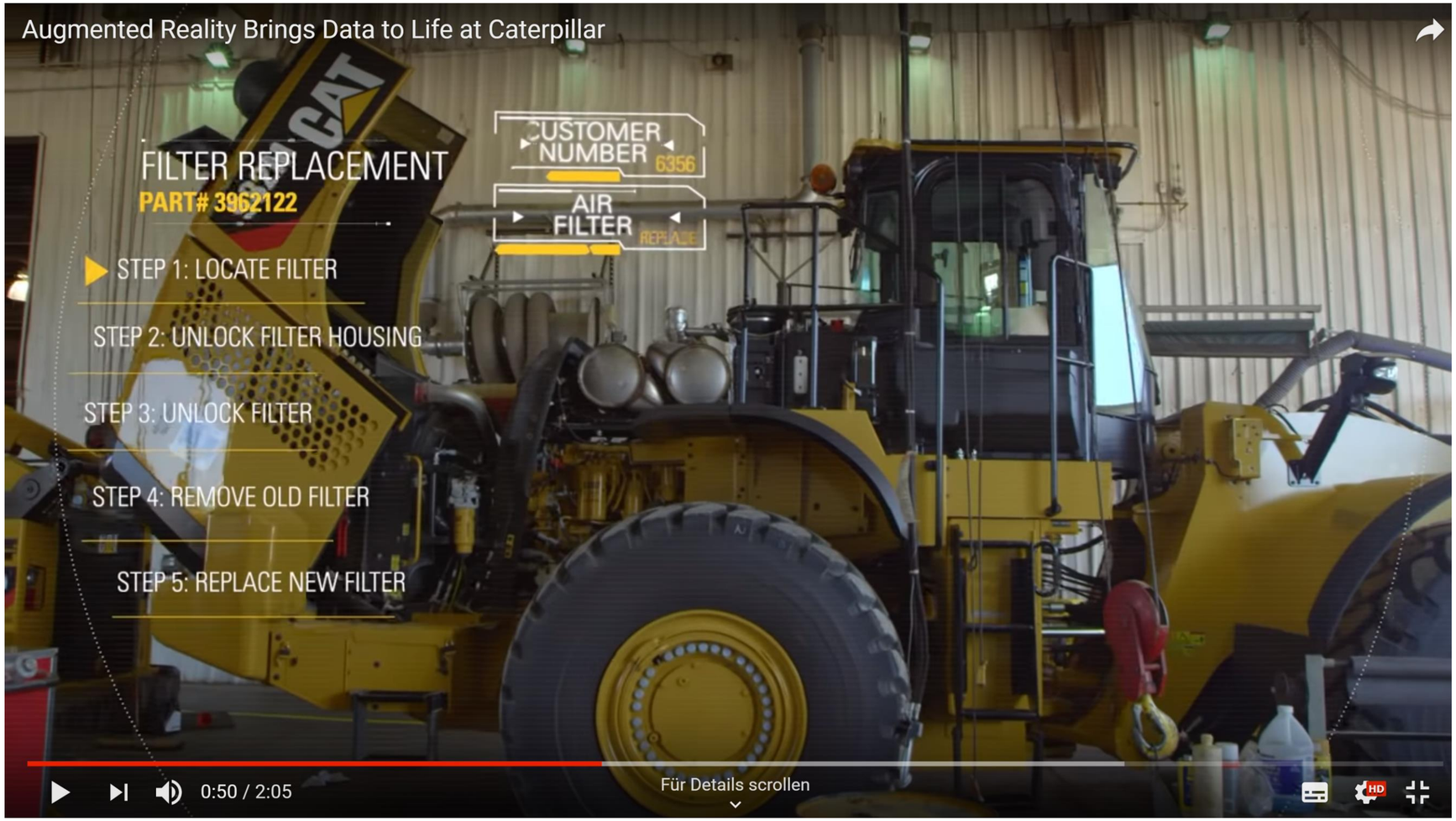
Service Information and AR (Hololens)

Source: Voith Hydro

https://www.youtube.com/watch?v=nyDZ7Q4AFu8

Interactive data from system sensors;
Content integration from
various sources;

DIS



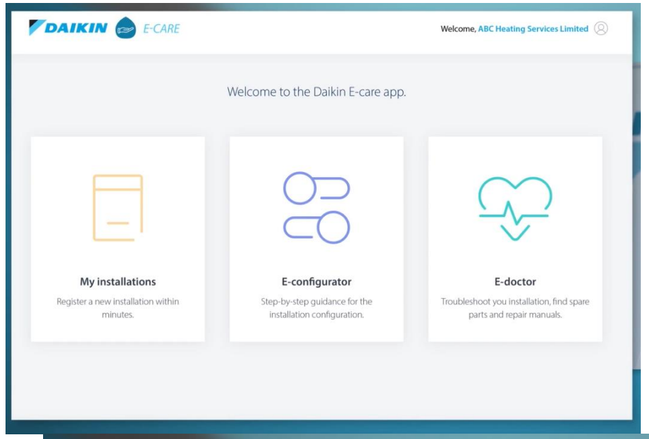
https://www.youtube.com/watch?v=VGtCQWROytw

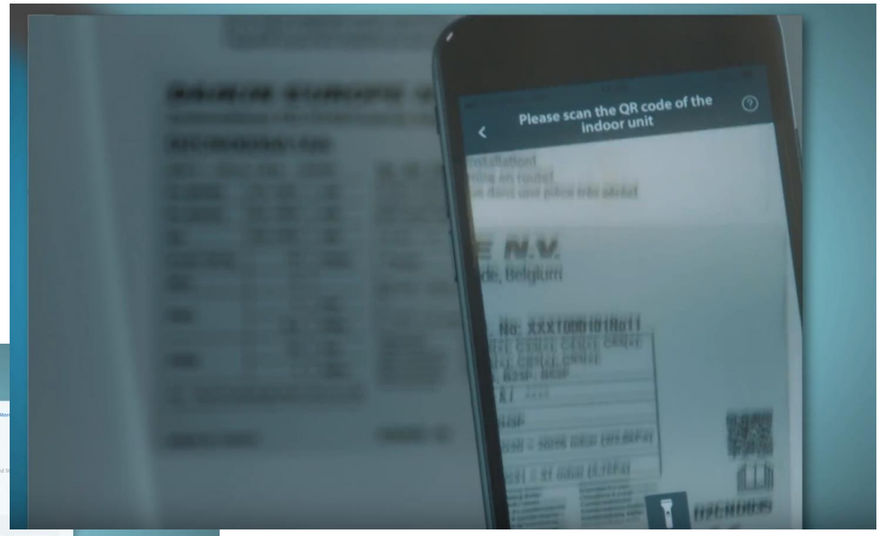
DIS

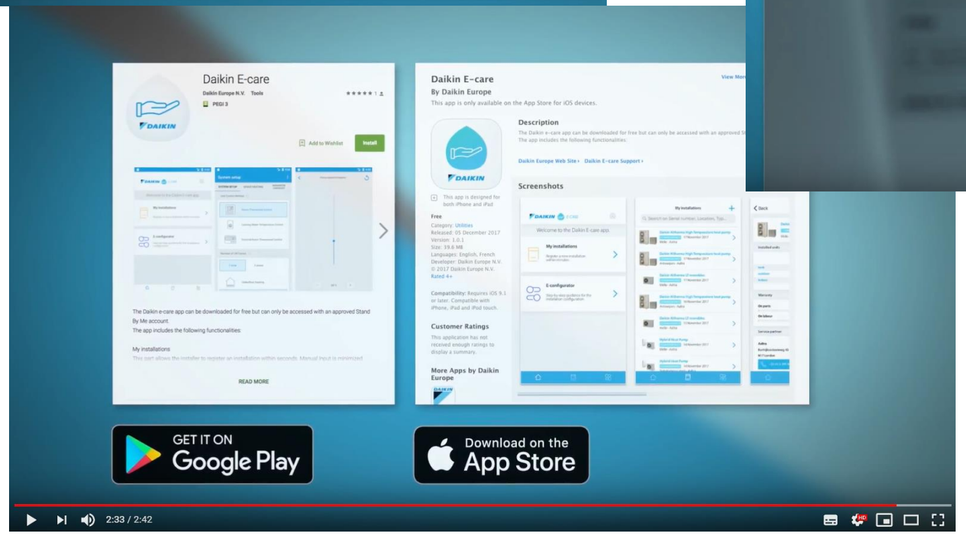
Reseller support

(Heating, AC)

Installation, Configuration, Troubleshooting





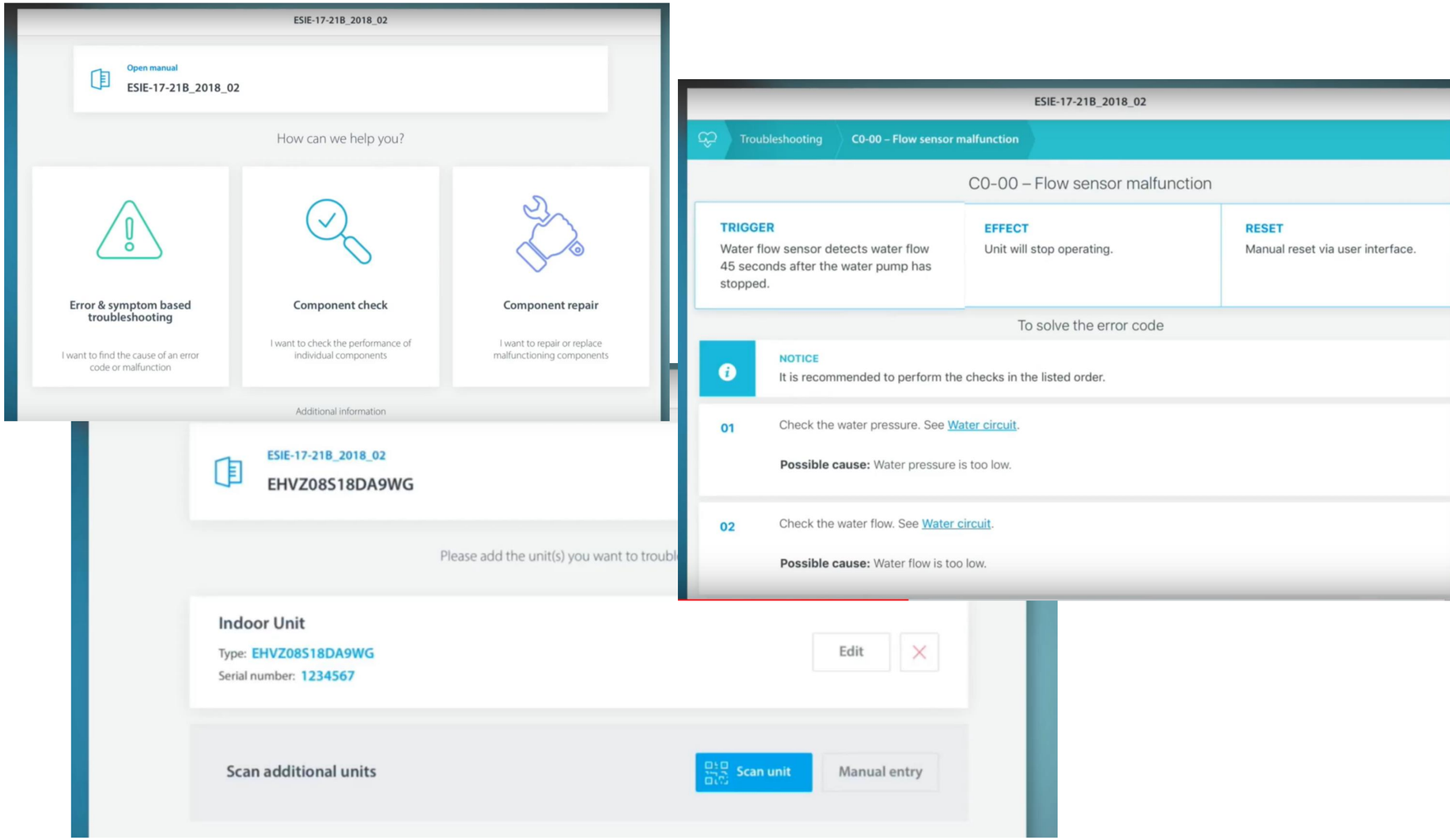


DIS

Reseller support

(Heating, AC)

