Alles hängt mit allem zusammen

Content vom Anfang bis zum Ende gedacht

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Prof. Dr. **Wolfgang Ziegler**

- **Karlsruhe University of Applied Sciences, Germany „Communication und Media Management“**
  - » 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, microDoc**)
  - » System evaluation/introduction, process analysis/engineering, CMS/CDP optimizing, classification/content engineering

Hochschule Karlsruhe
Technik und Wirtschaft
UNIVERSITY OF APPLIED SCIENCES

Institute for Information
and Content Management

I4ICM

Agenda

- Introduction
- Basic Content Management Concepts
- Content Delivery Concepts
- Intelligence Cascade and Type of Semantic Applications
- Future Content Access and Archiving
- Summary

Introduction

Introduction

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-specific (as most as possible)

– accessible (technically available and managed in the organization)

– suitable media

Introduction

Manuals & data on configurable products

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:

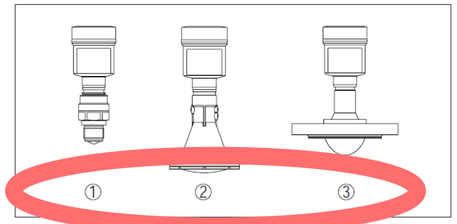

Fig. 2: Antenna systems LEVEL TRANSMITTER 8139

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.

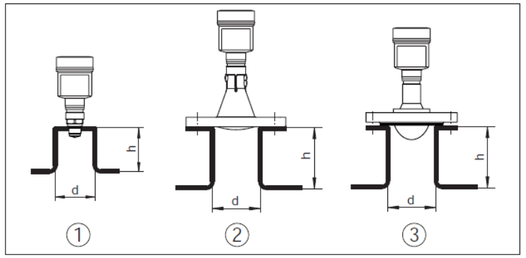

Fig. 17: Socket mounting with deviating socket dimensions with different versions of LEVEL TRANSMITTER 8139

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2 Plastic horn antenna
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Thread with integrated horn antenna

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

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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)
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Flange with encapsulated antenna system	PTFE and PTFE 8 mm	PTFE	-40 … +130 °C (-40 … +266 °F)
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Derating, ambient temperature

Introduction

Use Case parameters

- **Roles**
- **Knowledge level**
- **System condition**
- **System configuration**
- **Information holistics**

Use Case Dependencies & Requirements for Deliverables

- **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

Introduction

How can we…?

- … enable and empower writers to produce variant specific, i.e. configuration-dependant information units
- … plan configurations and relevant parameters for authoring & document creation
- … retrieve information in an efficient way
- … connect to use cases
- … prove relevance of content

And do this at reasonable costs?

Content Management

Creating (native) intelligent content

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)

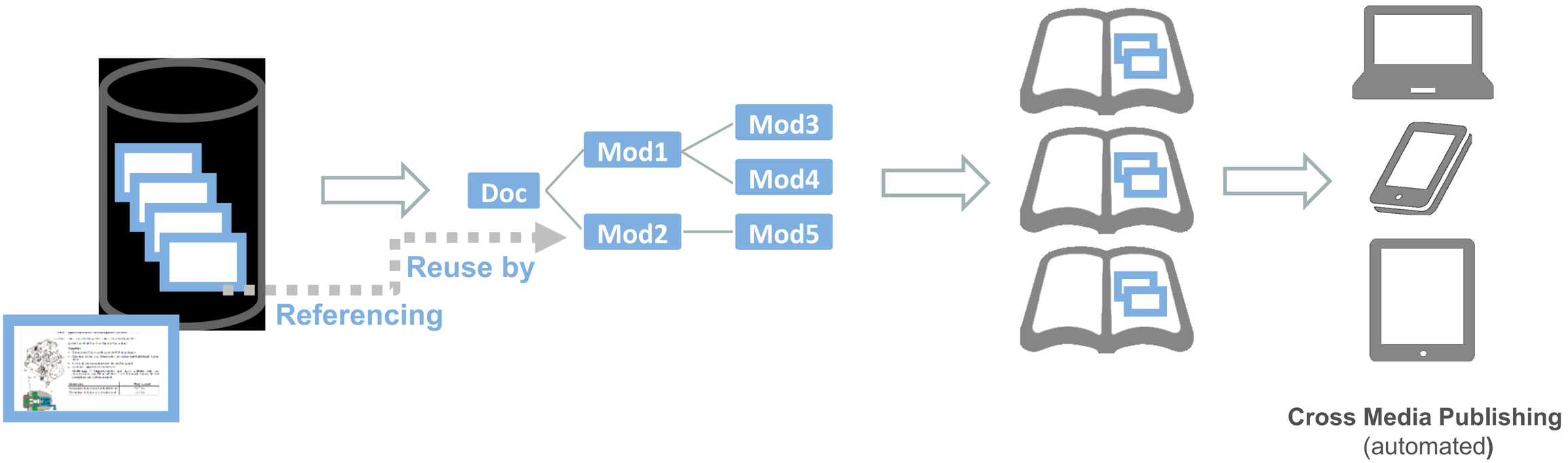
– Cross media & publishing management

CM Methods

Referencing modules/topics

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

Reuse, Aggregation and Publishing



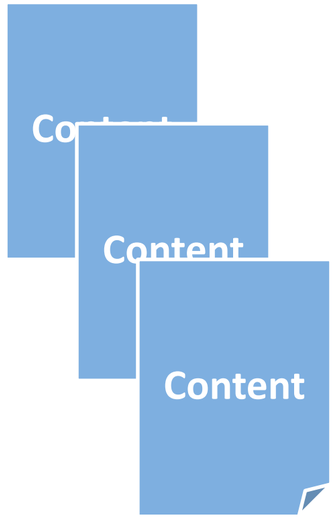
CM Methods

Semantic Metadata for Modular Content (PI-Class®)

Product Classes

Physical & Virtual Objects
(Product Components)

Content Objects
(Modular Topics)

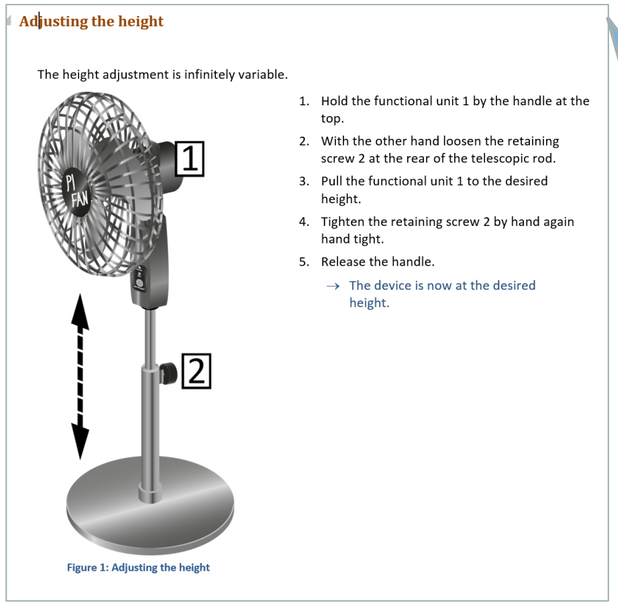


Information Classes

- Operation
- Dismount
- Repair

CM Methods

Basic Dimensions of Module Classification (PI-Class®)



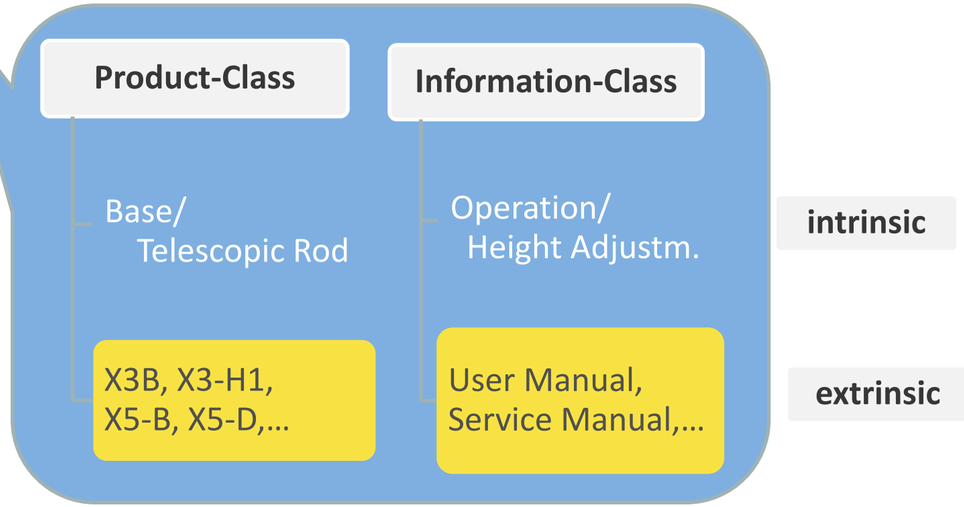
Adjusting the height

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

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

- (→ presentation of K. Reinhard, Siemens 2018)

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

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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

EN Translation provided by RWS Group, Germany

– Hierarchy of (extrinsic) Product Classes

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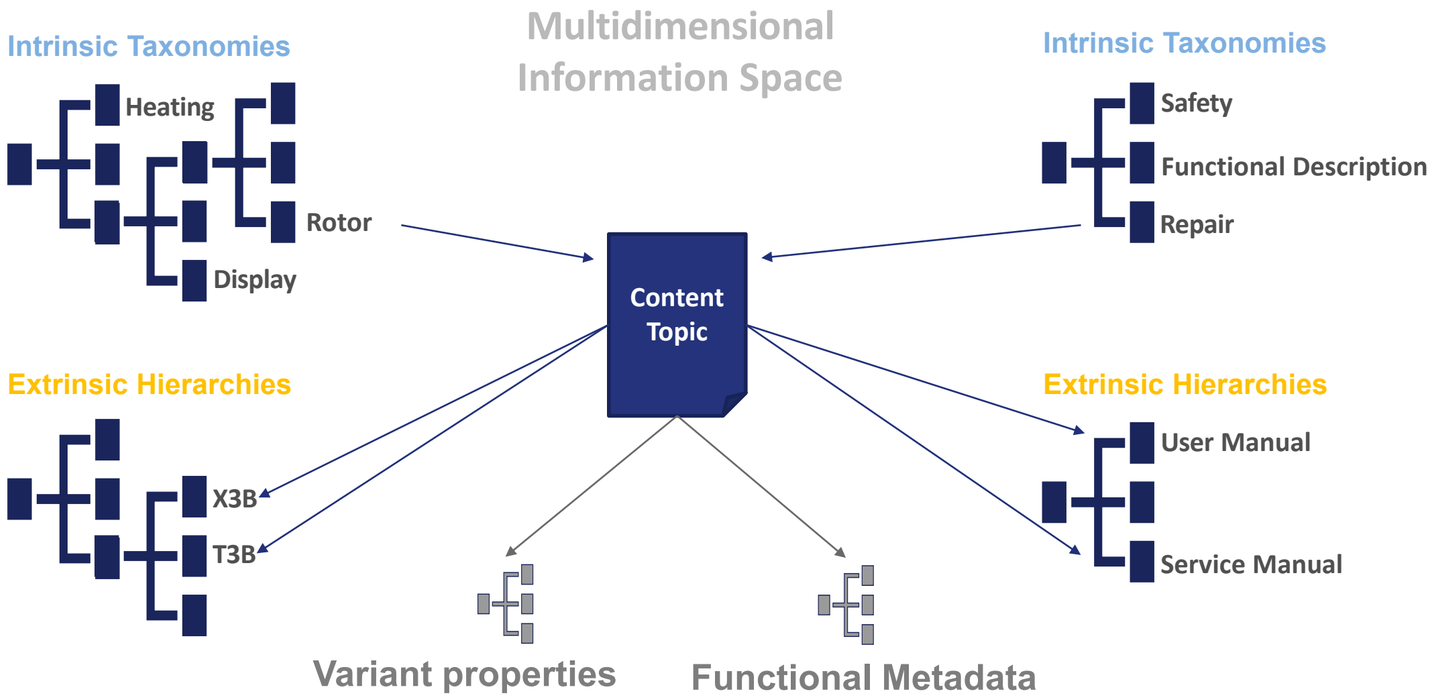
CM Methods

