



GenAI in der KOSTAL R&D: *Effizienz neu gedacht – Praxis live erlebt*

TuWAs Netzwerktage, 14.05.2025, Dr. Jonas Müller, KOSTAL Automobil Elektrik GmbH & Co. KG

*picture created with KOSTAL GPT

KOSTAL

B

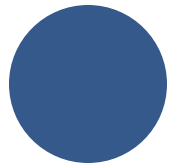
A

N

I

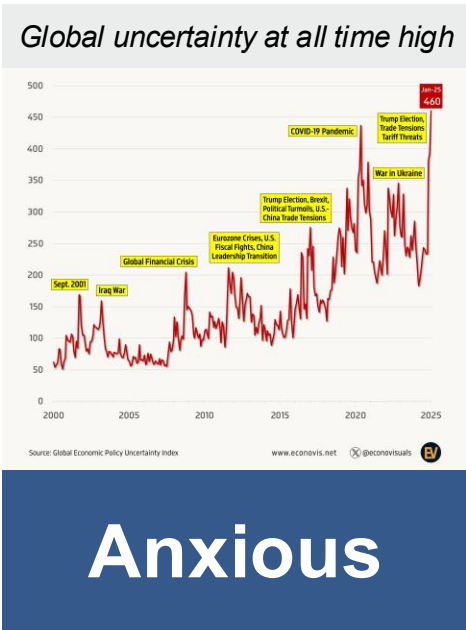


Uncertainty!



Cracks in traditional global order

Brittle



Increasing mutual dependencies

Non-linear

Information overflow

**Incompre-
hensible**

B
Brittle



A
Anxious



N
Non-linear



I
Incomprehensible



Uncertainty on Automotive (Supplier) market

- US: China (Connectivity) SW ban
- Domestic hardware (East-West)
- China for China dev. (global OEMs)
- Unique global platforms reducing
- Two AI ecosystems (East-West)
- Reduced volumes per project
- EU-SOP delays → uncertainty
- China Development cost requested
- (China) speed & flexibility wanted

Increased pressure for automotive R&D



B
Brittle



A
Anxious



N
Non-linear



I
Incomprehensible



Increased pressure for R&D



1

Global approach fading:
"Developed once – localized in all regions"

2

Cost challenge:
"Competition is Chinese"

3

Core principle threatened:
"In the region for the region"

!

**More R&D effort per Turnover
→ Efficiency, Speed & Flexibility**

01

KOSTAL Group – Short Introduction



02

Strategic Project AI@KOSTAL R&D



03

Live Presentation AI@KOSTAL



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Key Facts

-  1912 Leopold Kostal founds the parent company LK in Lüdenscheid
-  1927 LK designs and produces its first parts for the automotive industry
-  1973 Beginning of business activities in the first foreign subsidiary (Mexico)
-  2023 Acquisition of Compleo
Growth to five own business divisions
-  2025 In Realization: Foundation of KOSTAL Elektro
Mobility KEM

NEW

3.5 bn EUR Revenues	20k Employees
64 Sites	22 Countries
(2024)	