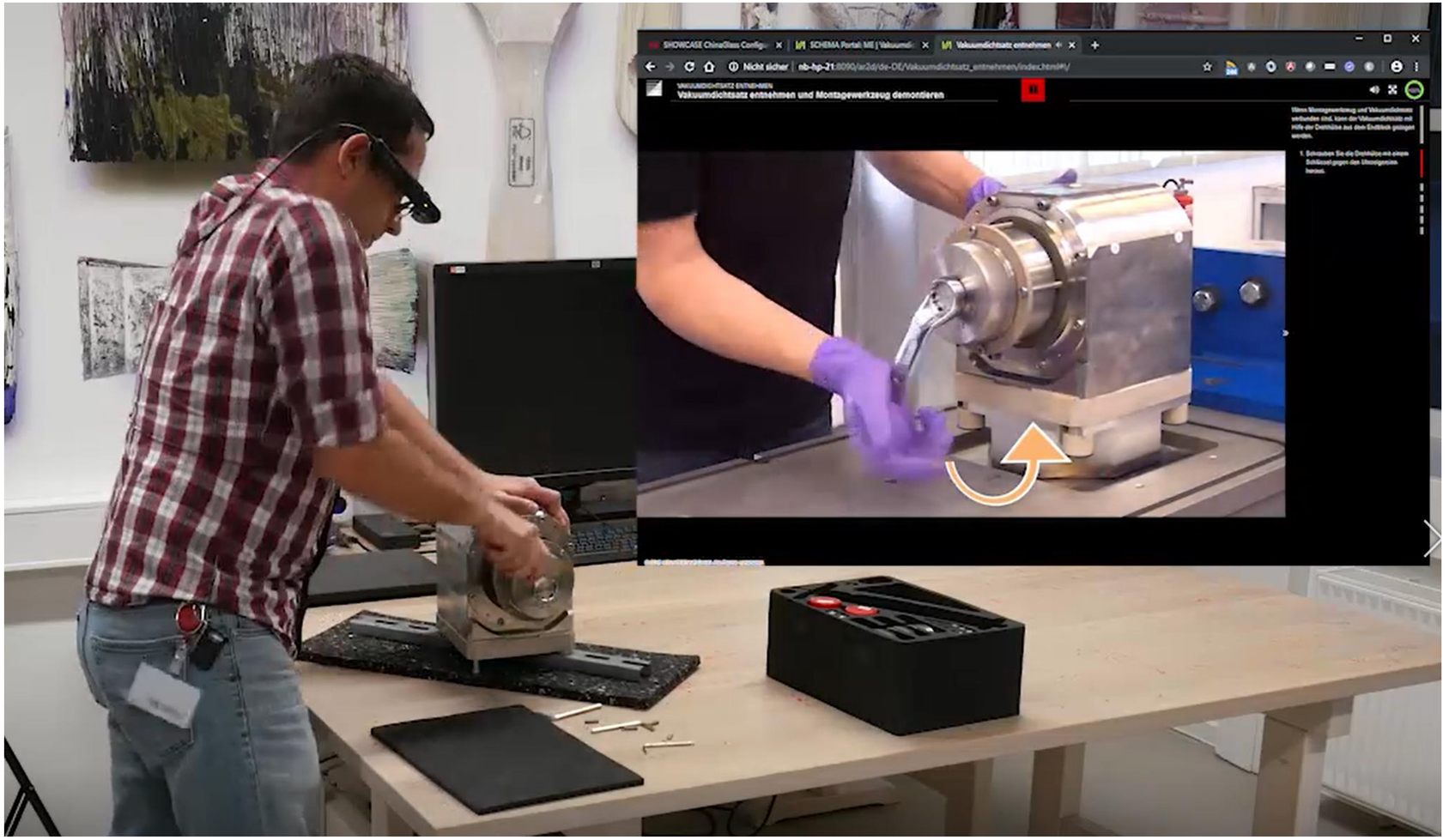
Installation, Configuration, Troubleshooting



DIS

Service (von Ardenne)

Remote Assist (including video + AR)

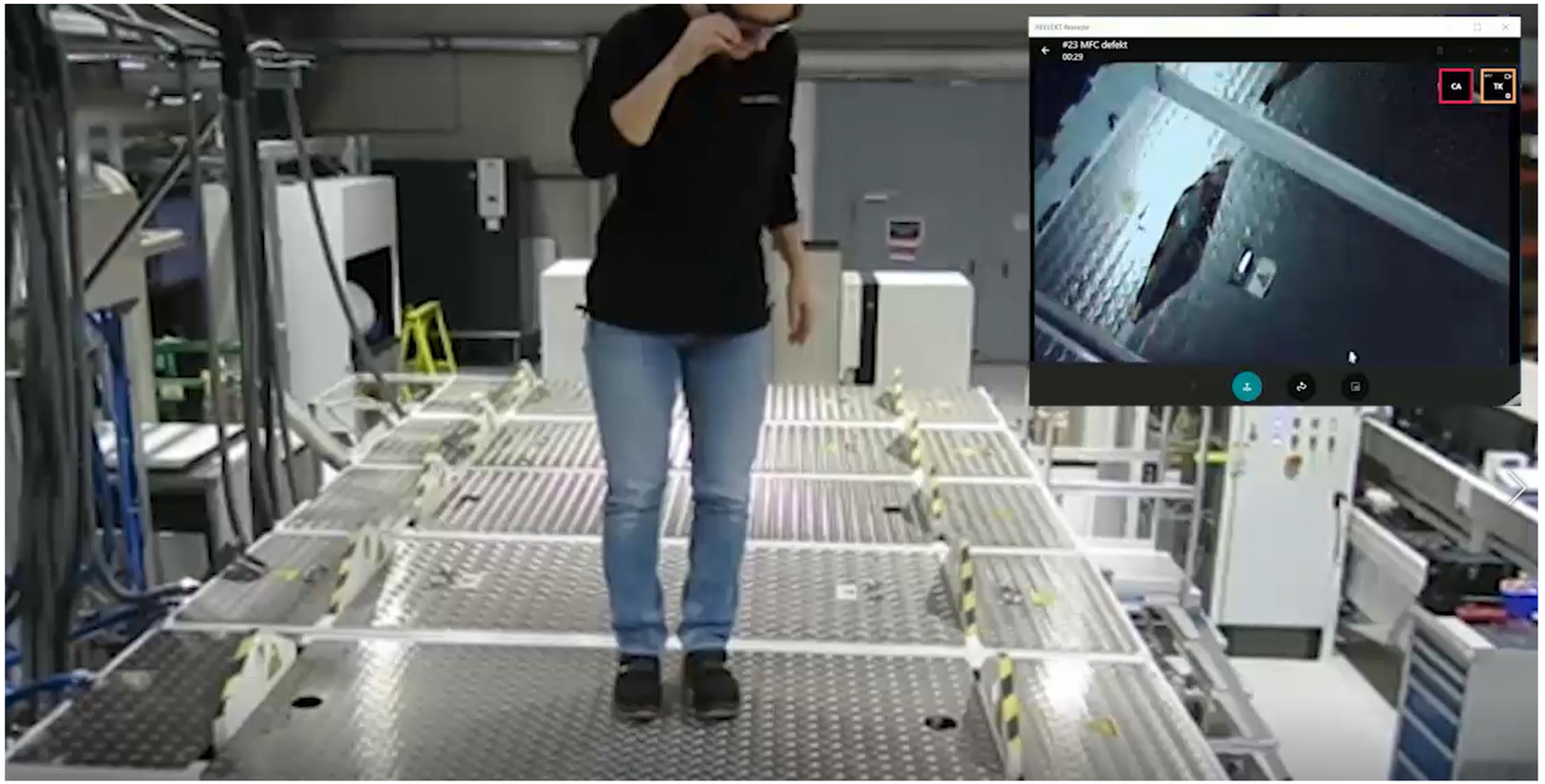


DIS

Remote Service

(von Ardenne)

Remote Assist (including video + AR)



DIS

Training (von Ardenne)

VR-based Learning

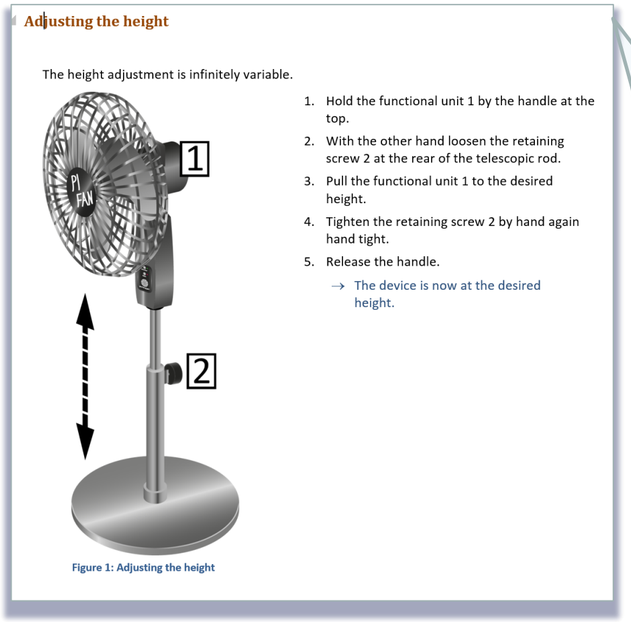
video_t3_vr

Content Management II

Deep(er) Dive into Classification

CM Methods

Basic Dimensions of Module Classification (PI-Class®)



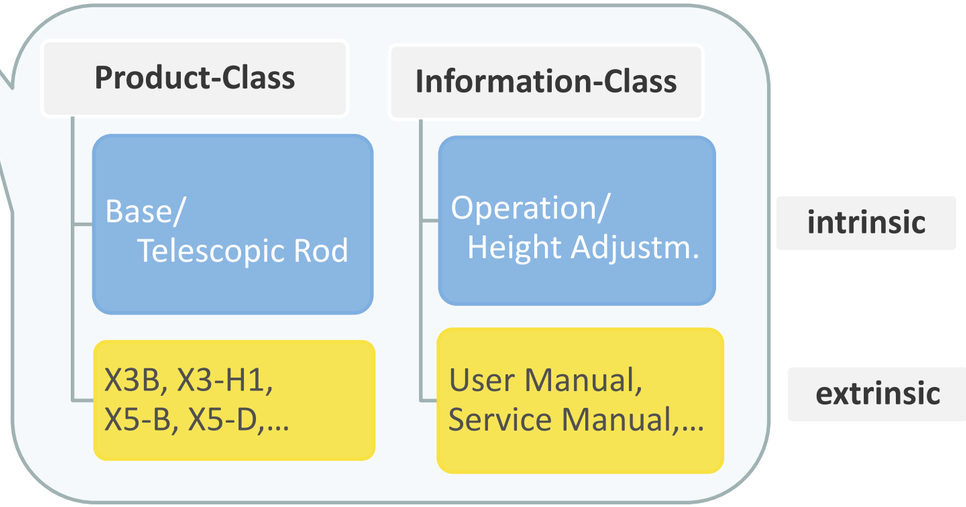
Adjusting the height

The height adjustment is infinitely variable.