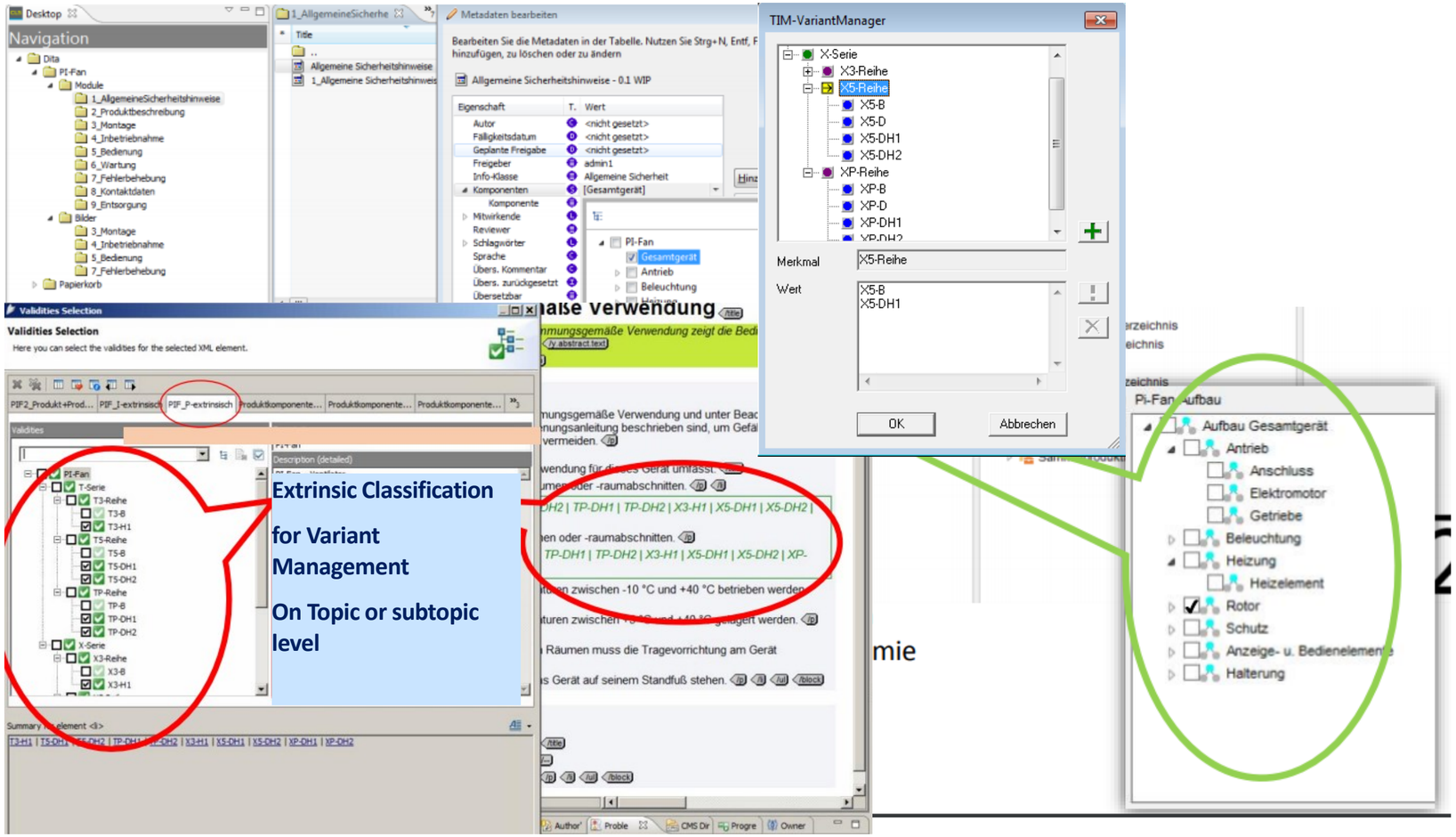
CMS „Taxonomies“ from Topic Classification



Hierarchies, Taxonomies, List, …

CM Methods

PI-Fan implementation & PI-Classification in CMS



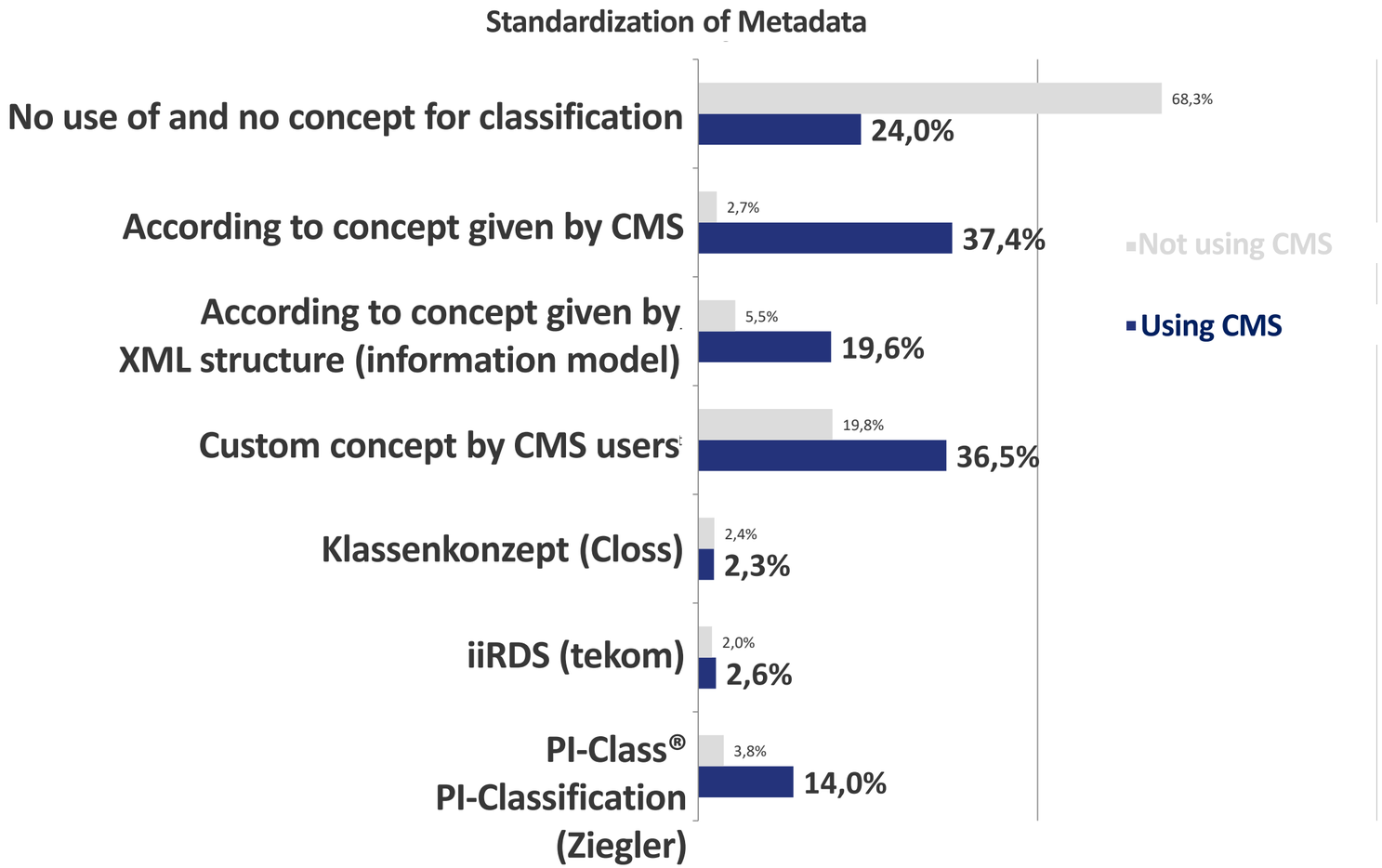
Content Management

tekom CMS Study 2018

(D-A-CH/ Central Europe)

(approx. 700 – 850 persons)