Business Units



KOSTAL Automobil Elektrik



KOSTAL Industrial Electronics



KOSTAL Connectors



SOMA



Compleo Charging Solutions

NEW

>2250

R&D employees worldwide
in December 2024

#1

world market leader
in several product areas

+8%

global R&D headcount
growth in 2024

KOSTAL

STRATEGY
R&D 2030

3

global engineering centers
with 18 locations

>250 m€

annual R&D expenditure 2024

ONE KOSTAL R&D

globally working together

 Countries with KAE R&D location

ENERGY

Energizing mobility

Power Electronics

Comfort Electronics

Onboard-Chargers

DC/DC-converters

Charging interface control units

Door control units

Seat control units

Tailgate control units

Smart Access



EMPATHY

Embedding people

Steering column modules

Shift-by-Wire mechatronic modules

Roof modules

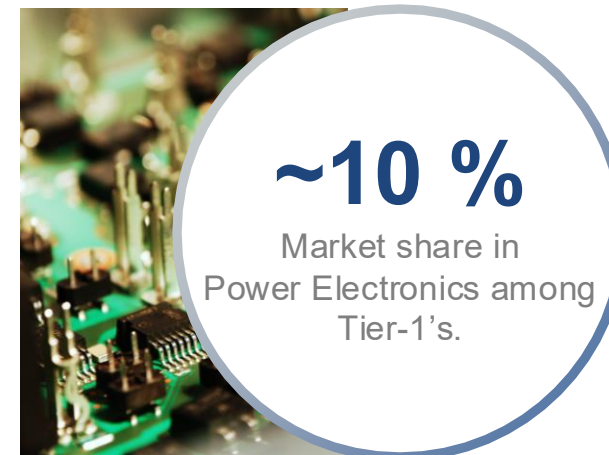
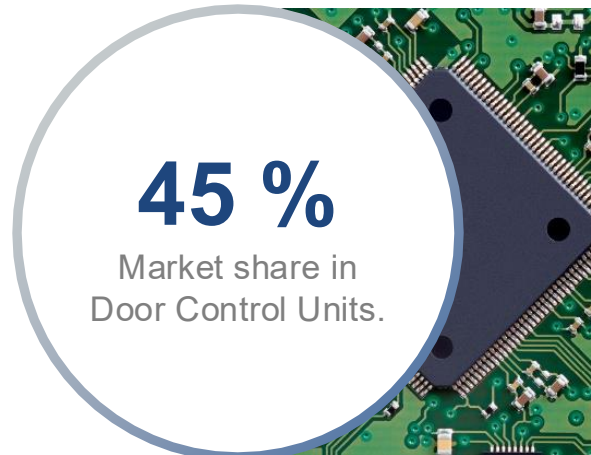
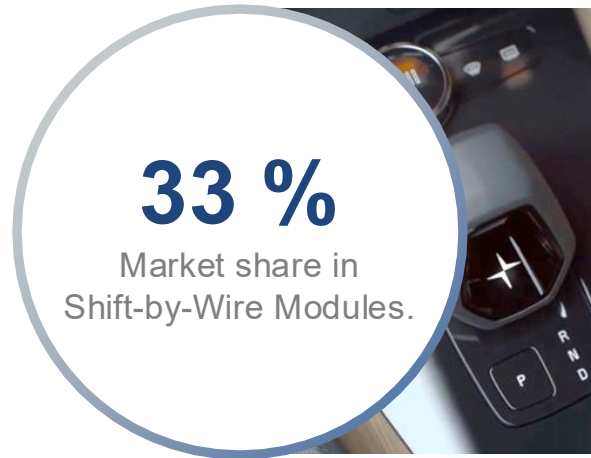
Control elements

Displays and Smart Surfaces

Drive Controls

Comfort Controls

Our products can be found in every second vehicle worldwide.



KOSTAL acts from a position of strength as a world market leader in several product lines to tackle an transforming car market.

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40-45%

Indirect costs in a vehicle:
Focus of direct AI
efficiency potential

40-55

Bill. € expected efficiency
gains along automotive
value chain in EU
until 2030

Costs of indirect functions per vehicle across the entire value chain ¹ , EUR thousand		2026 AI Efficiency potential		2030 AI efficiency potential	
		%	EUR	%	EUR
R&D	3,7-4,1	5-10 %	~260-330	20-30 %	~820-1.150
Indirect production costs, incl. depreciation	4,2-4,6	~5 %	~130-240	~15 %	~570-750
G&A	2,5-2,7	~10 %	~170-280	~20 %	~440-620
Sales & Marketing	3,0-3,3	10-15 %	~300-500	25-30 %	~760-1.000
Total	13,4-14,8	5-10 %	~860-1.350	20-25 %	~2.580-3.500
Number of vehicles produced in Europe			X 15.3 million		X 16 million
Total European efficiency gain potential, EUR p. a.			= ~13-21 billion		= ~40-55 billion

R&D: 82 % of activities can be made more efficient with AI in Automotive

Details for KOSTAL AI in R&D projects on next slides

KOSTAL R&D AI Projects

Requirements & Architecture

- A: Market Analysis

M
- B: Requirements analysis (e.g. quality assurance)

M
- C: Creation of the functional specification (specification sheet)

M
- D: Knowledge extraction, reporting and report generation (e.g. Co-Pilot for patent searches, virtual AR-knowledge expert)