1. Hold the functional unit 1 by the handle at the top.
2. With the other hand loosen the retaining screw 2 at the rear of the telescopic rod.
3. Pull the functional unit 1 to the desired height.
4. Tighten the retaining screw 2 by hand again hand tight.
5. Release the handle.

→ The device is now at the desired height.

Figure 1: Adjusting the height



Topic: self-contained information unit;

topic concept and content is defined by (intrinsic) PI-classes

www.pi-fan.de

CM Methods

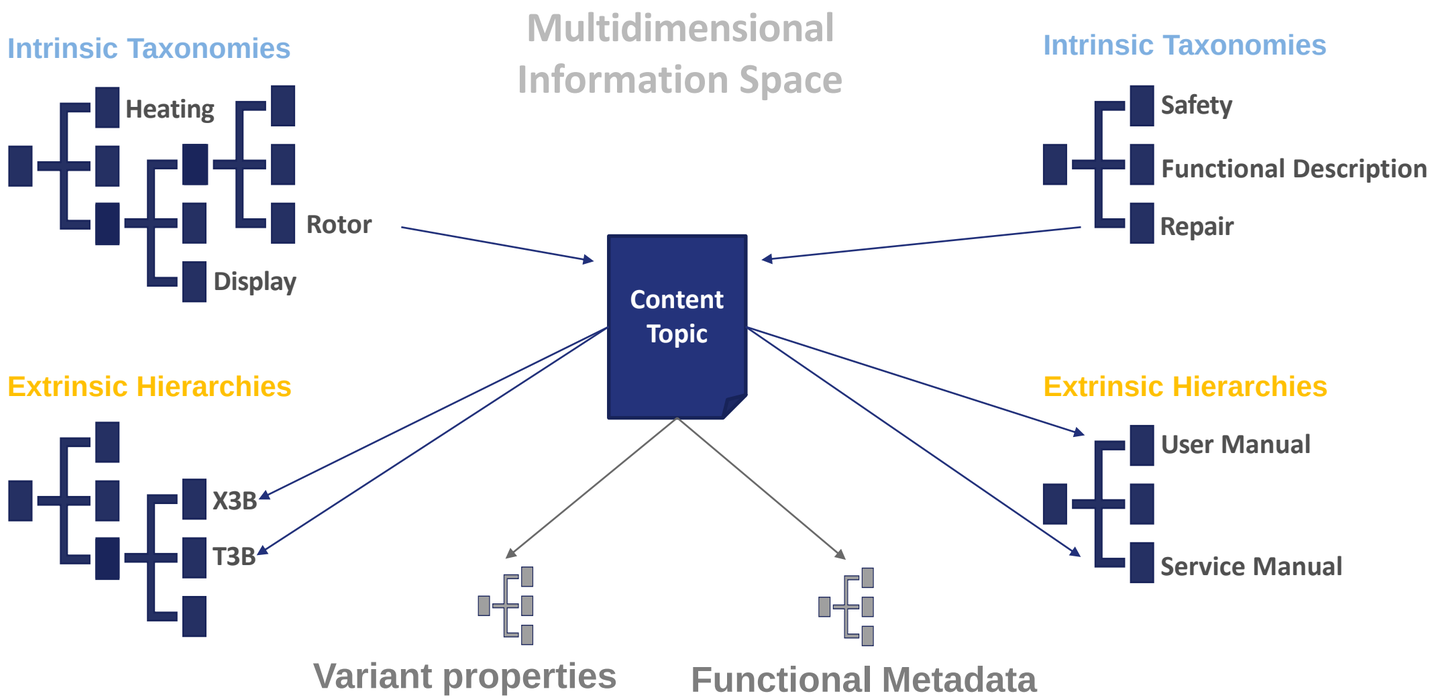
Metadata

for identifying

and addressing

modules/topics

CMS „Taxonomies“ from Topic Classification

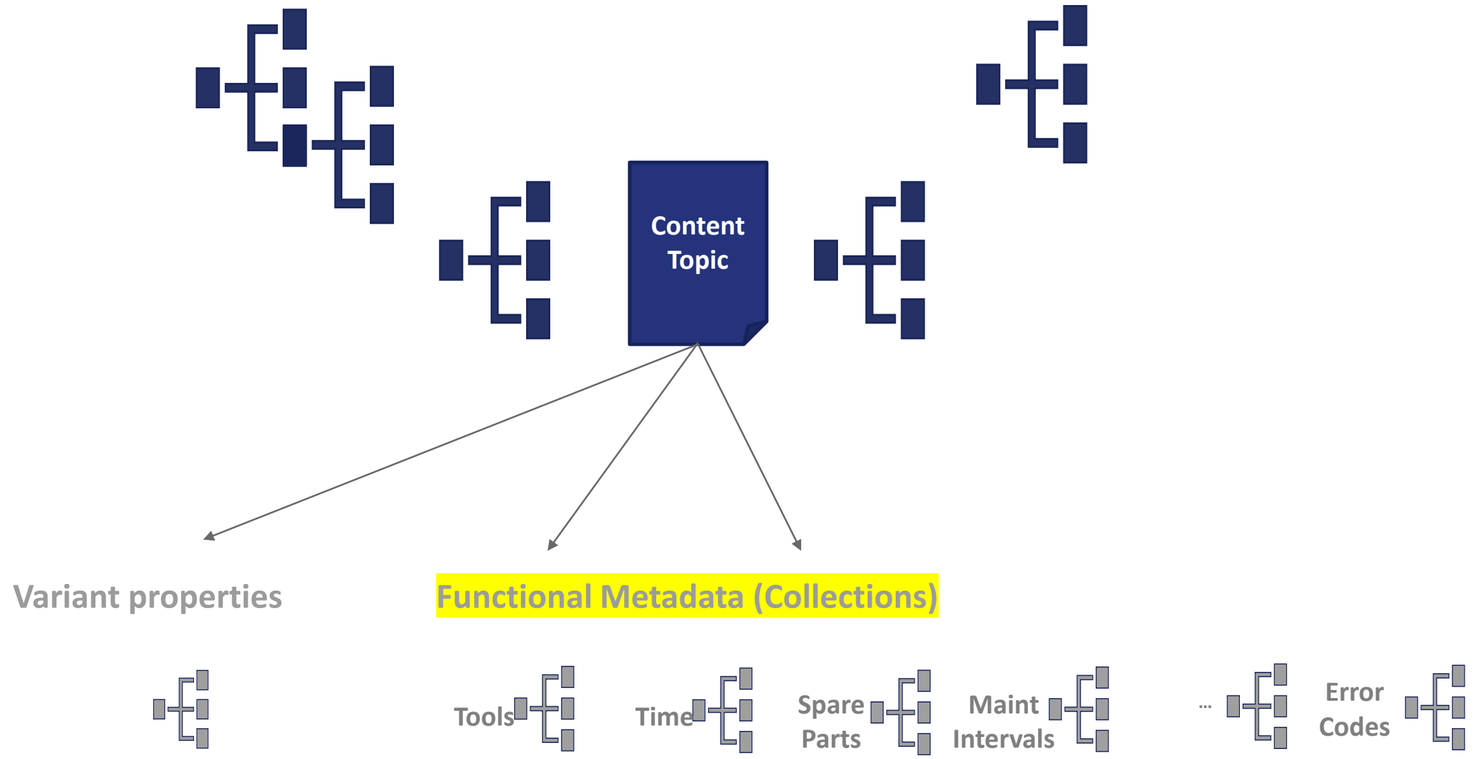


Hierarchies, Taxonomies, List, …

CM Methods

CMS „Taxonomies“ from Topic Classification

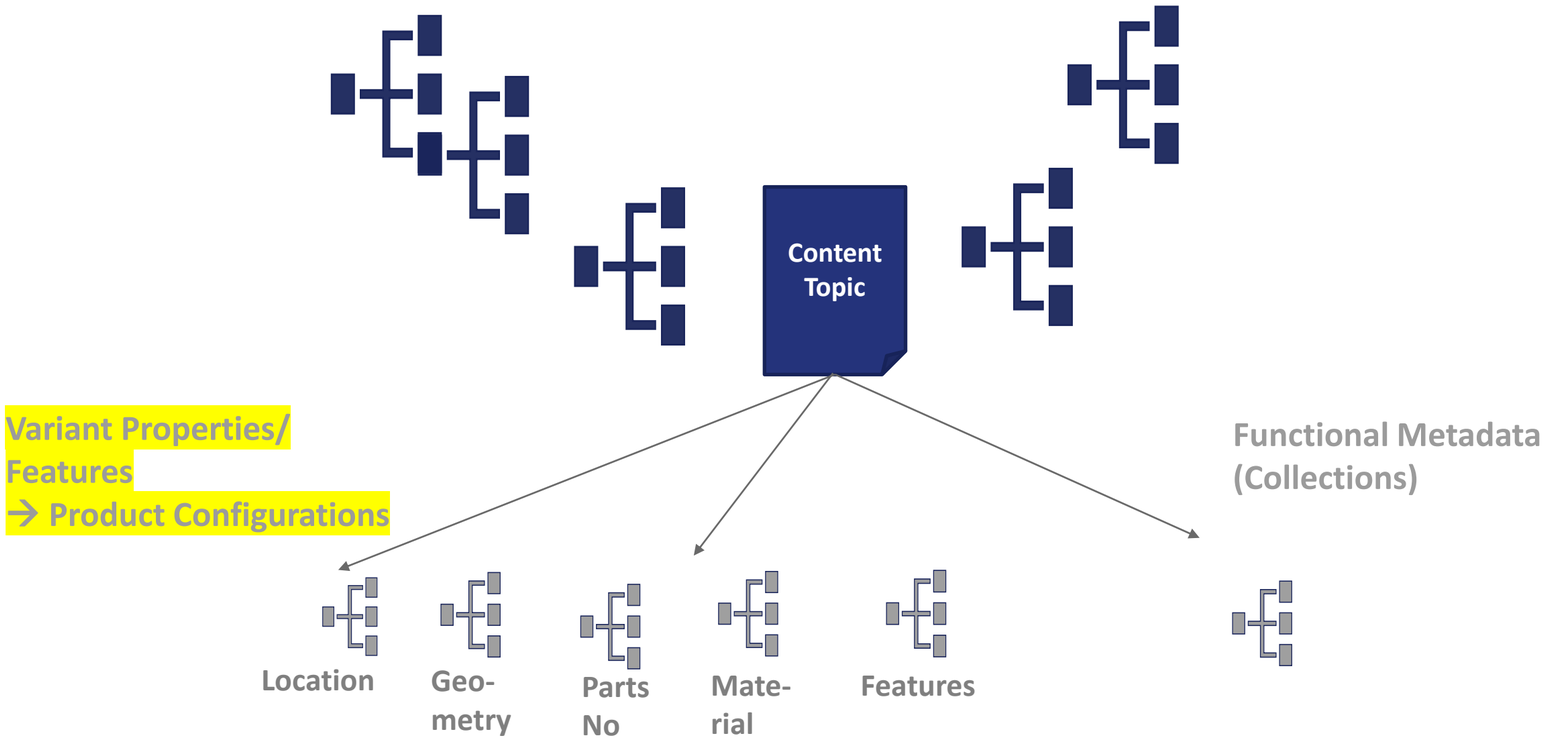
Extended PI-Class: Multidimensional Information Space