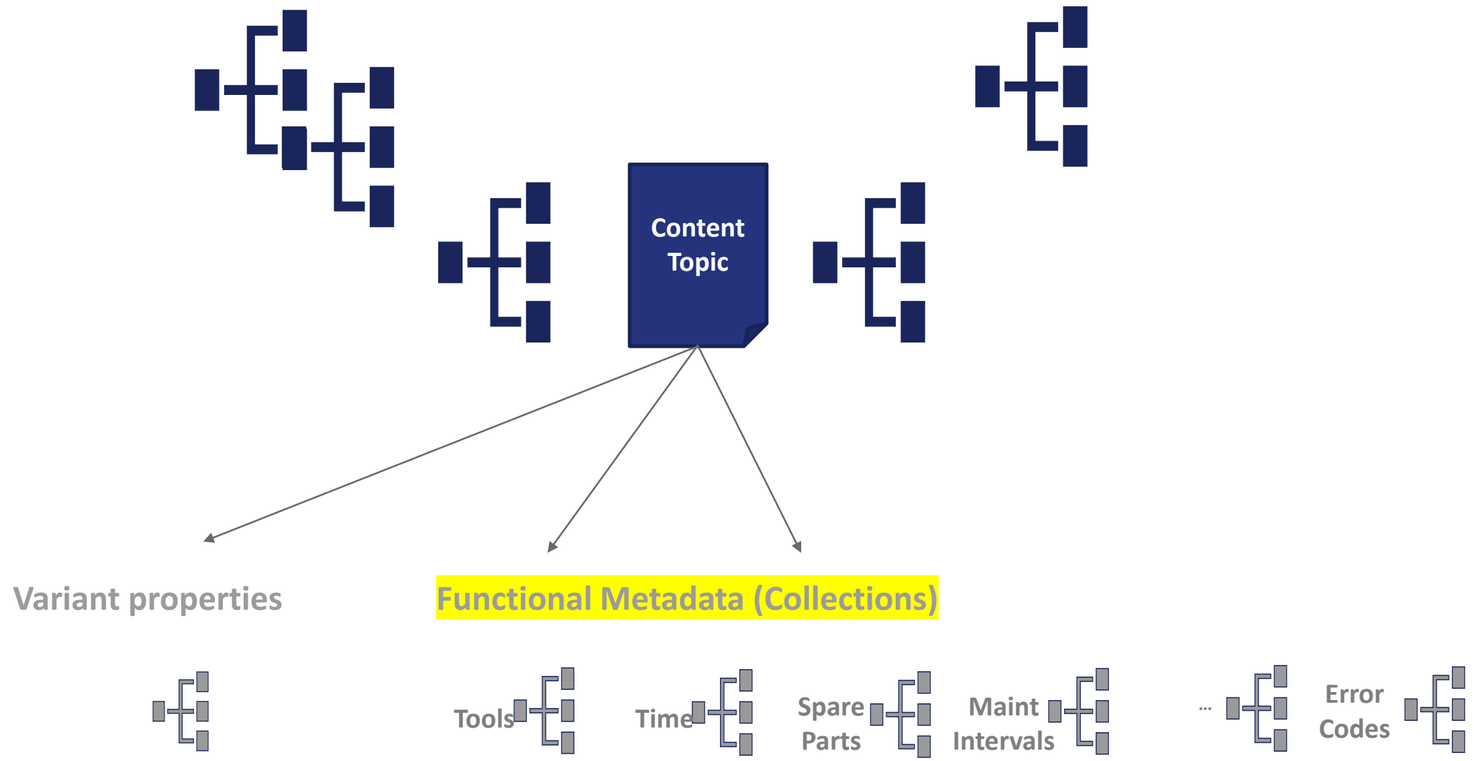
Use and Type of Classification with/without CMS



CM Methods

CMS „Taxonomies“ from Topic Classification

Extended PI-Class: Multidimensional Information Space



CM Methods

CMS „Taxonomies“ from Topic Classification

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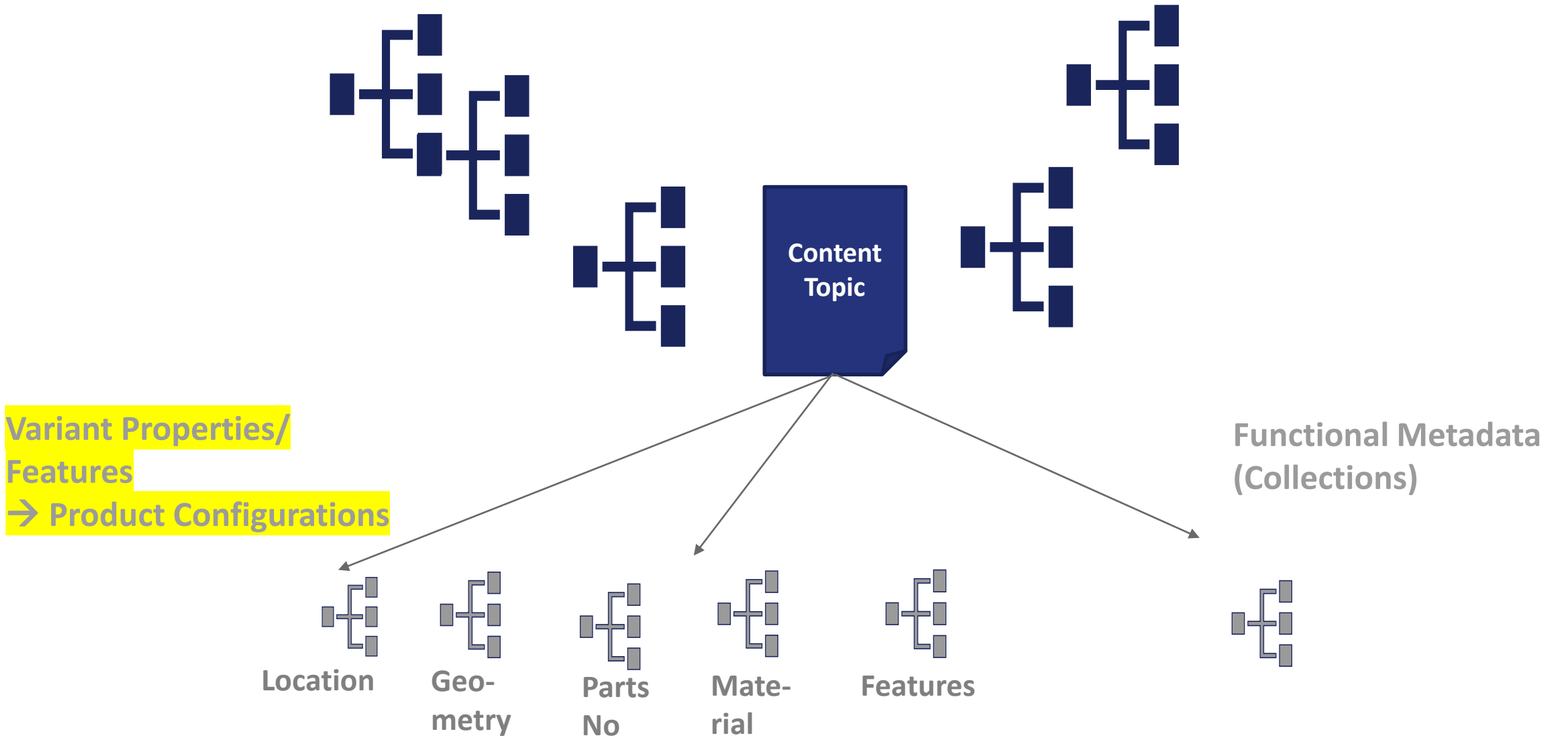


CM Methods

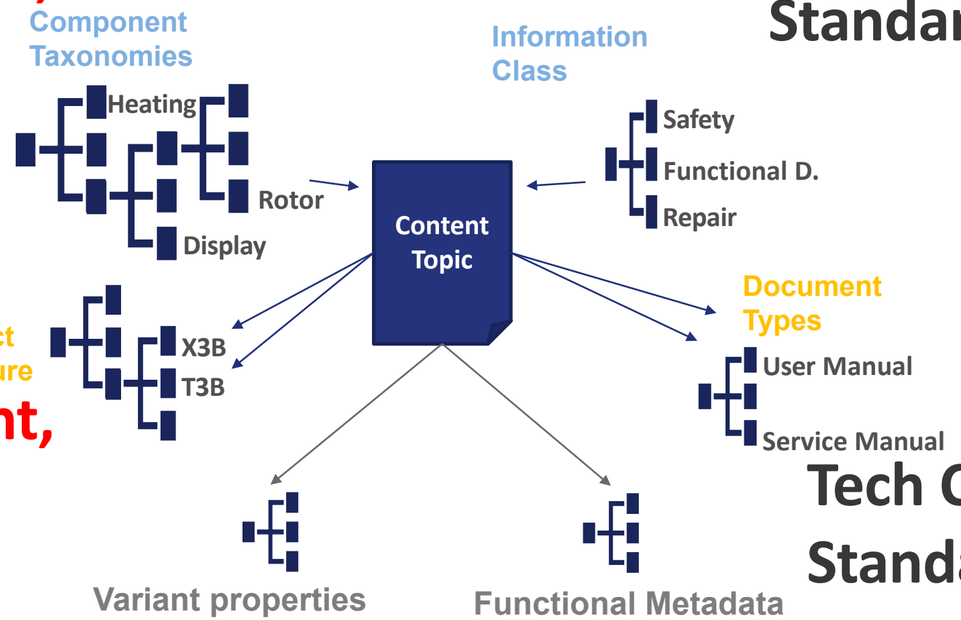
Depency on:

- 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 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 in seven levels.

- 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 continuously.
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%)

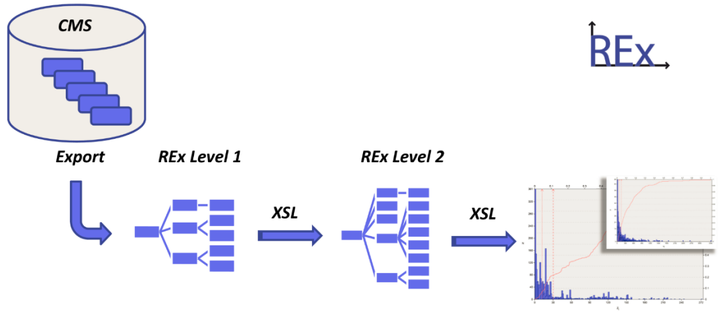
*,**,*** systemized, rules-based, automized

(x%) according to tekom CMS Study 2018

CM Methods

Report Exchange (REx)

Method



Analyzing CMS processes and use of CM methods

- Reuse numbers of modules, fragments, media, …
- Reuse rates of deliverables (documents, …)
- Cost indicators (Sharing factors per publication)
- Change rates and new content rates (per publication)
- Document fingerprints (module reuse rates from doc‘s)
- ….
- **The information space of CMS in the light of variants**