S

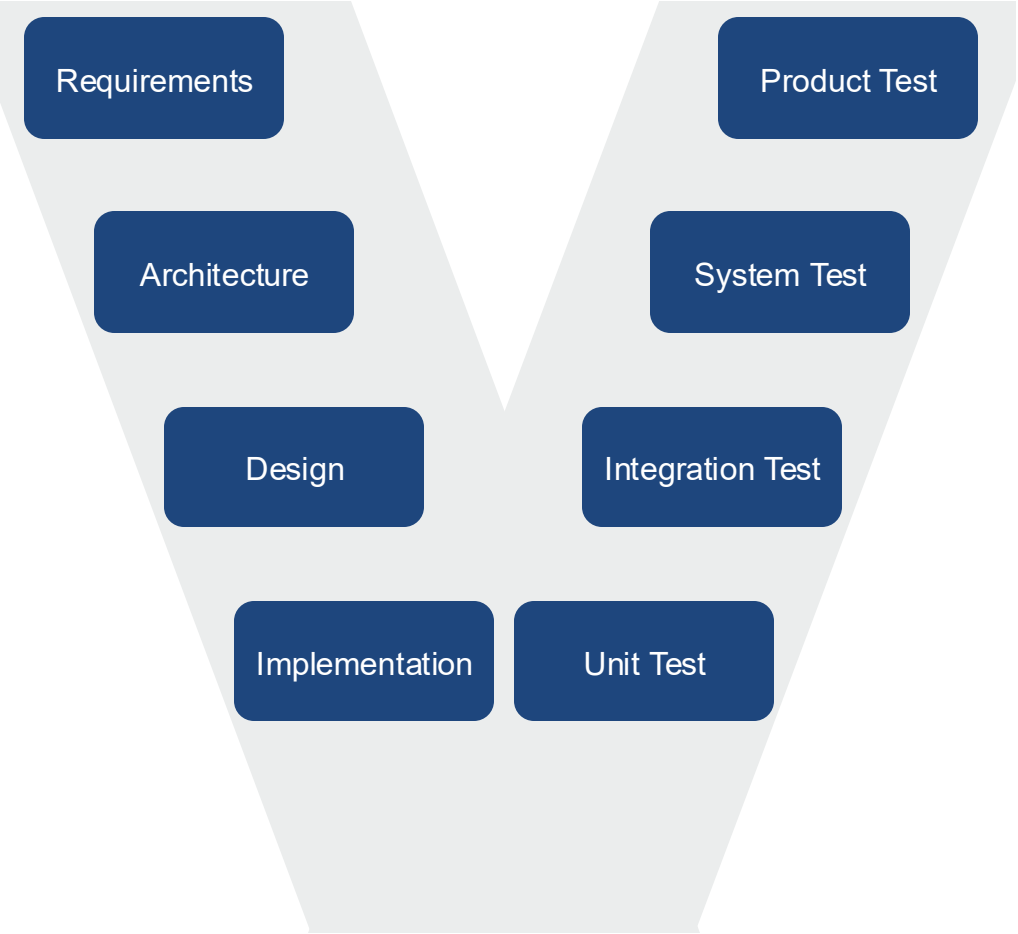
KOSTAL R&D AI Projects

Design

- E: Generative design/ DAPE (e.g. HW architecture optimization)

M
- F: Reverse and Black Box Engineering

M



KOSTAL R&D AI Projects

Testing and homologation

- L

I: Automated reporting and creation of documents (e.g. creation of reports, test documentation and analysis, assistant for patent applications)
- M

J: Procedure of the approval process (e.g. concept creation, co-pilot, approval documentation)
- M

K: Rule-based approach
- M

L: Scenario-based simulation and tests (e.g. test data evaluation, documentation)
- M

M: Checking the safety-critical aspects
- M

N: SiL/HiL test, testing, automation

Implementation & Software development

- M

G: Code management (e.g. code documentation, conformity testing).
Comment: No code generation for product SW!
- M

H: Assistant for software development

Expected cost savings (McKinsey):