CM Methods

CMS „Taxonomies“ from Topic Classification

Extended PI-Class: Multidimensional Information Space



CM Methods

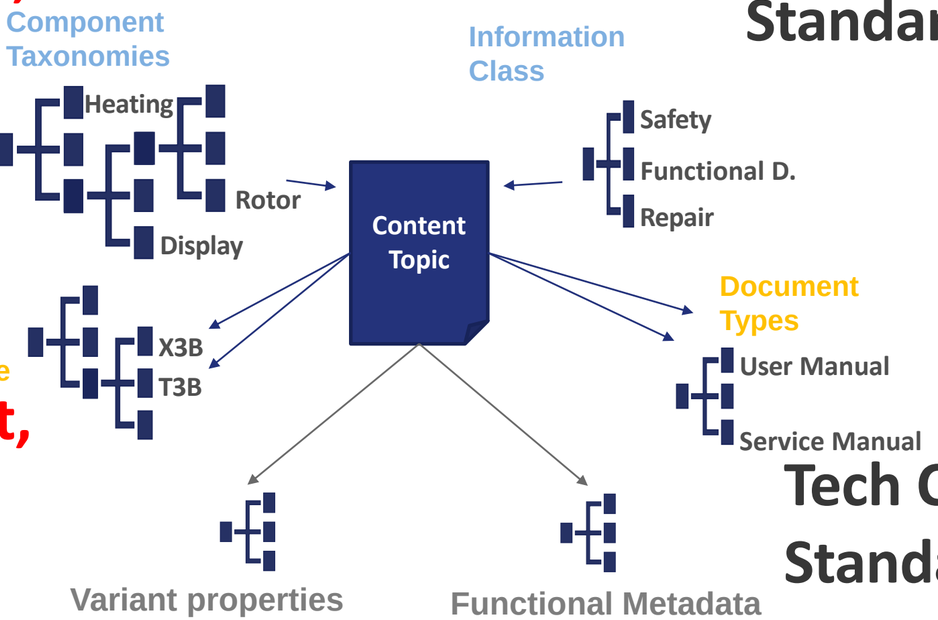
Depency on:

- Stake Holder
- Process Owner & Driver
- Information Sources & Systems

Information Environment and Dependencies

Engineering, Development, PLM, ERP or TC

Tech Comm. Standards, iiRDS



Prod. Management, Sales or Tc

Tech Comm. Standards, VDI 2770

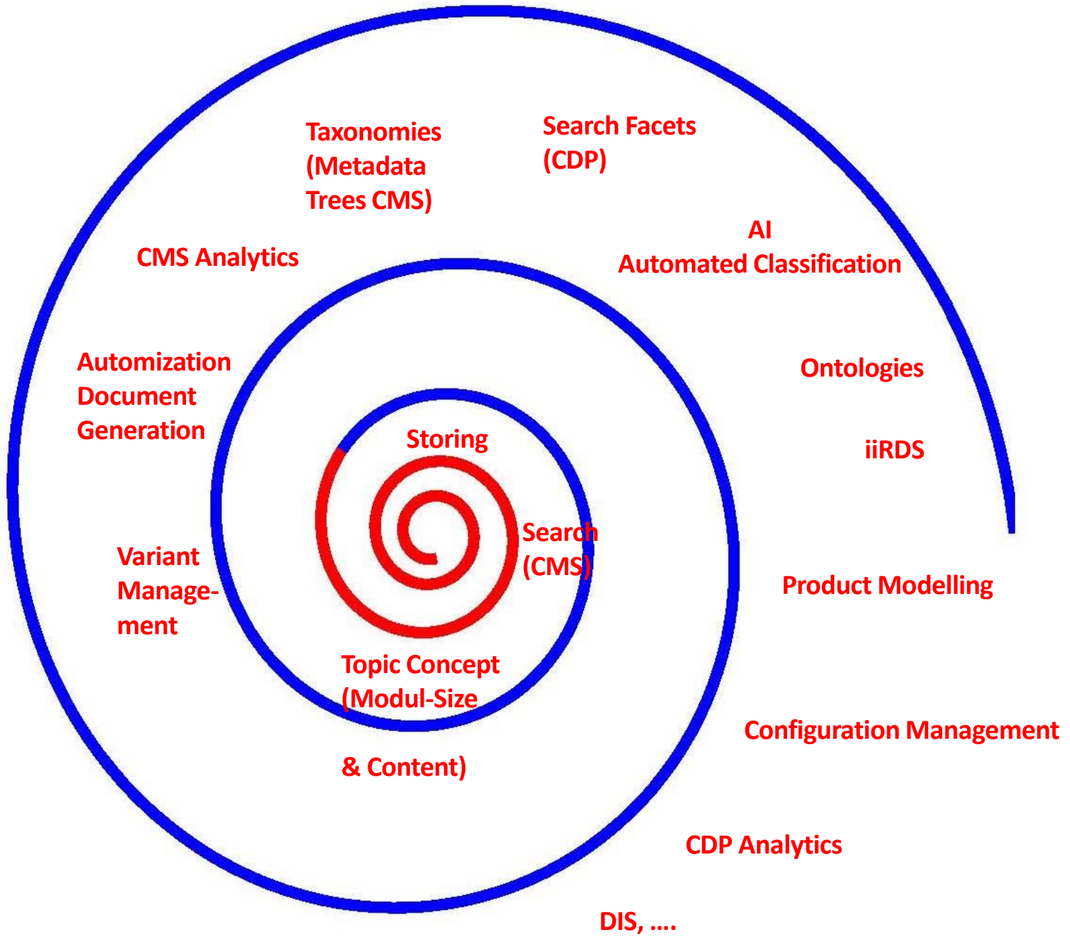
ERP, Engineering, PLM, PIM/PDM

Service, Production, Software Dev., … IoT!

CM Method

Use of Semantic Metadata

How (PI-) Classification evolved with Topics/Modules



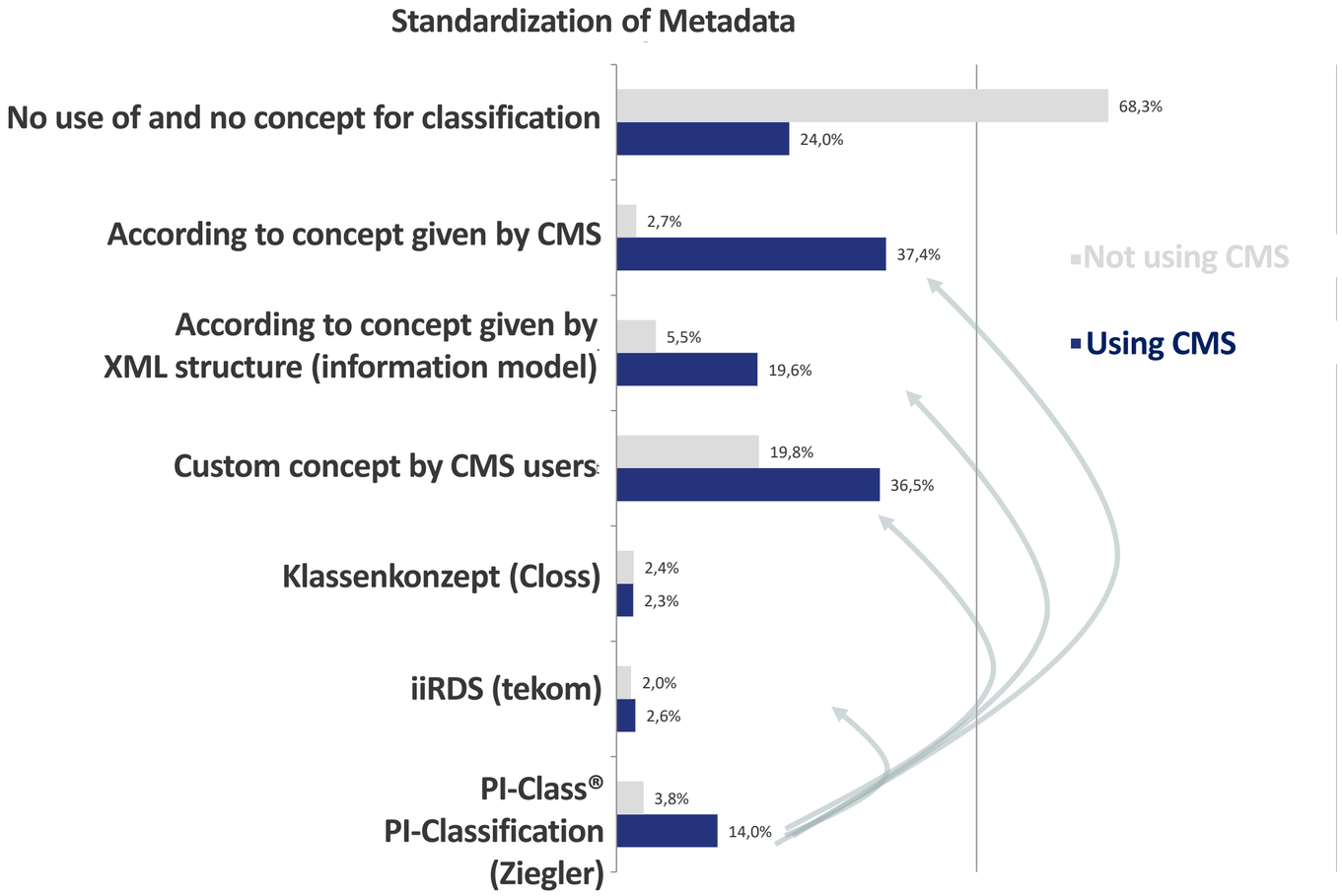
Content Management

tekom CMS Study 2018

(D-A-CH/ Central Europe)