CM Methods

Analyzing the origins of

large numbers of

topic variants

⇨

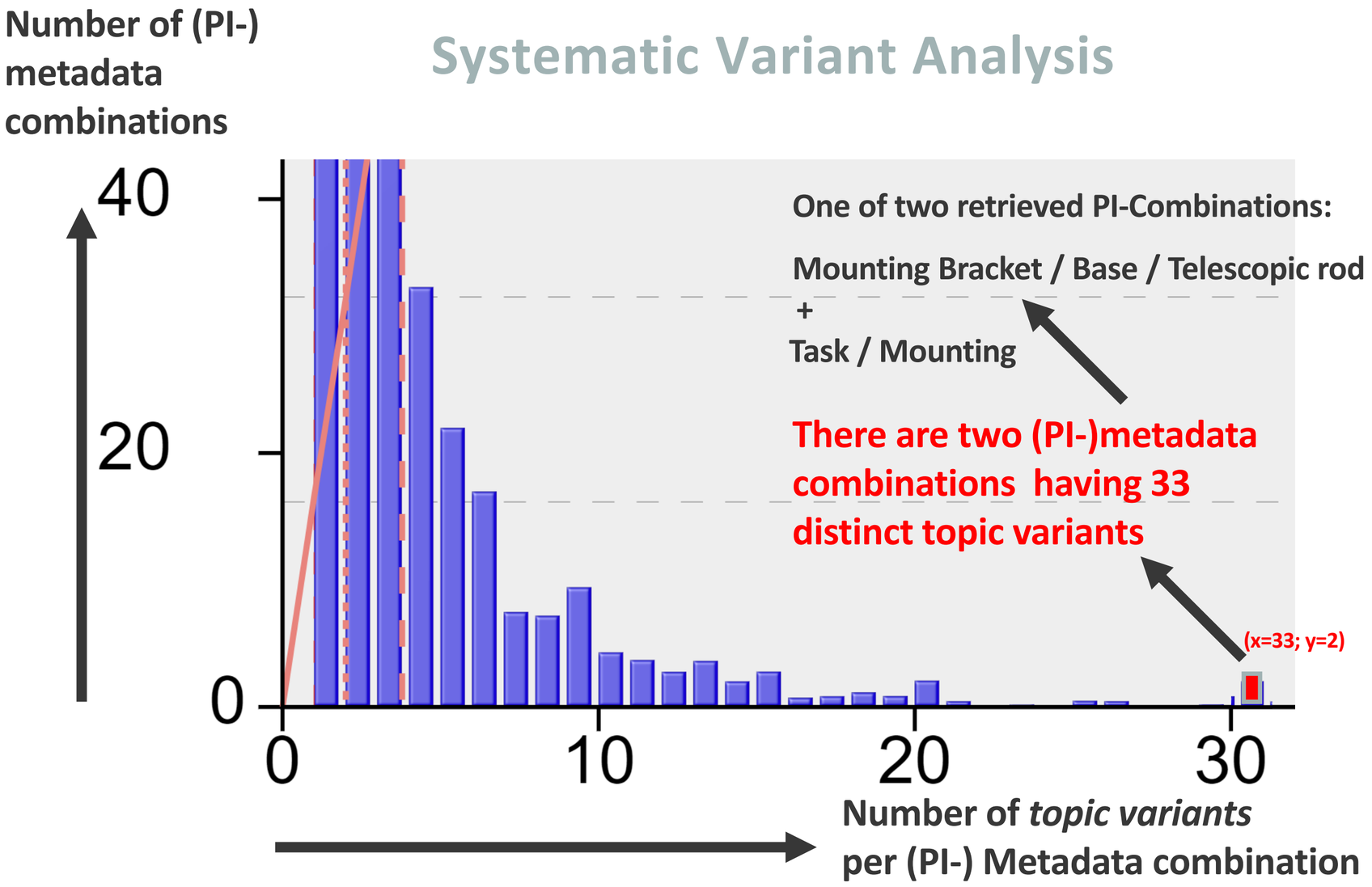
Driver of product complexity

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)

Objektgültigkeit **Produkt A**
I-Klassifizierung: Reinigung
ID

1 Reinigung

Bei der Reinigung die Schutzklasse beachten.

Zugelassene Reinigungsmittel:

- Ethanol 95%ig
- Wasserstoffperoxid 5%ig

Objektgültigkeit: **Produkt B**
I-Klassifizierung: Reinigung
ID 7

1 Reinigung

Zur Pflege:

- Das Produkt außen mit einem weichen Lappen reinigen.

Objektgültigkeit:**Produkt C**
I-Klassifizierung: Reinigung
ID)

1 Reinigung

HINWEIS!

Sachschaden durch unsachgemäße Reinigung.

- Führungselemente nicht reinigen.
- Produkt nur mit werkstoffschonenden Reinigungsmitteln und weichen Lappen reinige

P_
Objektgültigkeit:**Produkt D**
I-Klassifizierung: Reinigung
ID

1 Produkt reinigen

1. Produkt bei Bedarf mit weichem Lappen außen reinigen

V_
Objektgültigkeit: **Produkt E**
I-Klassifizierung: Reinigung
ID

1 Reinigung

1. Zur äußeren Reinigung folgende Energiequellen abschalten:

Y_
Objektgültigkeit:**Produkt F**
I-Klassifizierung: Reinigung
ID 1

1 Reinigung

HINWEIS!

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Die Reinigung der Einzelkomponenten des Bausatzes ist in den mitgeltenden Dokumenten beschrieben .

Content Management

Summary I (CMS)

- **Technology** and methods are mostly **available** in CMS **for** topic-based and **configuration-specific information creation**, document assembling 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, analytics is needed…)
- Planning, analysis and **management of processes** (like variant management) depend on **metadata quality**

Intelligent
Content Delivery

Making use of native intelligence of content

Content Delivery Portals

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.

CD Methods

Facetted search/request and topic delivery

Component

- Hydraulic system
  - Oil Pump

Information

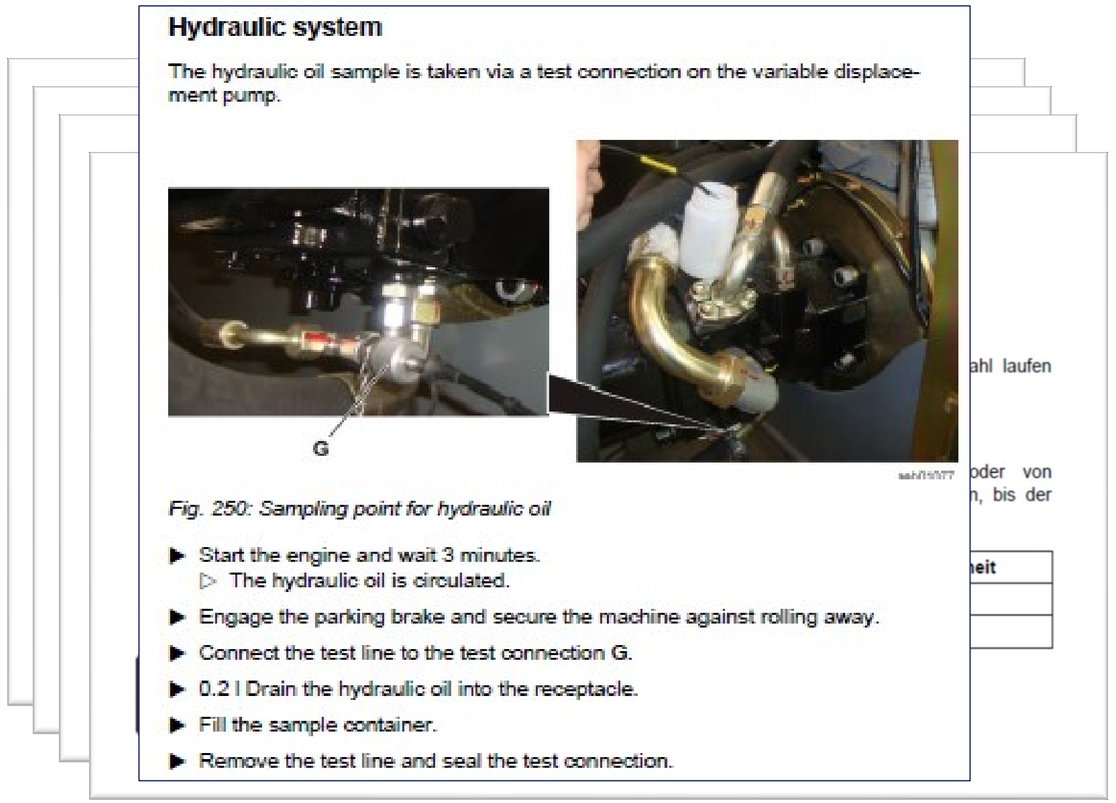
- Procedure
  - Testing

Machine

- Z-006

Document

- Service



Hydraulic system

The hydraulic oil sample is taken via a test connection on the variable displacement pump.

G

Fig. 250: Sampling point for hydraulic oil

- ▶ Start the engine and wait 3 minutes.
  - ▷ The hydraulic oil is circulated.
- ▶ Engage the parking brake and secure the machine against rolling away.
- ▶ Connect the test line to the test connection G.
- ▶ 0.2 l Drain the hydraulic oil into the receptacle.
- ▶ Fill the sample container.
- ▶ Remove the test line and seal the test connection.

CD Methods

Facetted search/request and topic delivery

Customer-dependent Configuration !

Component

Hydraulic system

Oil Pump

Information

Procedure

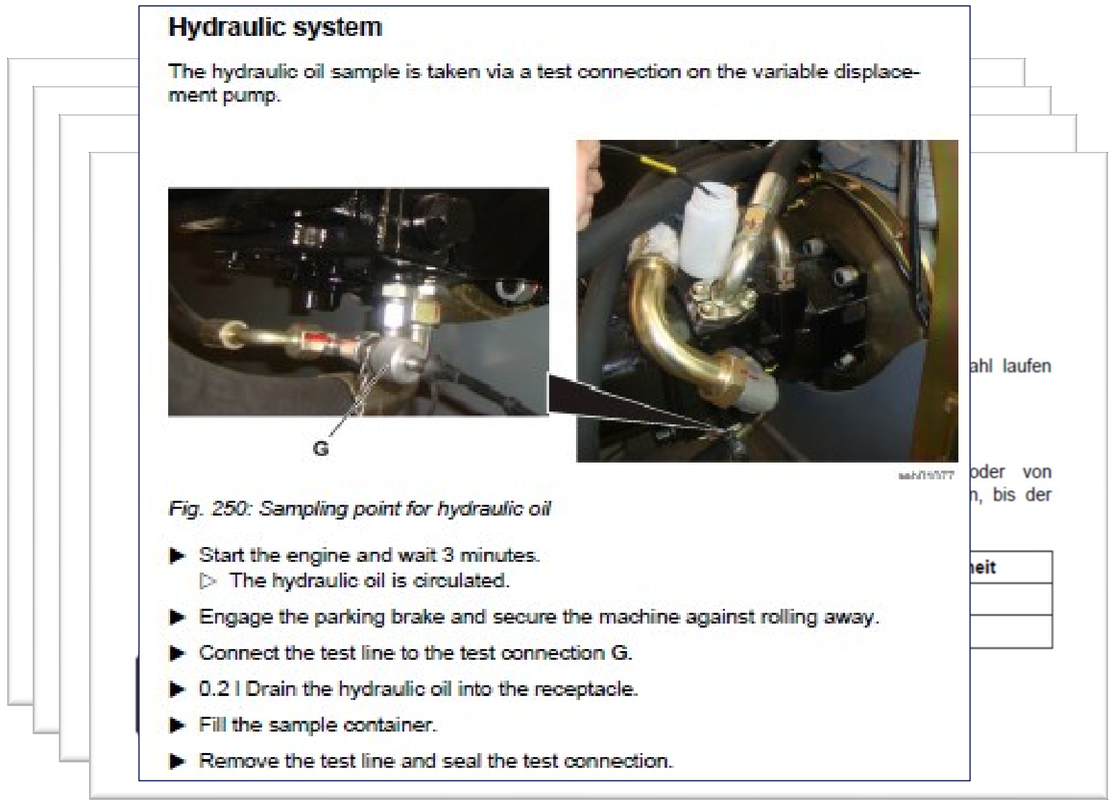
Testing

Machine

Z-006

Konfiguration

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



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CD Methods

Application area

3.2 Principle of operation

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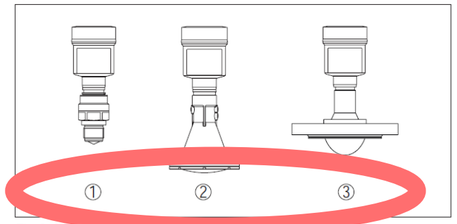