S

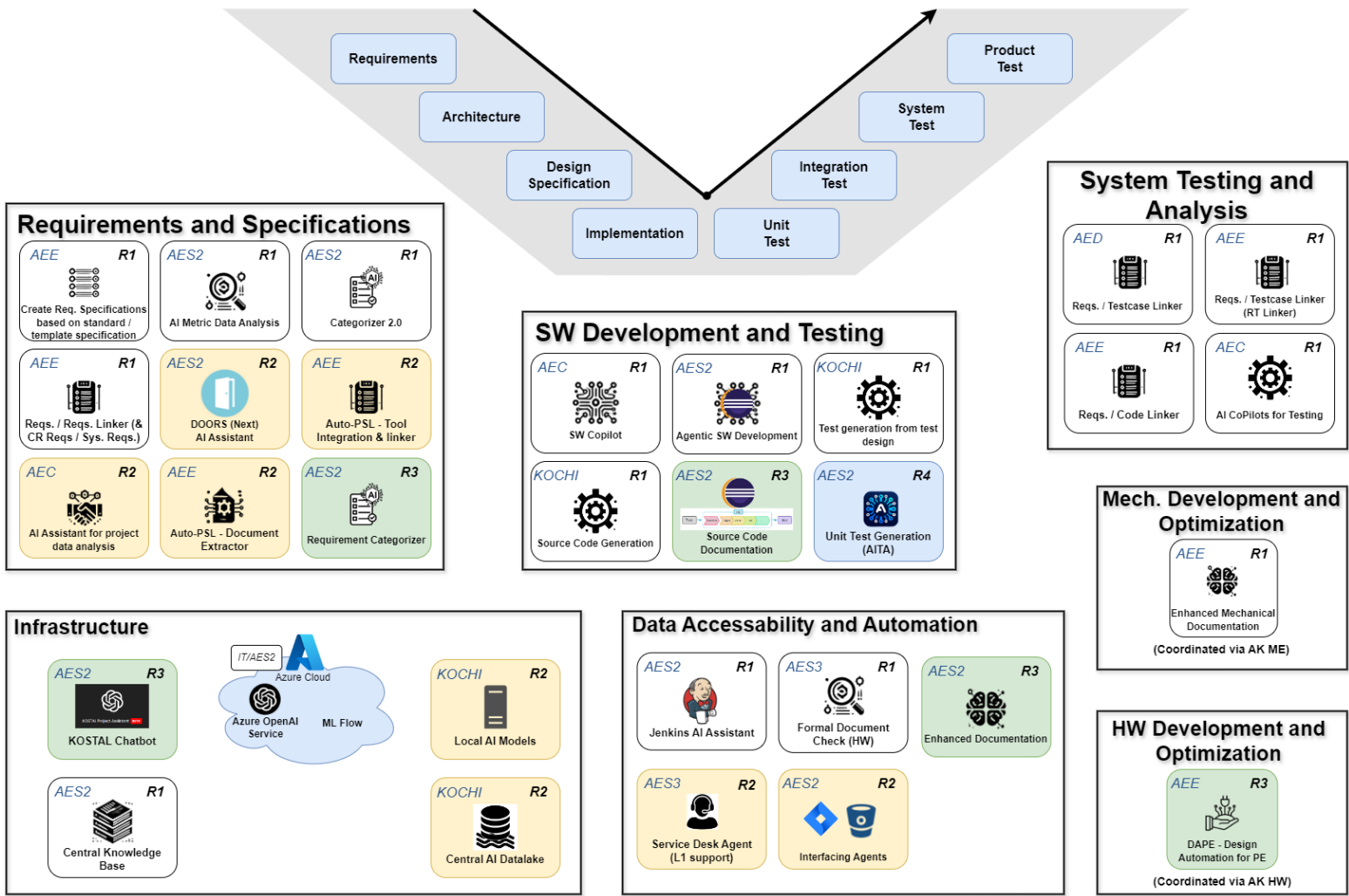
5-10 %

M

10-20 %

L

20-30%



- 31 Key Initiatives in R&D, with many sub-initiatives
- 7 Cluster
- Initiative Size up to several FTEs

R1: Concept definition

R2: Concept validation

R3: Qualification for large-scale application

R4: Implementation in large-scale application

▶ **Priority on processes with highest savings potential.**

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Strategic Project AI@KOSTAL R&D

- High pressure of OEMs to gain efficiency
- Strategic program AI@KOSTAL R&D
- Focus: efficiency & speed