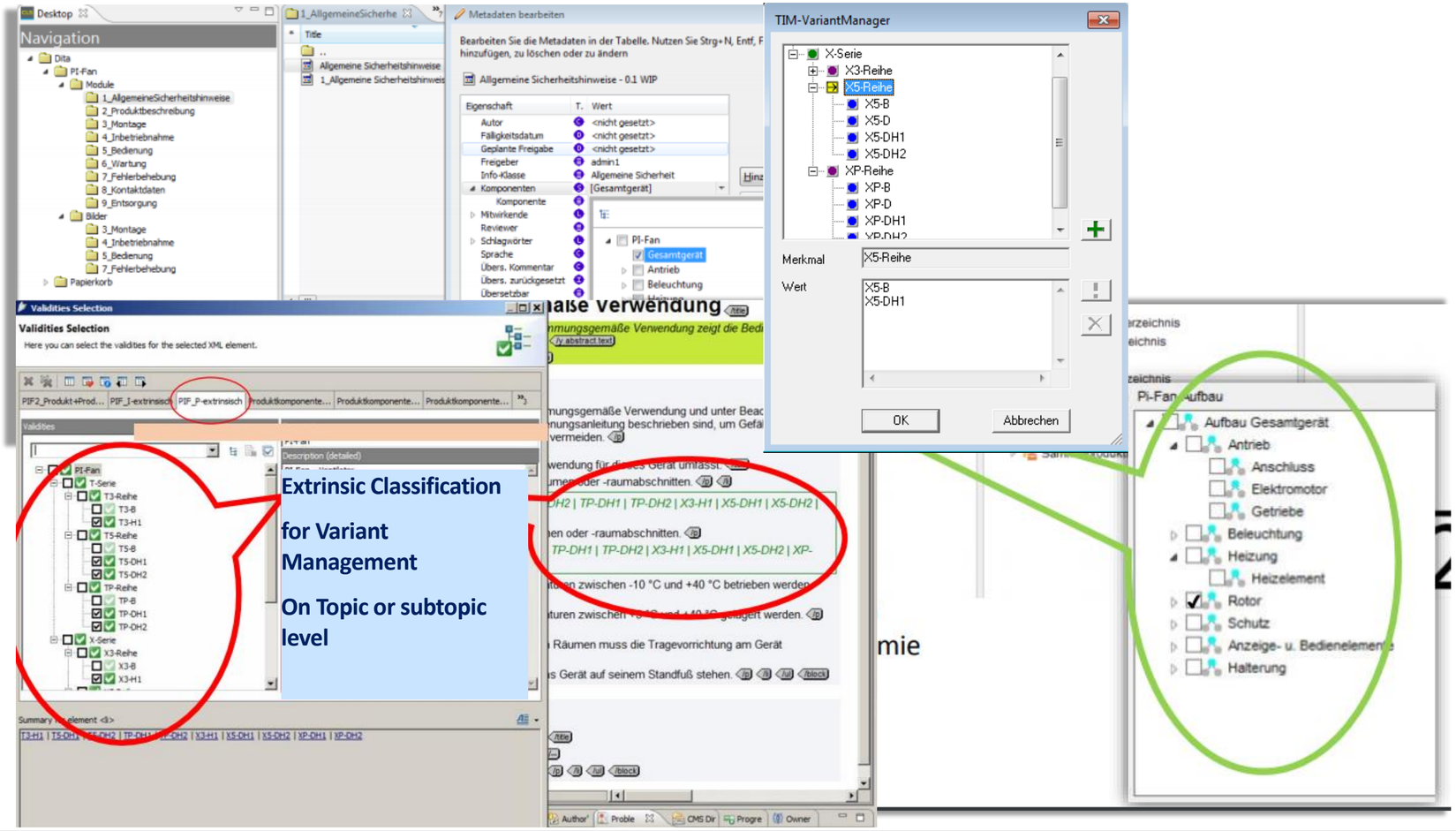
(approx. 700 – 850 persons)

Use and Type of Classification with/without CMS



CM Methods

PI-Fan implementation & PI-Classification in CMS



CM Methods

Classification of Components

Product class 1 (Assembly/ Functional group)	Product class 2 (Components/ Functional unit)	Product class 3 Part
Complete device		
Drive		
	Drive	
	Connection	
	Electric motor	
	Gear box	
Lighting		
	Cover	
	Light fitting	
Heating		
	Heating element	
Rotor		
	Blade	
	Blade mount	
	Impeller	
Protection		
	Safety grille	
Display_operating element		
	Speed controller	
	Swivel control	
	Temperature probe	
	Temperature control	
	Display	
Mounting bracket		
	Base	
		Base plate
		Telescopic rod
	Ceiling mount	

Analogous procedure of component-based decomposition and classification of software products:

- software components
- software classes/objects/functions
- GUI components
- programming units

EN Translation provided by RWS Group, Germany

www.pi-fan.de

CM Methods

Classification of Information Types

Information class 1 (Module type)	Information class 2 (Product life cycle)	Information class 3 (Detailed product life cycle)
Procedure	Operation	Blower adjustment Height adjustment Tilt adjustment Swivel activation Temperature adjustment
	Getting started	
	Storage	
	Assembly	
	Maintenance	Check Repair
Description		
	Layout	
	Disposal	
	Function	
	Tech. data	
Plan	Diagnostics	Error code Manual
Safety		
	General safety	
	Intended use	
	Specific safety	
	Forsee. misuse	

EN Translation provided by RWS Group, Germany

www.pi-fan.de

CM Methods

Classification of Products

Series	Model range	Type
T series	T3 range	
		T3-B
		T3-H1
	T5 range	
		T5-B
		T5-DH1
		T5-DH2
	TP range	
		TP-B
		TP-DH1
		TP-DH2
X series	X3 range	
		X3-B
		X3-H1
	X5 range	
		X5-B
		X5-D
		X5-DH1
		X5-DH2
	XP range	
		XP-B
		XP-D
		XP-DH1
		XP-DH2

– Hierarchy of (extrinsic) Product Classes

EN Translation provided by RWS Group, Germany

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CM Methods

Metadata exactness

and company awareness

influences also

variant handling of topics

in CMS

Configuration-specific Information by Features

- Product features included or in addition to (extrinsic) product classes / names: T3B, TP-DH2, ….
- Example PI-Fan: Type TP-DH2 (Combination type)
  - Table Fan (T)
  - Continuous Switch (P)
  - Display (D)
  - Heating (H)
  - 2-Level Heating (2)
- Goal: Facilitate planning of new variants/configurations and metadata handling in CMS

CM Methods

Extrinsic product variant

retrieved by usage

or described by product

types (for retrieval)

Variant Management (Topic variants)

Extrinsic Classification as variant property

T3B, TAB, TB5, T35, T3X5B,...

TPB, TAMP, ...

T7B, TFX,..

Adjusting the intensity

The intensity of the fan can be adjusted in five levels.

- .
- .
- .

Adjusting the intensity

The intensity of the fan can be adjusted continuously.
Turn the level knob until the intensity of the fan is set as desired.

...
...
...

Adjusting the intensity

The intensity of the fan can be adjusted in seven levels.

- Turn the level knob until the intensity of the fan is set as desired.

CM Methods

Extrinsic product variant

collection (of all products)

for filtering

Variant Management (sub-modular; one topic)

Extrinsic Classification as Variant Property

T3B, TB5, T445, TX5B,...

TPB, TAMP, ...

T7B, TFX,..

Adjusting the intensity

The intensity of the fan can be adjusted in five levels.
The intensity of the fan can be adjusted continuously.
The intensity of the fan can be adjusted in seven levels.

- Turn the level knob until the intensity of the fan is set as desired.

...
...
...

CM Methods

Topic **planning** according to configuration variants

Variant Management by Properties (submodular)

Product features as variant property

levels = 5

levels = Cont

levels = 7

Adjusting the intensity

The intensity of the fan can be adjusted in five levels.
The intensity of the fan can be adjusted continuously.
The intensity of the fan can be adjusted in seven levels.

- Turn the level knob until the intensity of the fan is set as desired.

...
...
...

CM Methods

How to Aggregate Documents

- Manually assembling (67%)
- Filtering of master documents (by reduced set of meta data) ** (44 %)
- Copying and modifying documents / templates * (41 % / 23%)
- Automated Assembling (by full set of metadata) *** (27%)

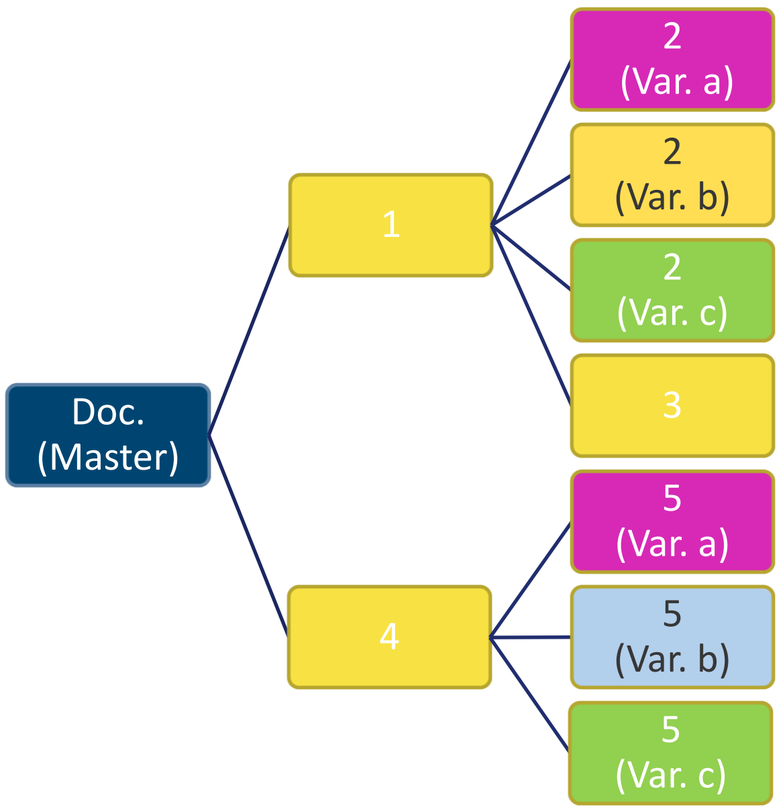
*,**,*** systemized, rules-based, automized