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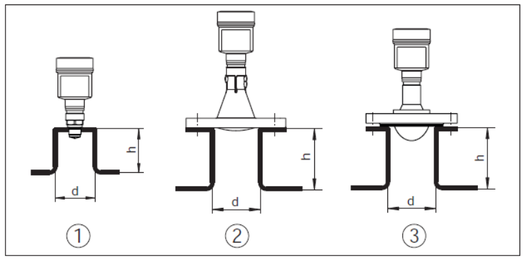

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Thread with integrated horn antenna

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Selection/Generating of publication depending on parameters

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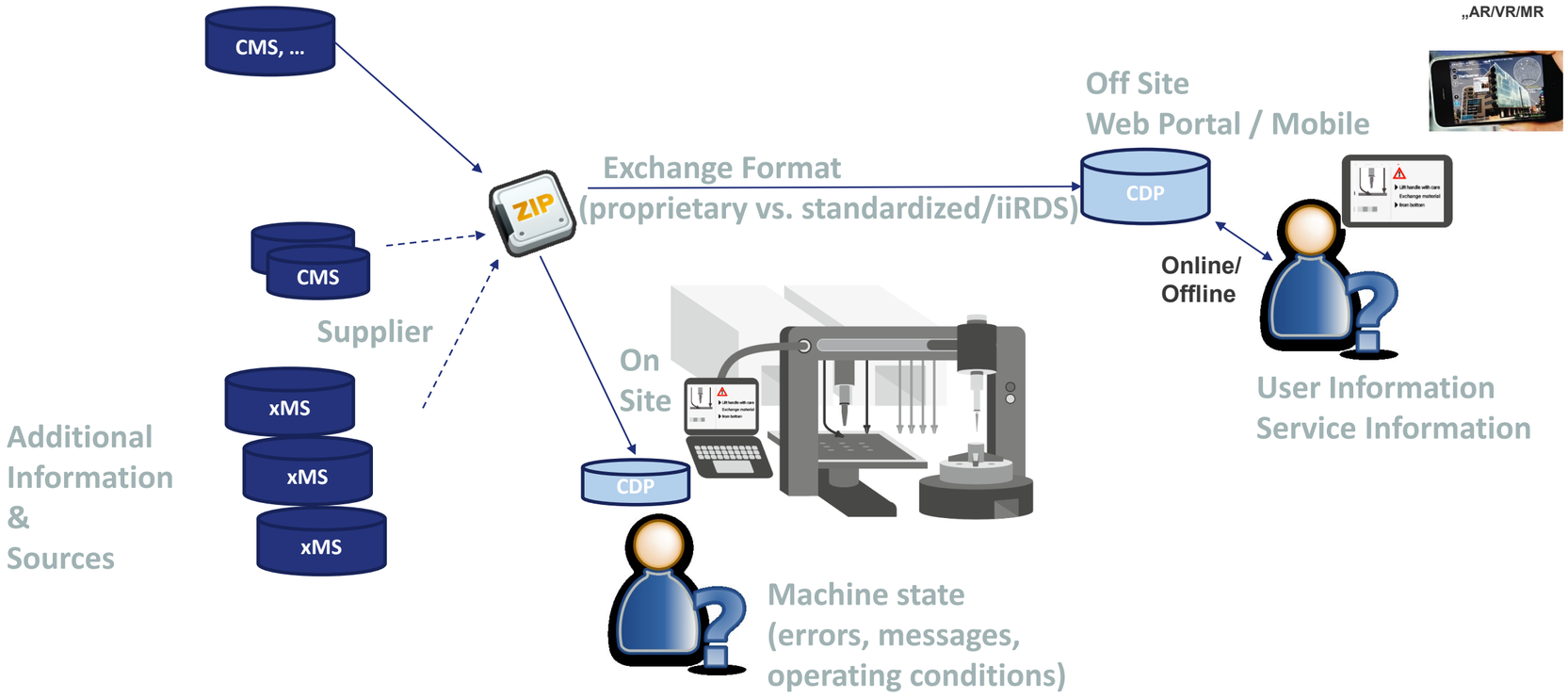
Derating, ambient temperature