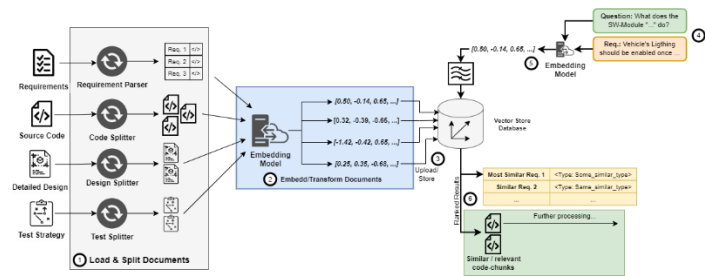
03

Live Presentation AI@KOSTAL R&D



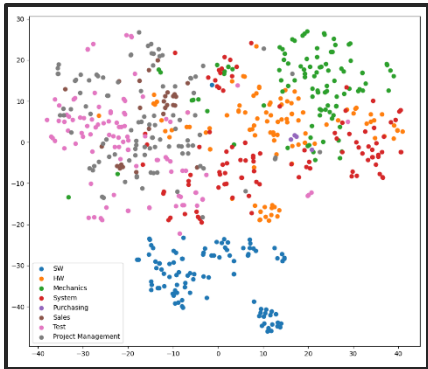
Search (RAG*)

- Training & Onboarding
- Finding Templates and Descriptions
- Problem & Change Analysis
- Evaluating Contracts & Requirements
- Traceability & Re-Use



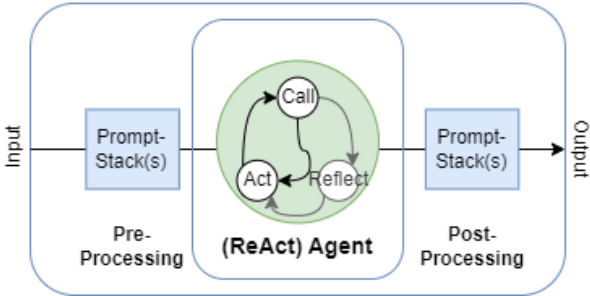
Classification

- Documents
- Requirements
- Issues regarding
 - Domain
 - Function
 - Safety / Security relevance



Generation & Summarization

- Design
- Documentation
- Training Material
- Tests Specification
- Code

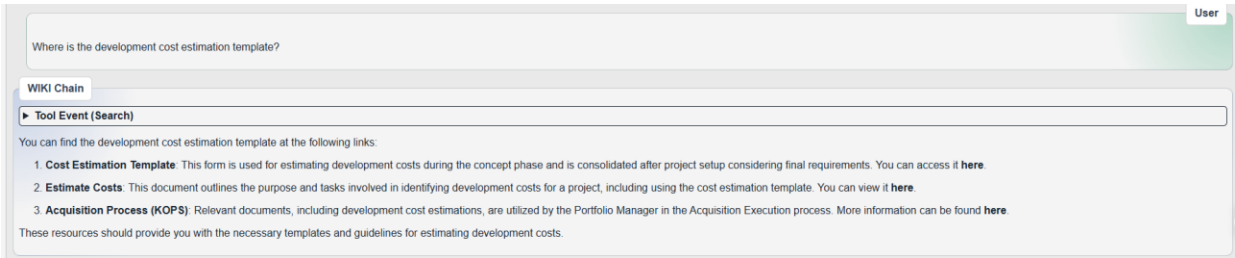


Save effort, increase speed, improve quality and documentation, relieve experts of routine tasks.

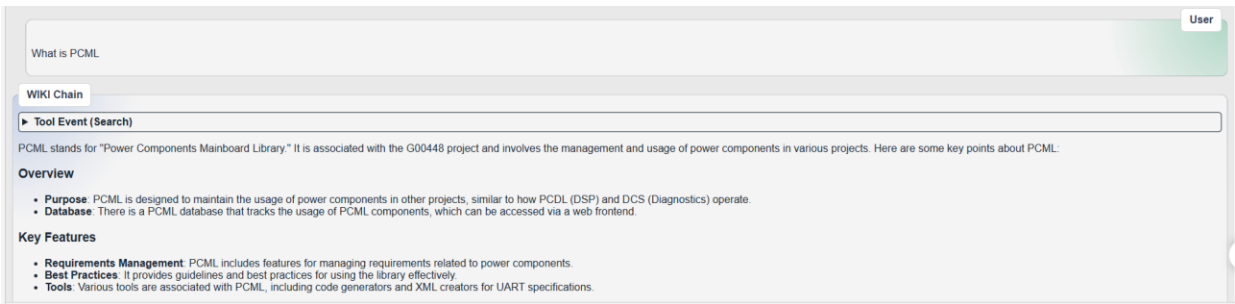
Use Case 1 – AI Search: Process & Documentation