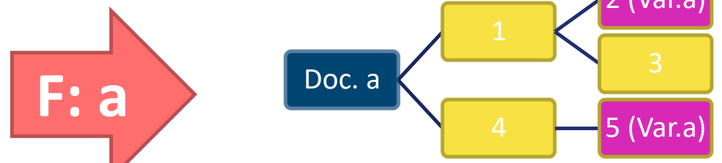
(x%) according to tekom CMS Study 2018

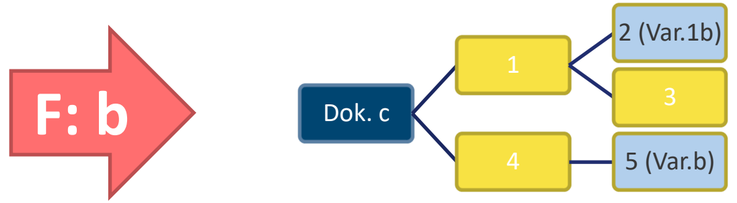
CM Methods

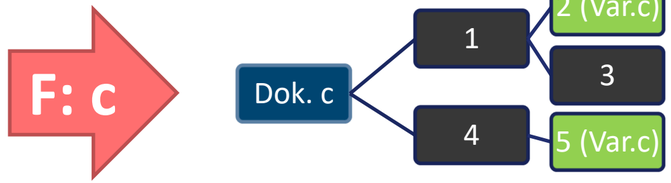
Document Filtering

Filter criteria in many cases correspond to extrinsic classification (validity for end-products: T3B, X5B, X5-DH2)





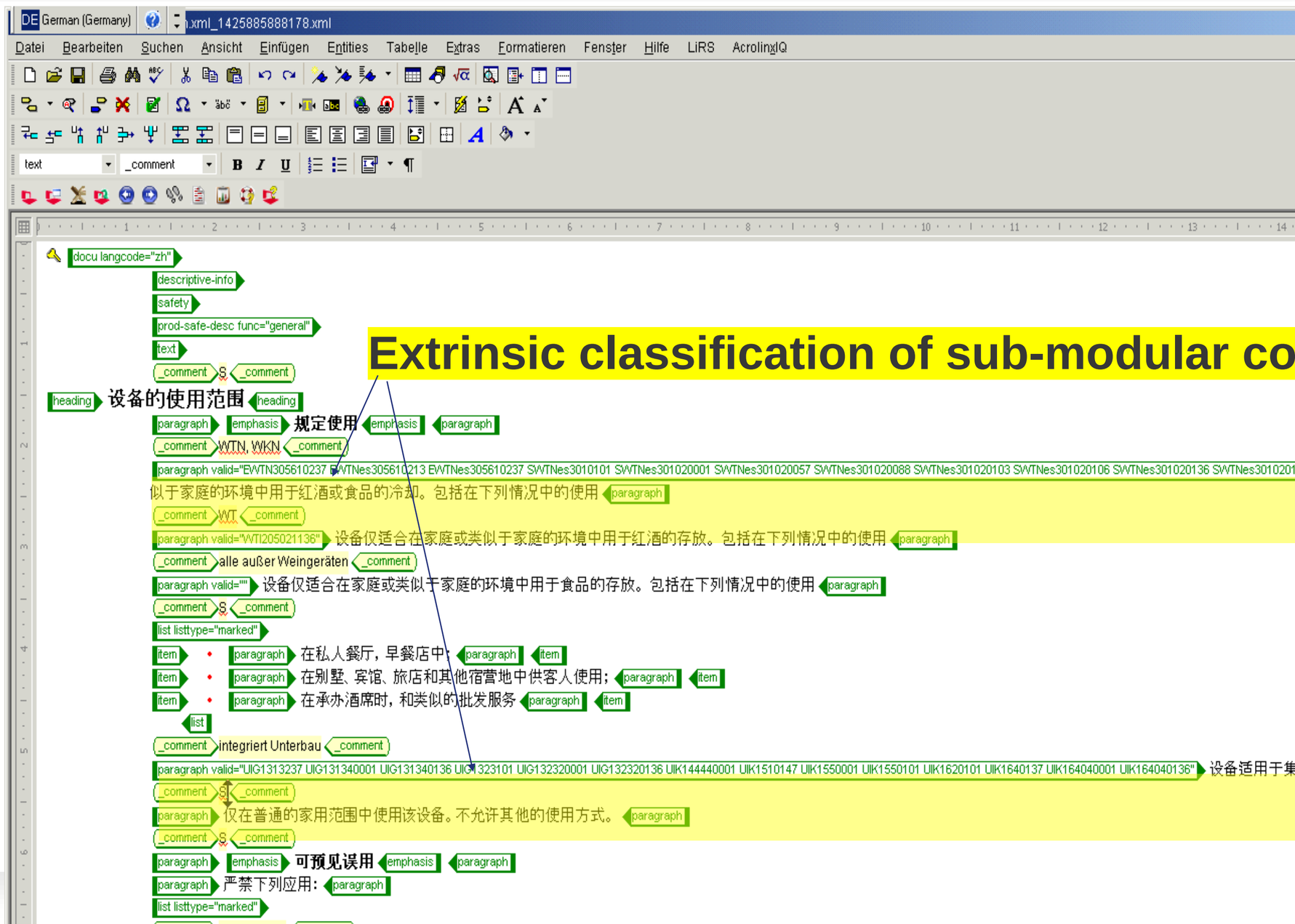




Hochschule Karlsruhe
Technik und Wirtschaft
UNIVERSITY OF APPLIED SCIENCES

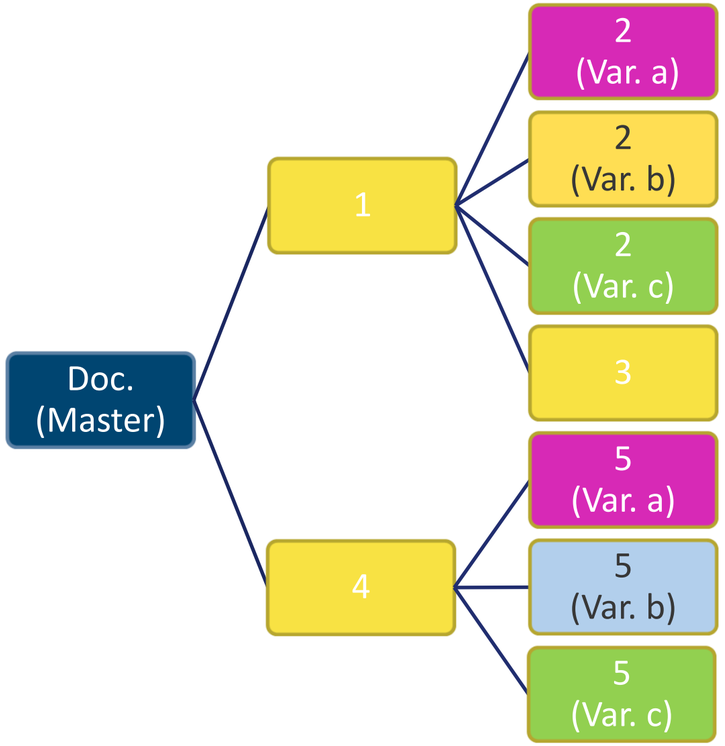
CM Methods

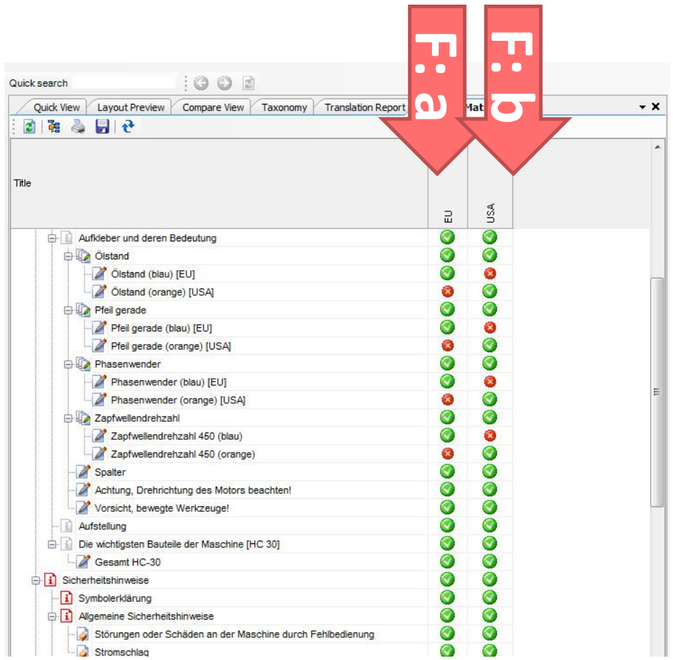
Filterung on sub-topic level

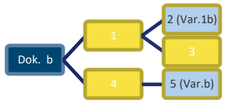


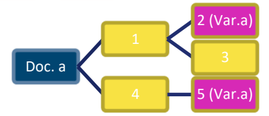
CM Methods

Visualization of Filtering







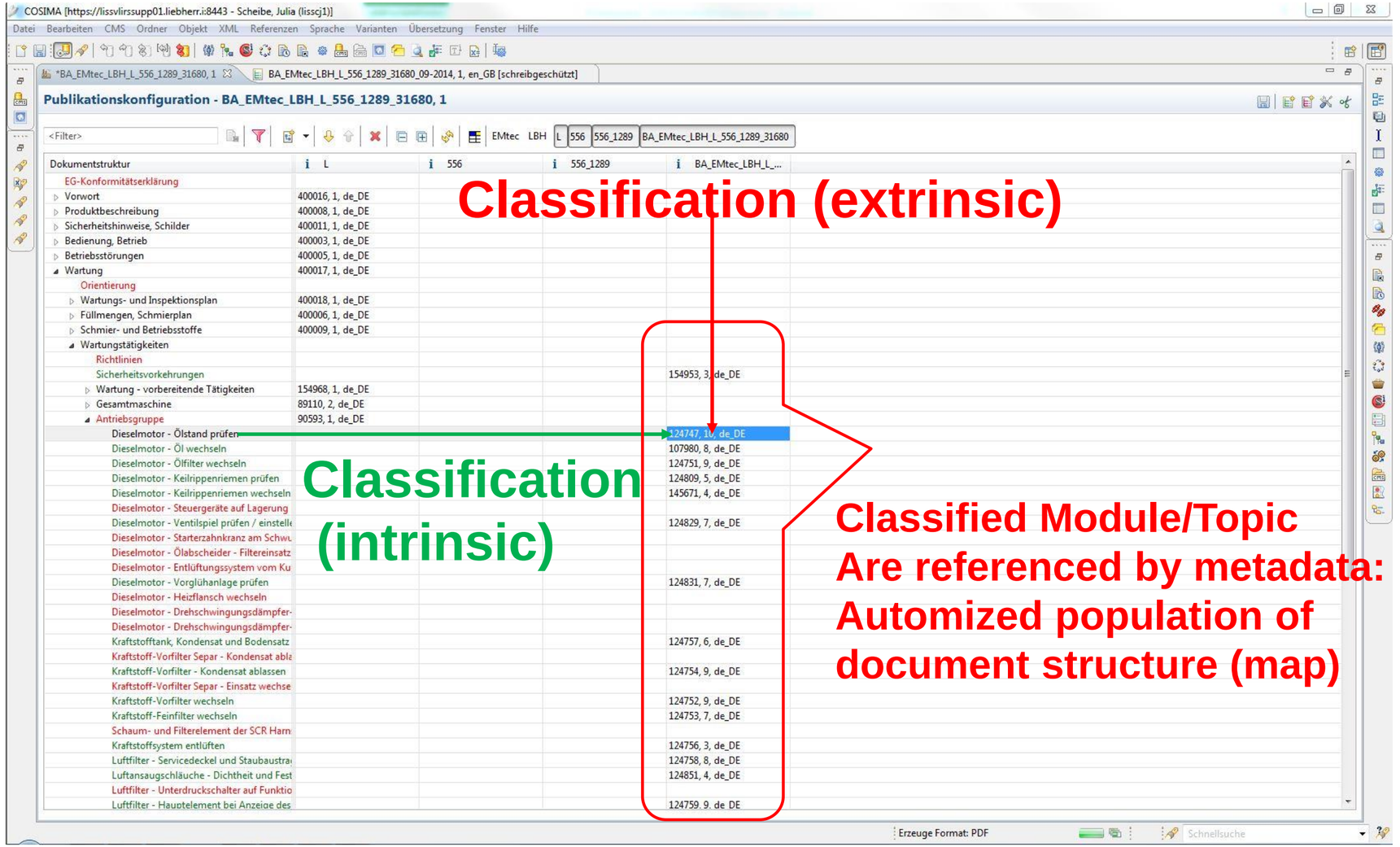


Source: Schema ST4

CM Methods

Automized document creation (metadata rules)