CD Methods

CDP environment in industrial applications

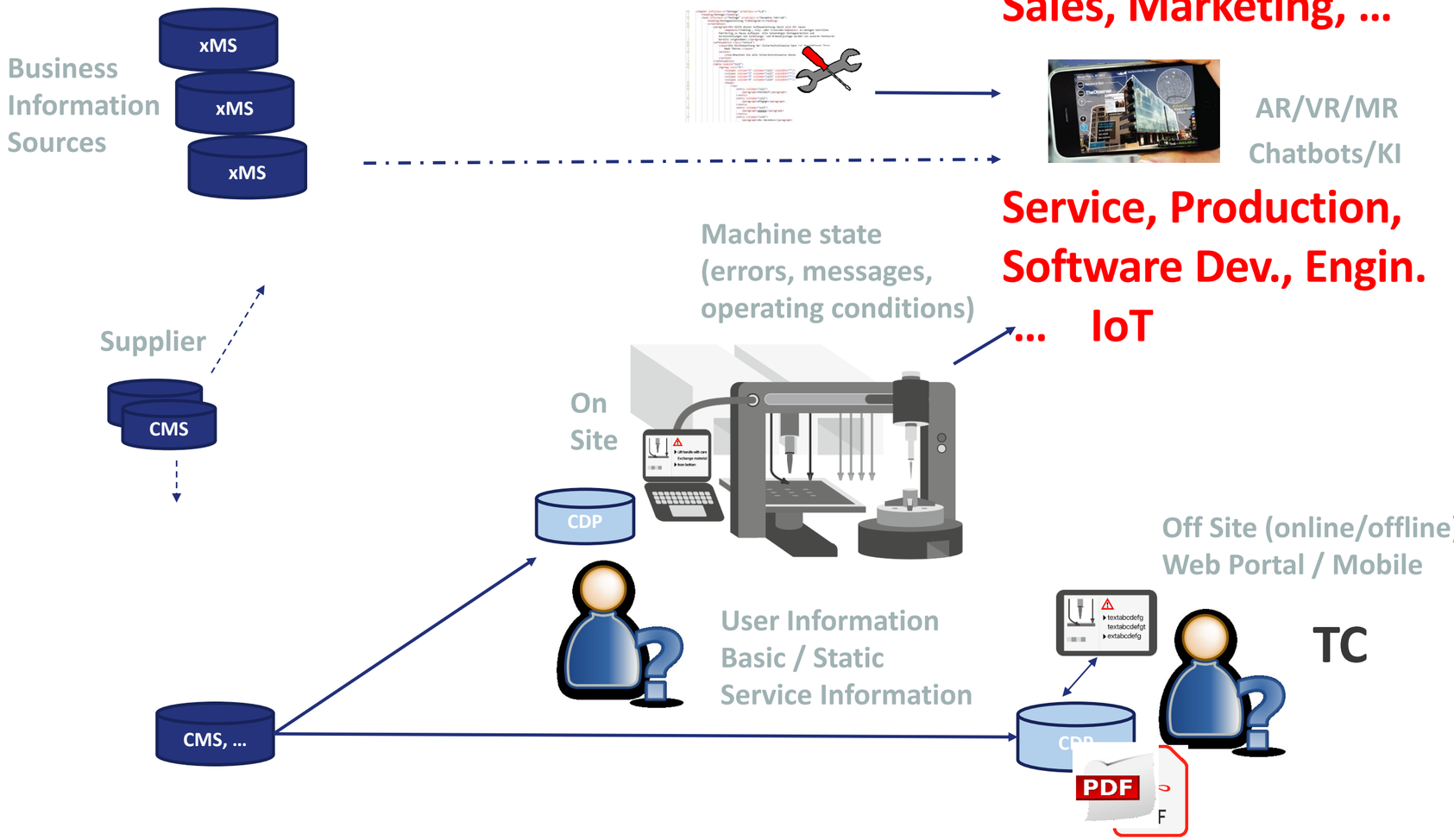


CD Methods

Digital Services by different

- Projects
- Show cases
- Departments

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

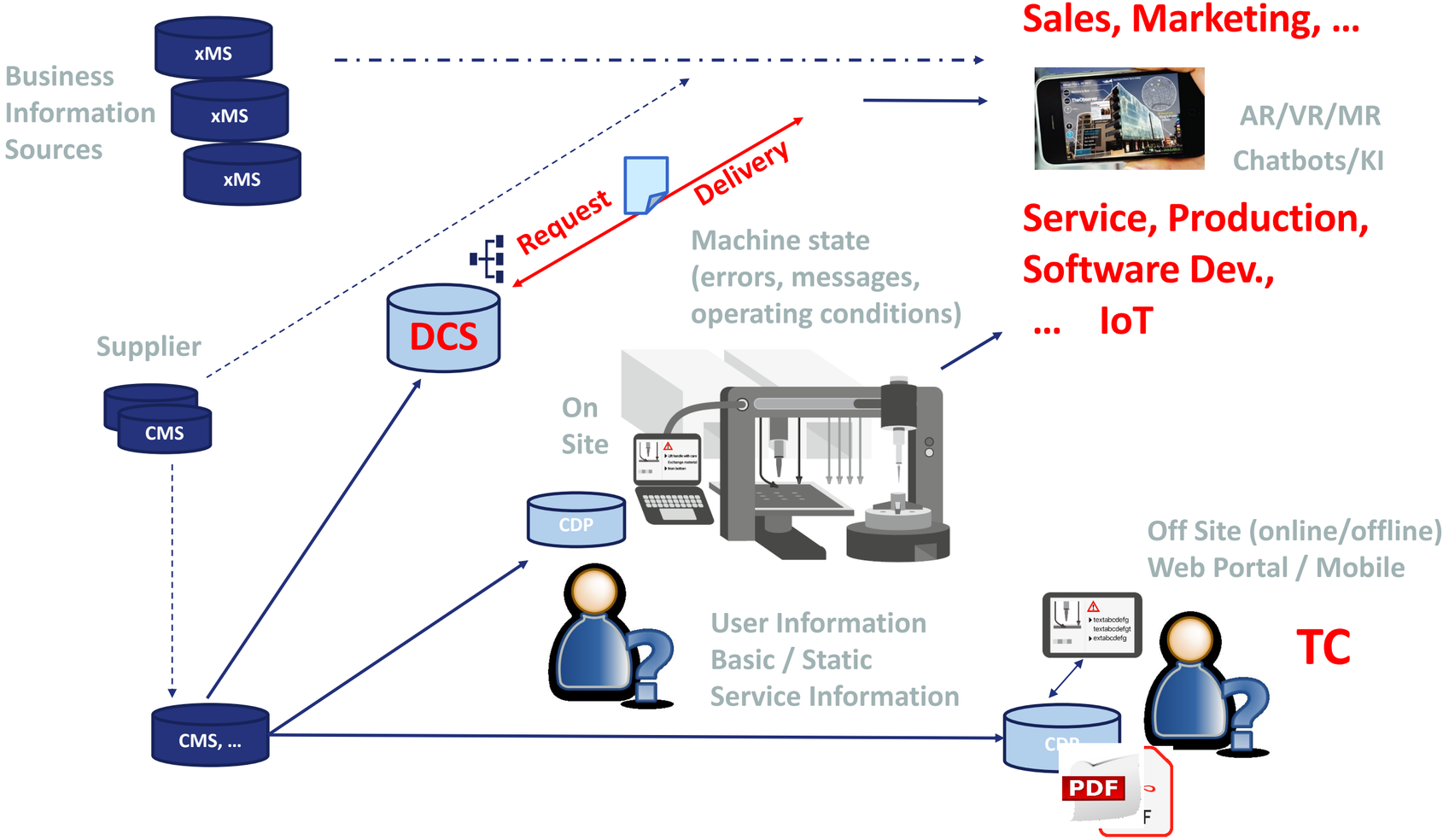


CD Methods

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



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, **variant management** is (at the moment) mostly done in CMS, not in CDP; **configuration management** needs new approaches because of itsmore 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

Augmented Intelligence

The Intelligence Cascade

Intelligence Cascade

Levels of Intelligent Content and Data

Native Intelligence
Semantic content and semantic metadata for process automization, e.g. PI-Classification

Extended/Augmented Intelligence
Additional relations between (content) objects described e.g. by ontologies or other semantic

Artificial Intelligence
Automated extraction of metadata and knowledge by statistical methods (machine learning), …

Intelligence Cascade

Typical challenges arising from taxonomies

- Multi occurences of product components at different locations (in taxonomy)
- **Relations between product components; Depencies of topics on combinations of components**
- **Dependencies of additional variant properties between each other and on product components (configuration management)**
- Dependencies of information types on other taxonomic values

Intelligence Cascade

Relations and rules are

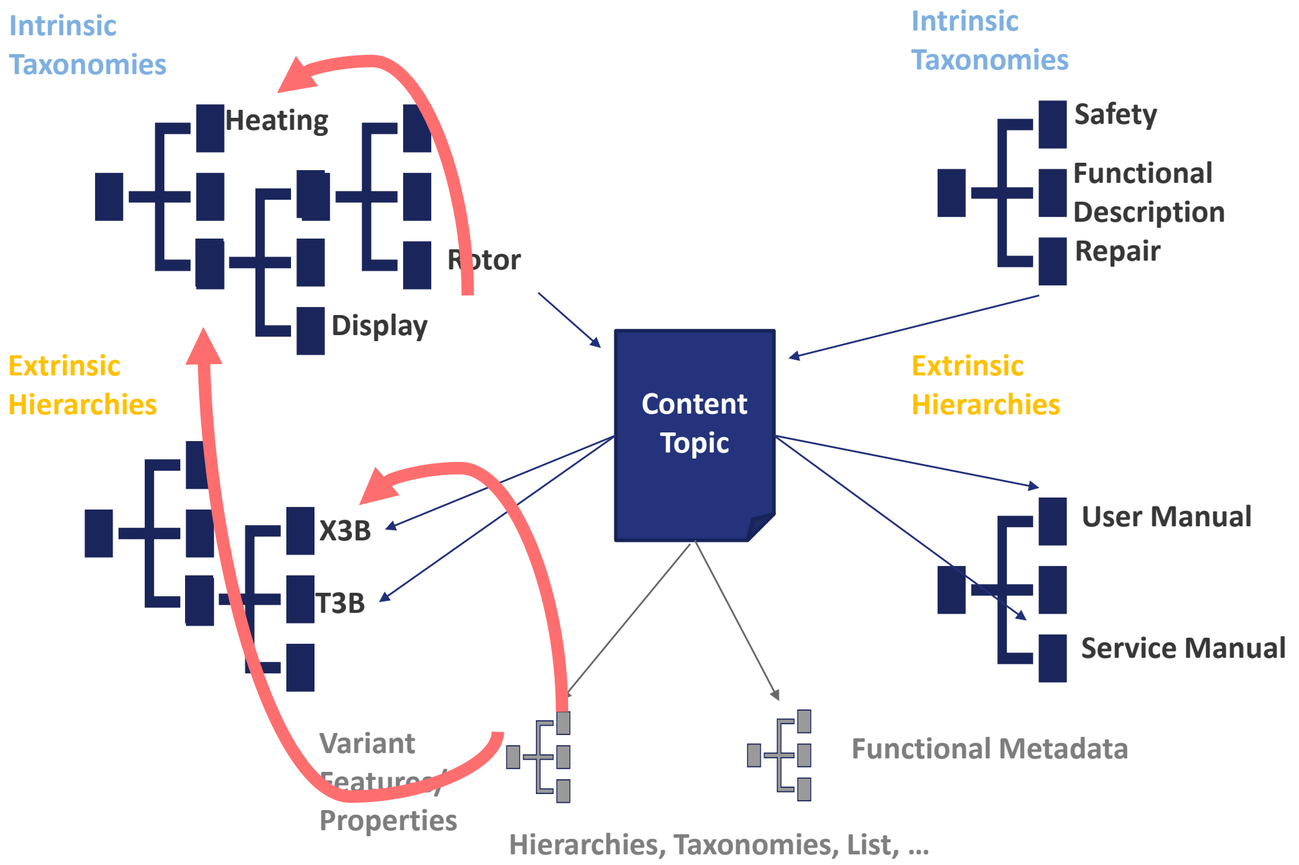
mostly given by

by product management

or by technology

More Complexity (and Dimensions)

Multidimensional Information Space including relations

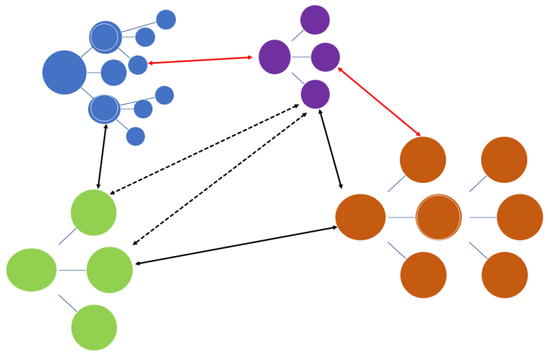


Intelligence Cascade

Ontologies and semantics as communication means and knowledge representation

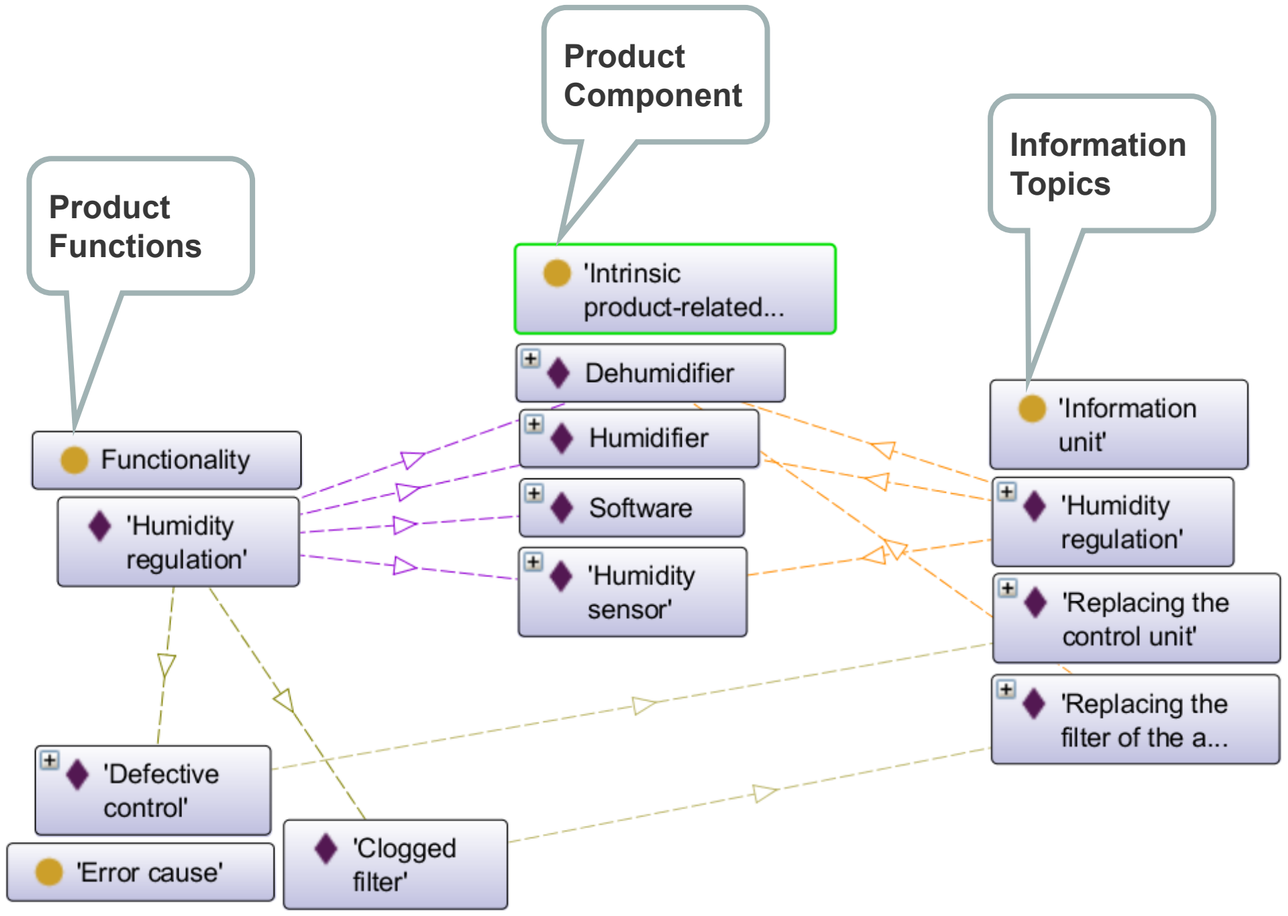
Augmented Intelligence

- Purpose of Augmented Intelligence is to model the complexity of real world products and information
- Overcome typical shortcomings of the taxonomic modelling of metadata
- Introduce model of objects, their properties and (conditional) relations between each other as semantic network → Ontologies