Document structure = classification hierarchy

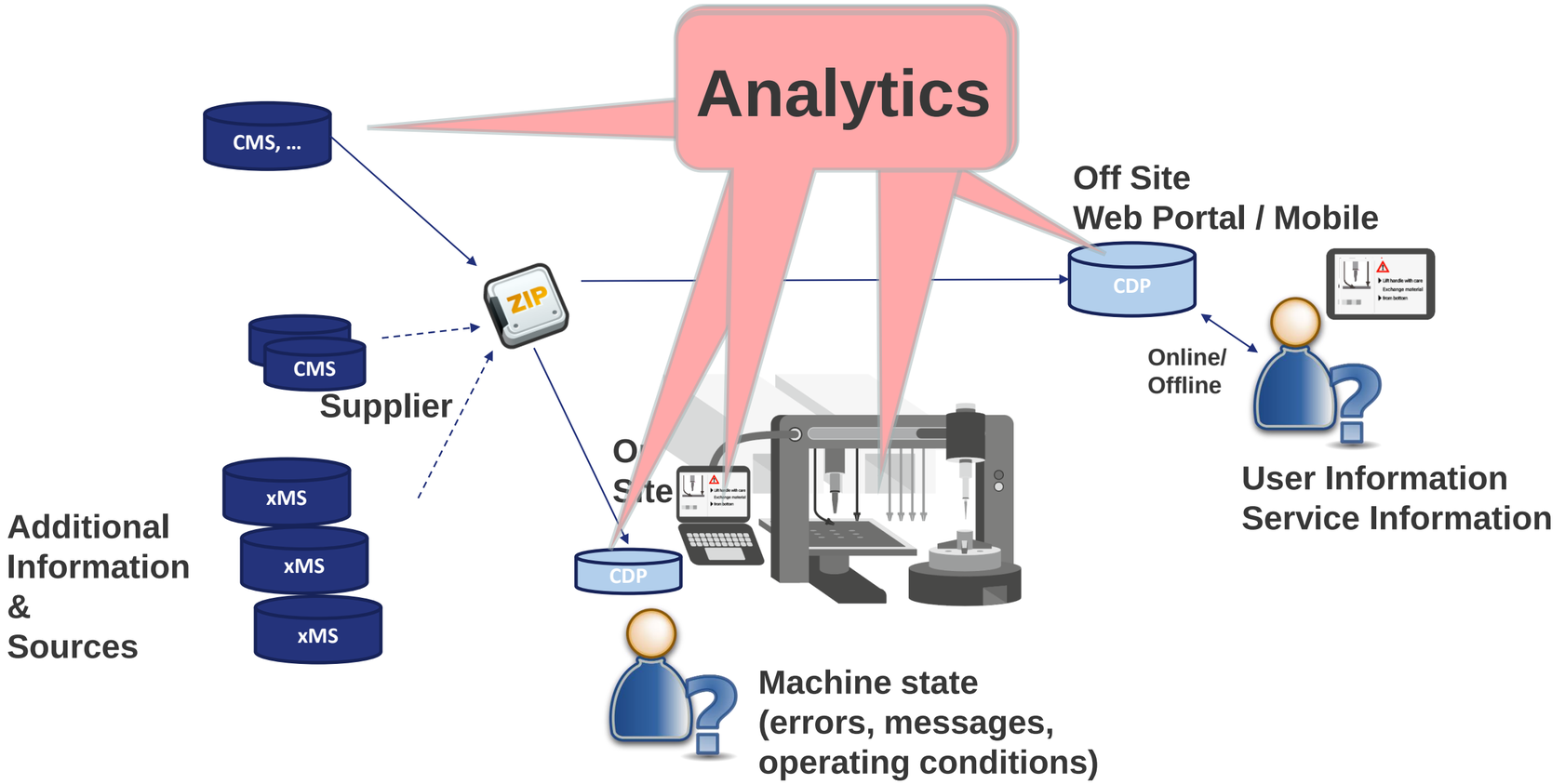


CCMS: Docufy / Cosima

CD Environment

Analytics

CDP and Analytics in Industrial Applications



- Analytics

CMS & CDP Analytics

Overview of Content Intelligence

CMS Analytics (REx)

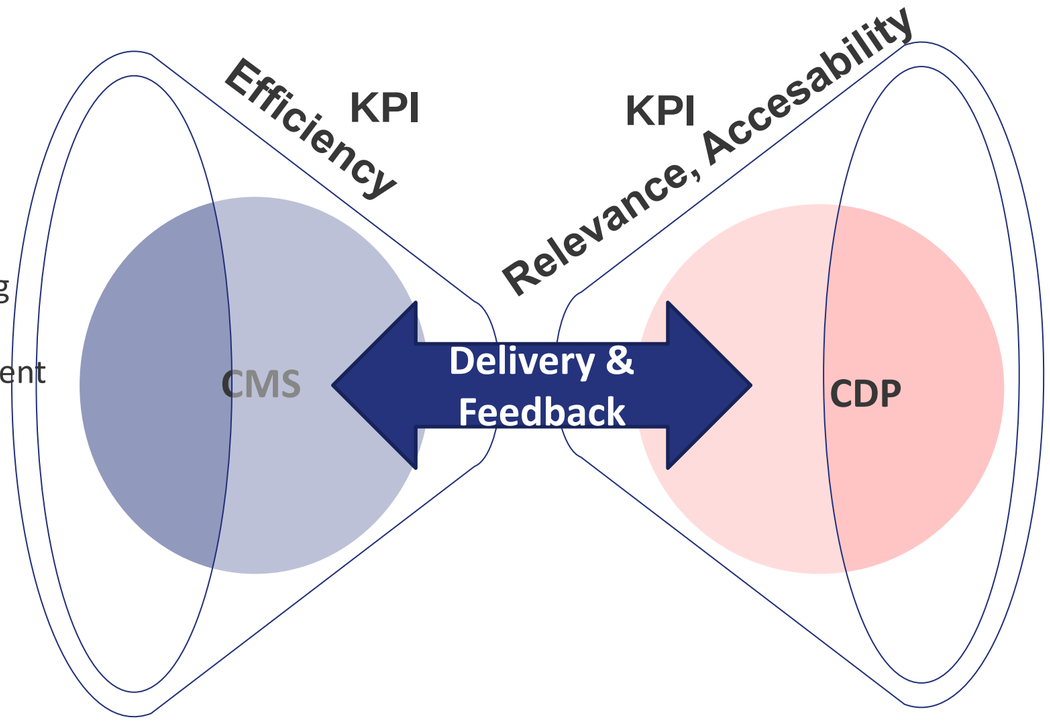
→ Metrics:
- Reuse Rates (Abundancy)
- Redundancy
- Document Sharing factor
- Variant management
- Correlations; Distributions

…

Artificial Intelligence

→Quality assurance:
- Similarity analysis
- Classification quality

…



CDP Analytics (CoReAn)

Indirect feedback

→ Metrics:
- visiting time,
- Visit frequency
- **search behaviour**
- **search terms**
- …

Direct feedback
- Rating
- Satisfaction

→ Improve:
- Product
- Information
- Terminology (Harvesting)

CM Methods

Analyzing the origins of large numbers of topic variants

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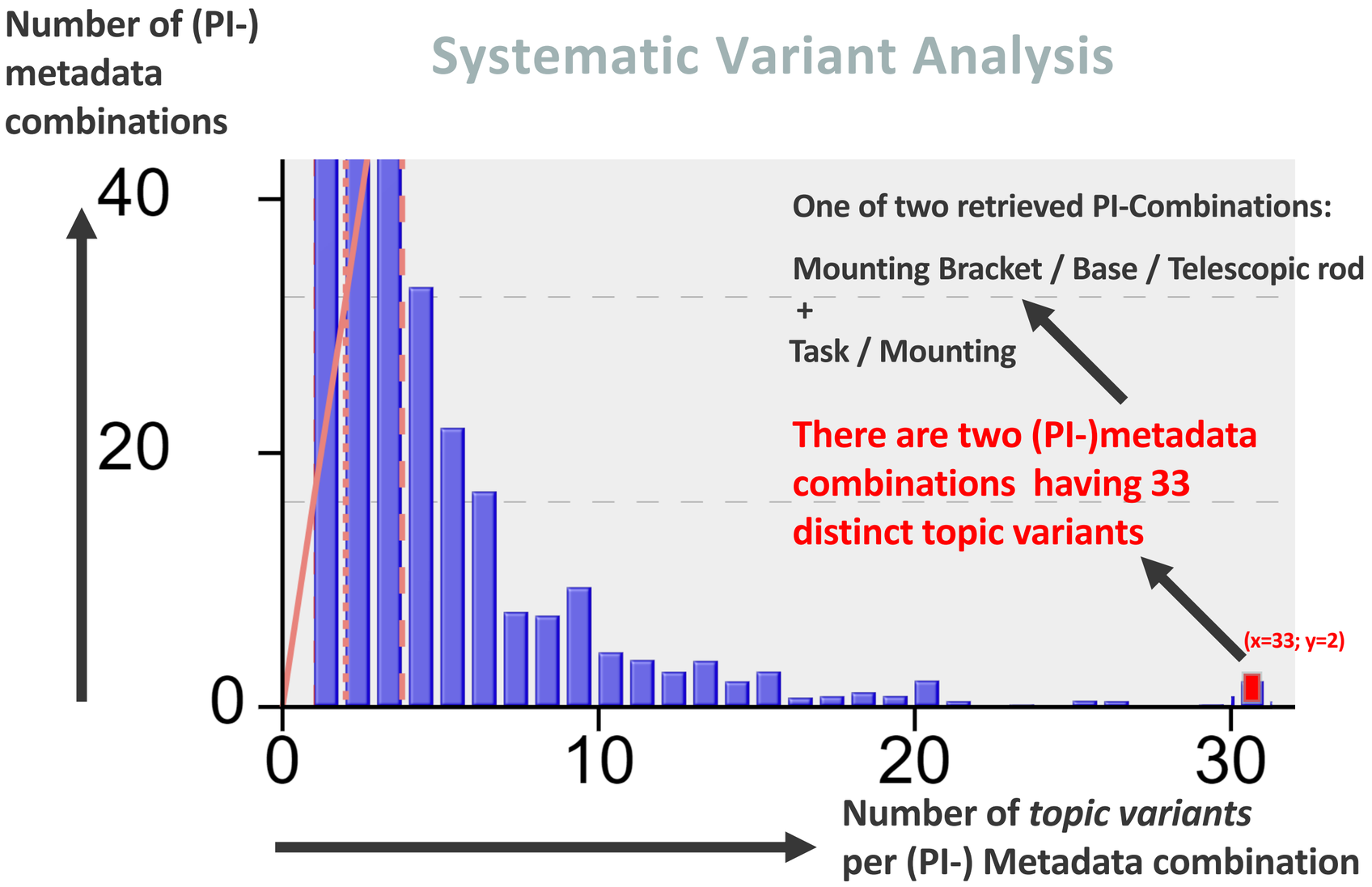
Driver of product complexity and / or (necessary?) content complexity