Augmented Intelligence

Augmented Intelligence: Appl. Type



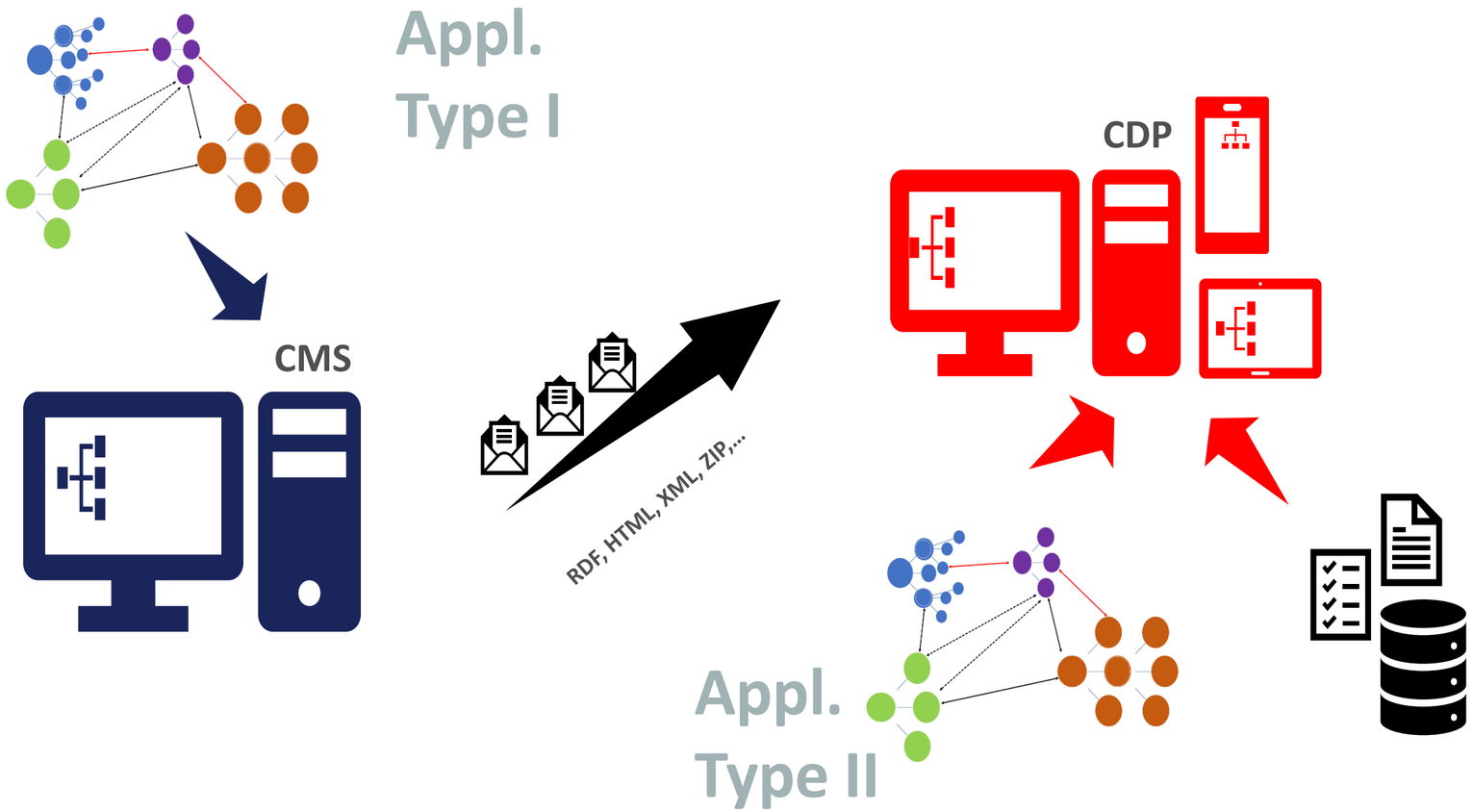
Modelling tool: Protege
Data by A, Ahmadpour MT HSKA 2019, W. Ziegler

Augmented Intelligence

Applications for

Augmented Intelligence

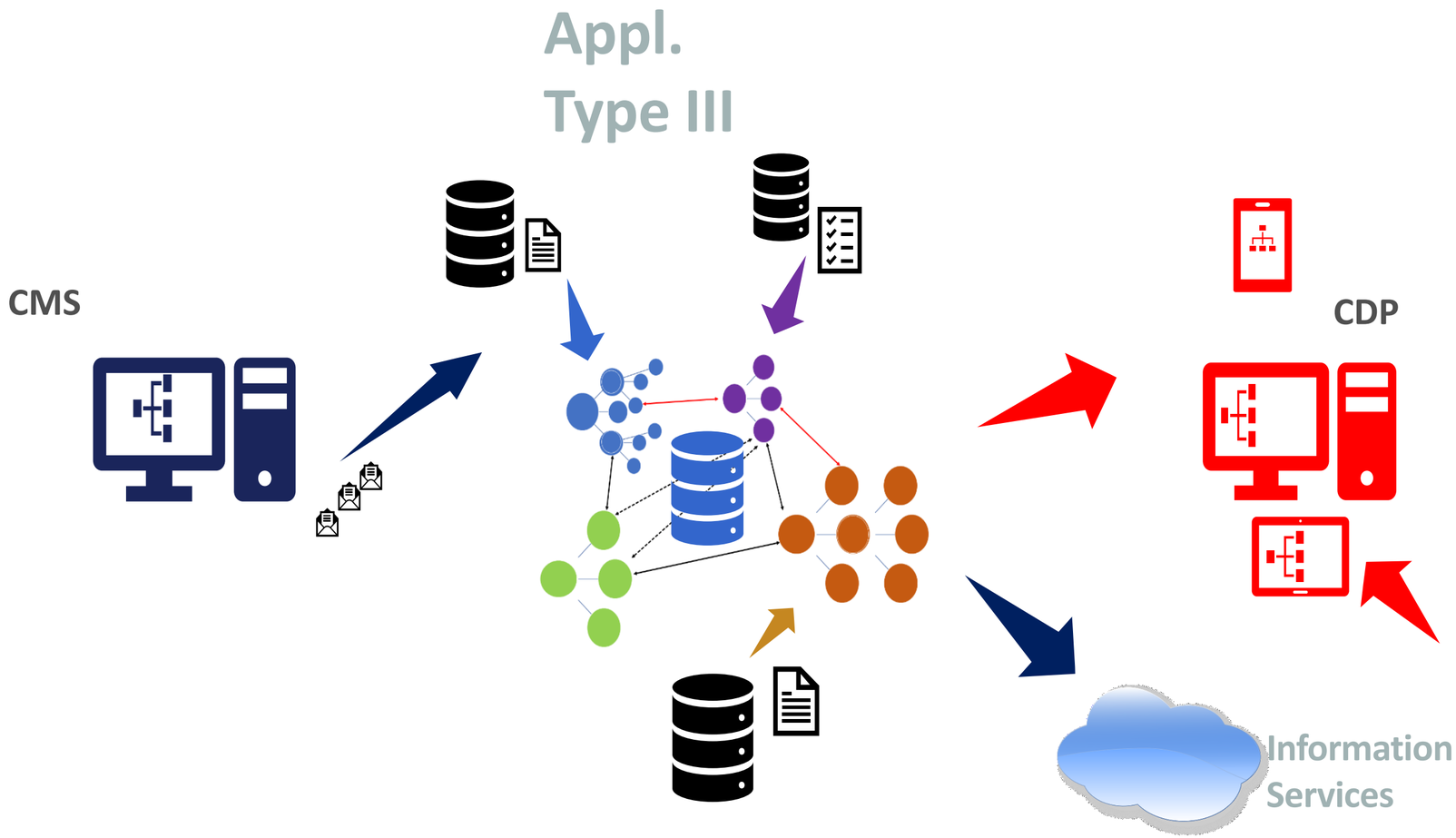
Augmenting CMS / CDP by Ontologies



Augmented Intelligence

Applications for Augmented Intelligence

Semantic Middleware (Information Hub)



Augmented Intelligence

Application Type I

- Allows planning of product variants in a systematic, rules-based and visual way of ontology models
- Can be used as a lookup technology or can be integrated via CMS interfaces
- Connects to product development, configuration management, PLM and configuration software
- Empowers TC writers to handle product complexity
- Control/support CMS processes (in the future) by interfaces

Augmented Intelligence

Application Type II

- Allows the modelling of logical connections between information and topics available in a search system (CDP)
- Can be used as a visual lookup technology (delivery network)
- Can be **integrated into CDP** in order **to improve search results** by logical relationships between information (similarity algorithms)
- Can be connected to enterprise search systems (search expansions)
- Topics/Information can be **assigned manually** to an ontology or using AI technologies

Augmented Intelligence

Application Type III

- Semantic middleware (information hub) is connecting the enterprise information environment and contained information through semantic relations (ontologies)
- **Independent of specific applications** (CMS, CDP)
- Provide connectors/interfaces to different information systems and databases
- **Can import or manage (meta) data; rules-based operations** (coll.)
- Provides (web-)services and interfaces to other applications in order to benefit from a structured access to all data sources

Future Content Access

- microDocs
- System and user tracking related to archiving

Future Content Access

Retrieval Methods by Content User

Hypothesis & first experiences

- The more unexperienced, the more users will use direct search (full text search)
- Document structures are often designed as print publications or as a most complete set of information;
  therefore, navigation by document structures (toc) will not be the appropriate (online) retrieval structure

Future Content Access

Retrieval Methods by Content User

Hypothesis & first experiences

- Facetted search relevant (only) for experienced users, e.g. service technicians, product managers, production process, …
- Full facets derived form product (component) taxonomies are quite complex to access;
  taxonomies may be (more) relevant in the system background;

→ **How can we benefit even more from facets/ taxonomies/classes and/or ontologies**?

Future Content Access

Retrieval structures by CDP

„Delivery zwischen Kontext und Content"
technische kommunikation, Heft 6
S. 58-61 (2019)

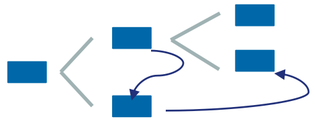
Single topic

Product-Class: Base/ Telescopic Rod; X3B, X3-H1, X5-B, X5-D,...

Information-Class: Operation/ Height Adjustm.; User Manual, Service Manual,...

Lack of context

microDocs



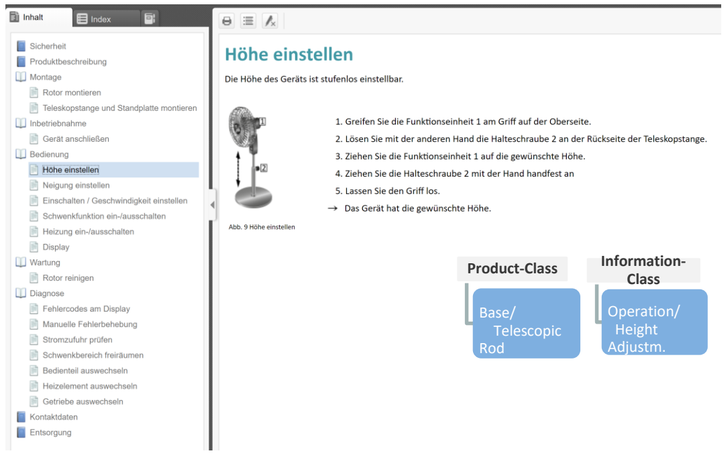
What is needed?

A structured set of topics with relevant context and sufficient content

Relevance and sufficency ist defined by use cases

Document (complete topic assembly)

Abundance of content

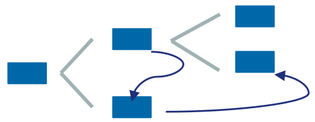


X3B, X3-H1, X5-B, X5-D,...

User Manual, Service Manual,...

Future
Content Access

microDocs



Definition

A microDoc is a (sub-)set of topics
required by predefined use cases
and connected by a logical concept
as a dynamic publication in search media

Additional comment:
The logical concept, the relevant context and the amount of required content can be derived at different levels from semantic models.

Future Content Access

microDocs

Implementation levels

I. Static documents aggregated on CMS level and packaged for CDP

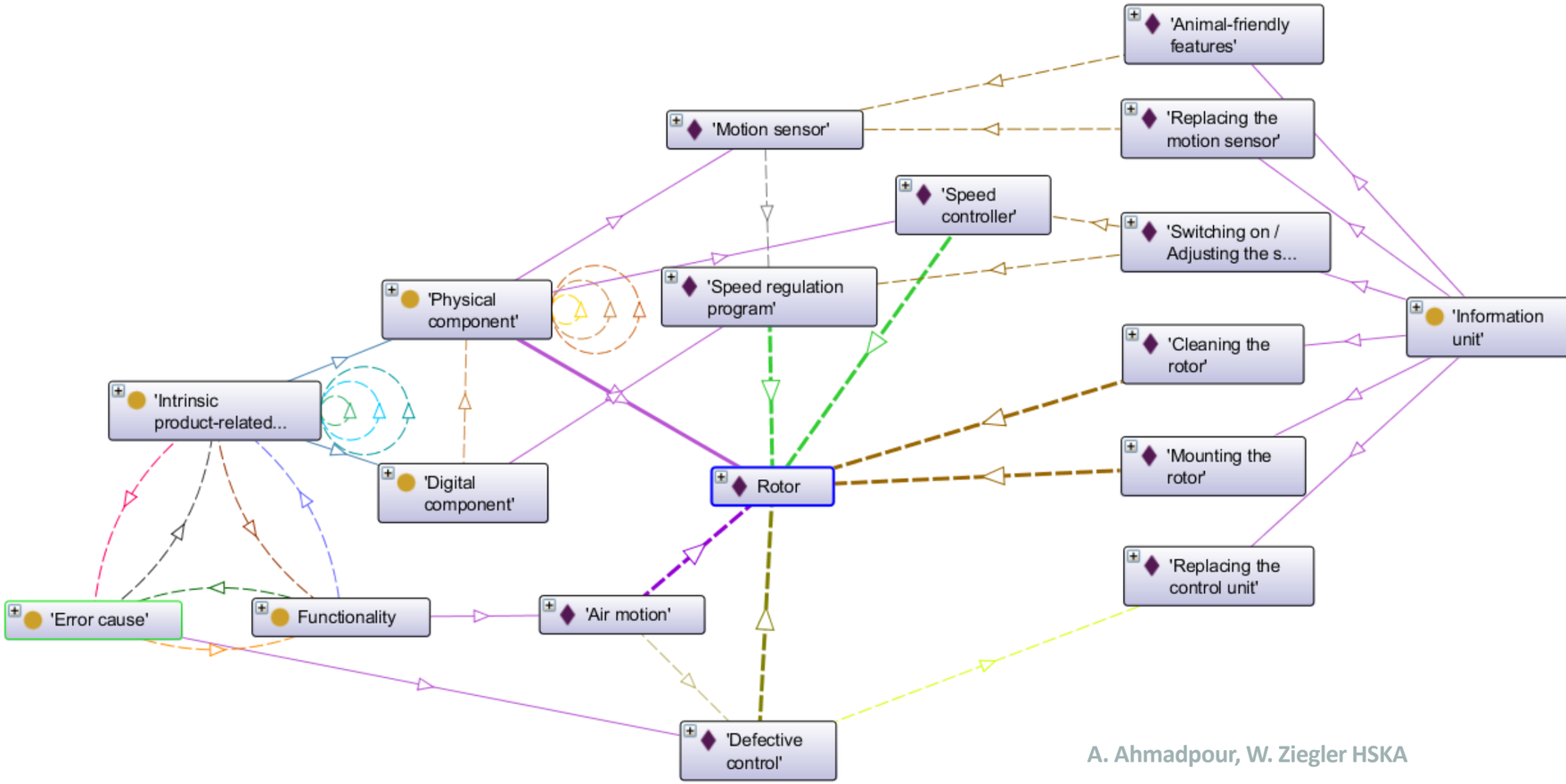
II. Dynamic topic aggregation / or filtering in CDP according to predefined structures using taxonomies (including dynamic linking)

III. Extraction and linking of content from predefined semantic relations, rules and properties of ontology classes and/or instances

Future Content Access

How topics can derived from a logical structure/ semantic network

microDocs



A. Ahmadpour, W. Ziegler HSKA

Future Content Access

microDocs

Implementation levels

IV. Extraction and linking of content from human-derived semantic relations, rules and properties (by search and access analysis)

→ Web-Analytics (CoReAn) of retrieval processes

V. Extraction and linking of content from machine-learned (AI) semantic relations, rules and properties (by search and analysis)

→ „Predictive Content“

Future User Access

CDP-related archiving relies on **tracking/analytics** of user behaviour and of dynamics of information delivery (dynamic publications)

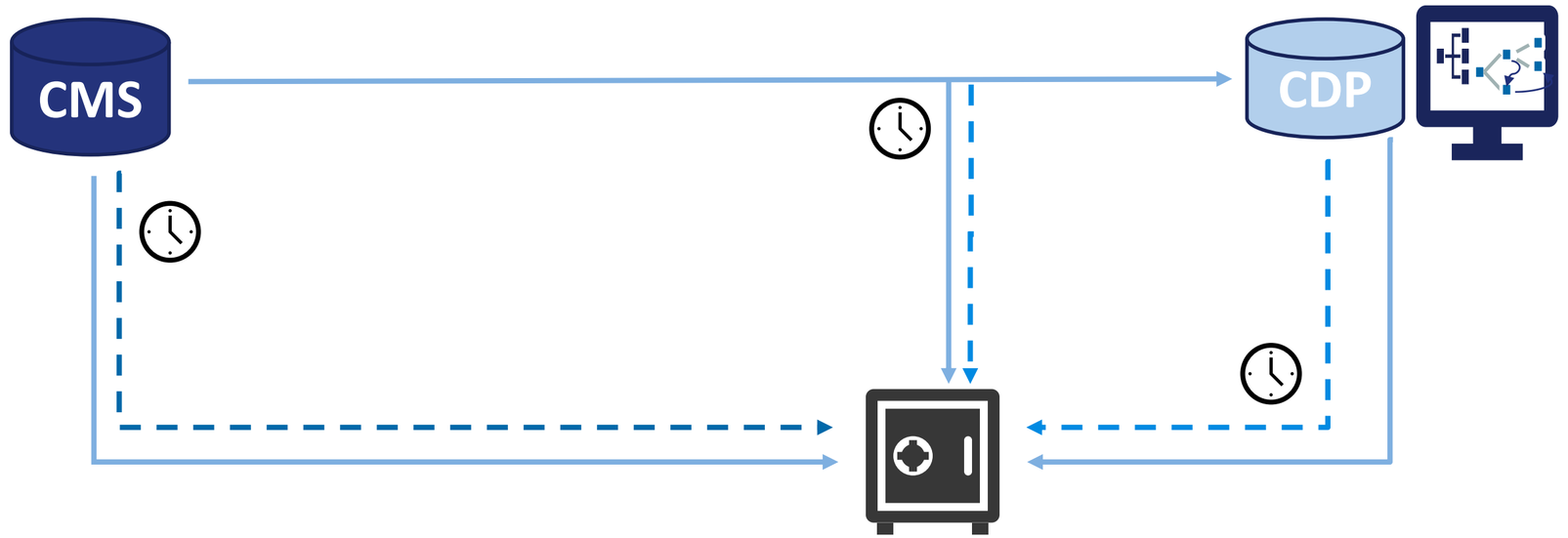
Digital Archiving Services & CMS/CDP

Use Cases/Processes:

- **Publishing**
- **Download (Download Portal)**
- **Retrieval + Viewing (CDP)**
- **Dyn. Publication (Config, microDocs)**
- **Download (Dyn. Publication)**

Proof Levels:

- **Publicatior**
- **Download**
- **Deployment**
- **Viewing**
- **Search/Retrieval**
- **Aggregation, Dynamic Pub.**



Summary

Summary I

Semantic Technologies in TC

- Augmented intelligence relies on native intelligence (classification concepts) used for example in CMS
- Semantic systems using augmented intelligence can empower
  - Companies with their various departments to interact based on explicit models (of products and information, functionality etc.)
  - Information managers and writers to cope with product complexity
  - Information systems to deliver most relevant and specific information to users (e.g. **by microDocs** and other services like archiving)

Thank you for your attention!

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