Systematic Variant Analysis

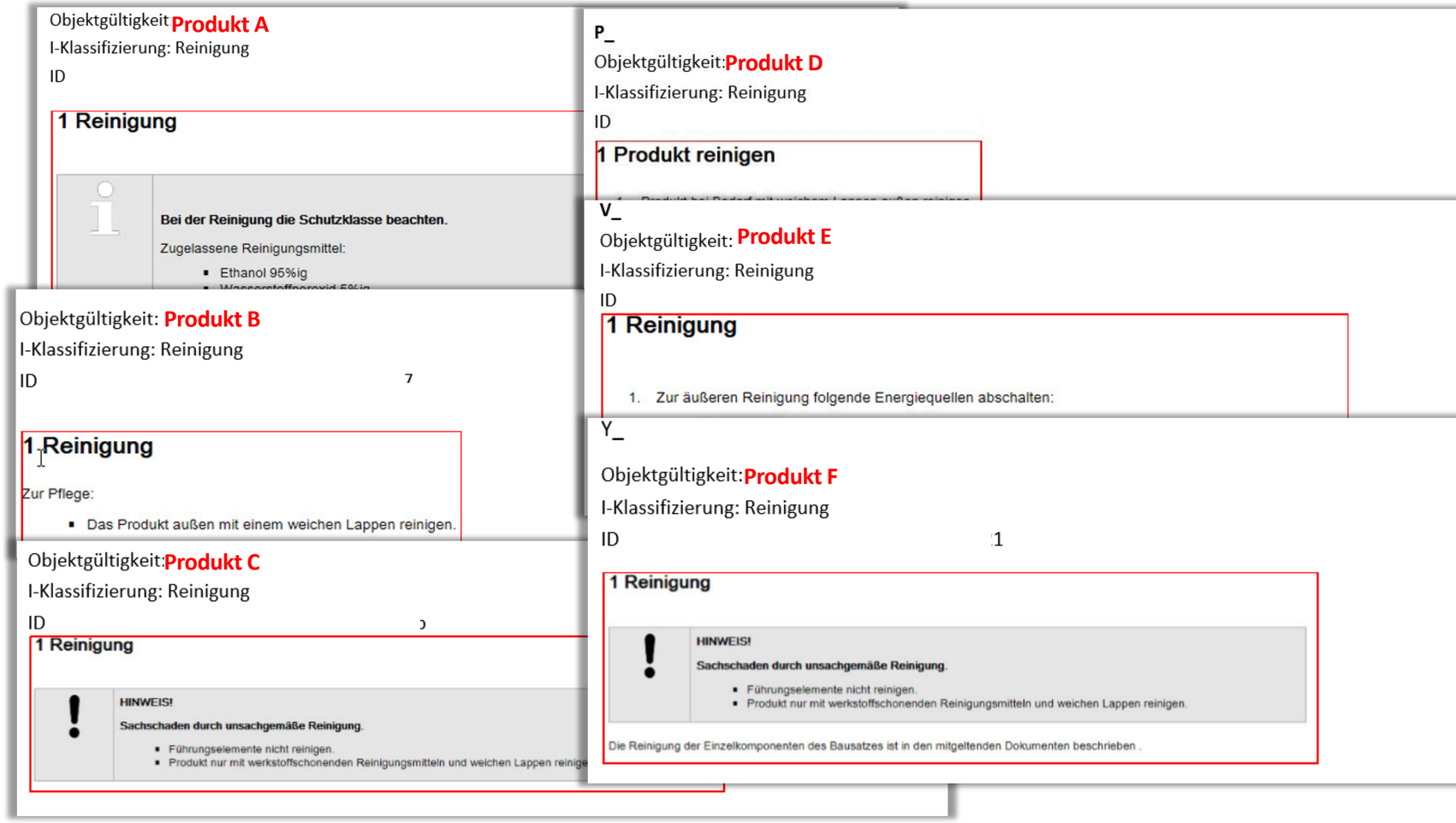


CM Methods

Example detected by REx method:

All topics have the same (intrinsic) classification but differ in (extrinsic) product classes

Analyzing Content Variants (by content)



CD Methods

Relationship between PI-Class and iiRDS

- The metadata concept of iiRDS (for topics) has been derived from PI-Class® (W.Z. is founding member of iiRDS WG). The PI-Fan is a reference model for both.
- The metadada description of iiRDS is written in RDFs-notation. (Standardized XML-notation)
- RDF is a light-weight ontology-description language, which is not relevant for authors, CMS users.
- iiRDS uses explicit metadata values, given by standards
- PI-classified topics can be transformed or mapped to iiRDS

CM Methods

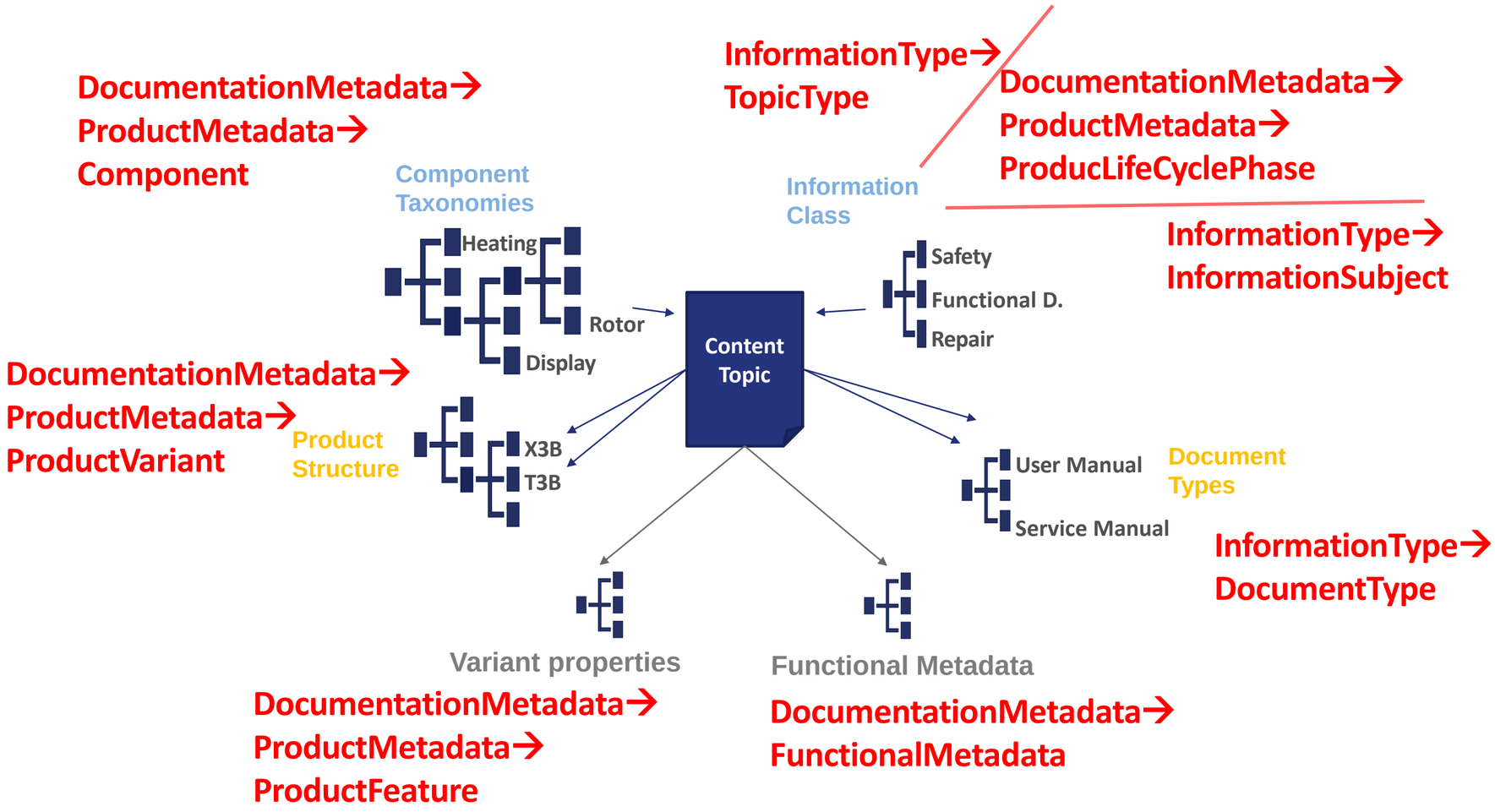
iiRDS

PI-Class (inner area)

See also:

https://iirds.tekom.de/fileadmin/iiRDS_specification/20180418-1.0-release/index.html#iirds-metadata-class-diagram

Metadata Correspondence & Mapping (for Topics)



Content Management

Summary I (CMS)

- Technology and methods are available in CMS for topic-based and configuration-specific information creation, document assembling, publishing and provisioning (packaging). They rely strongly on taxonomic classification.
- Limiting factors are often data quality / process integration within companies and human factors (complexity of information structures; „lost in metadata“ of different configurations) as well as a lack of information planning! (Therefore, also analytics is needed…)
- Planning, analysis and management of processes (like variant management) depend on metadata quality

Content Management

Summary /Vision II (CMS)

- Highly structured content, enriched by semantic metadata has been created, but often only used for (automated) PDF/print production. (Even though CMS can produce all types of media)
- Latest delivery technologies benefit from and require such structured content packages
- New media (e.g. chatbots, training, animations, AR/VR/MR) demand additional or new types of information structures and content