Live Presentation

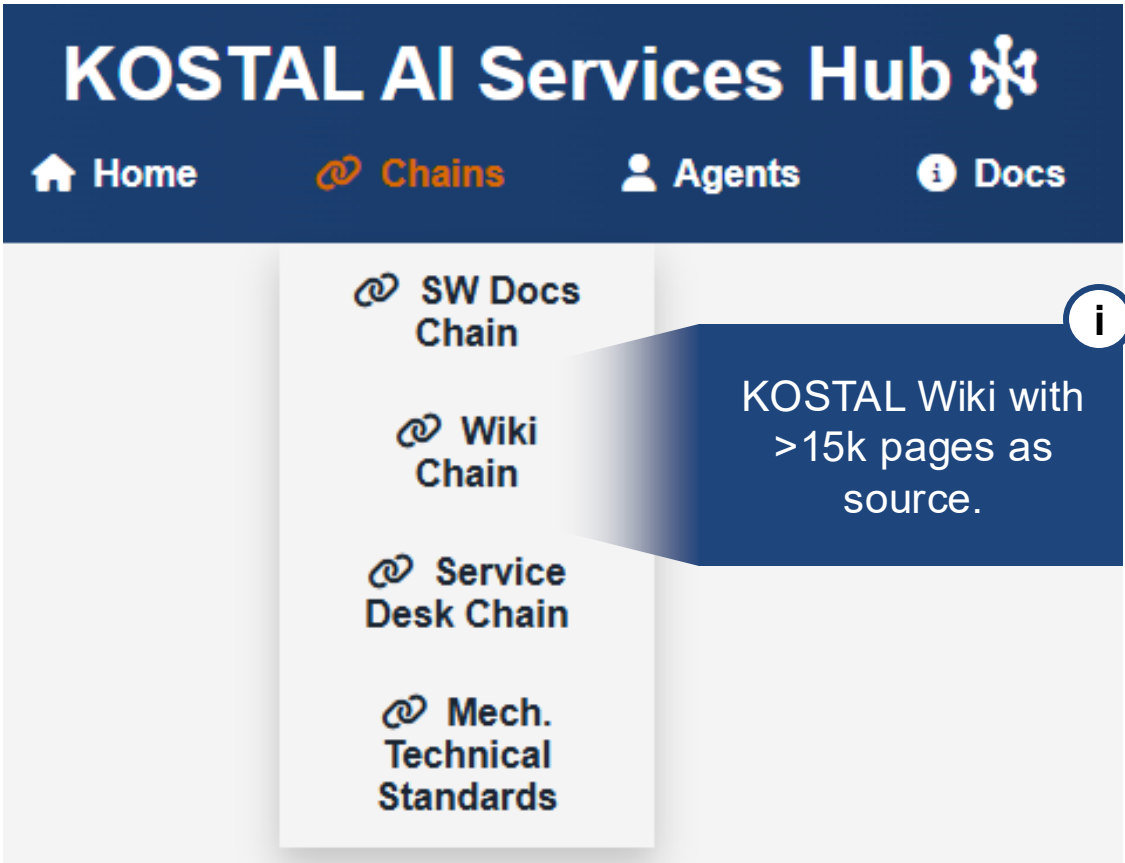
Templates, Process Descriptions



KOSTAL Frameworks, KOSTAL Tooling, ...



KOSTAL Wikipedia as source



AI searches multiple systems containing „unstructured“ data based on semantics and generates results.

Problem and approach

Problem:

- Customer specifications with 300+ documents and up to 20k requirements per project: a lot of time for (re-)searching
- Process descriptions, methods & manuals are unstructured and spread over several systems

Approach

- Enhance existing search techniques with semantic search (vector based)

Examples

User

Kannst du mir die Titel der Dokumente auflisten?

KOSTAL ChatGPT 3.5

Hier sind die Titel der Dokumente, in denen die Temperaturanforderungen spezifiziert werden:

1. XXXX – Electric and Electronic Units in Motor Vehicles up to 3.5 t; General Component Requirements, Test Conditions, and Tests [10:13↑source] .

2. Lastenheft für Authentic Time Client [10:0↑source] .

3. Lastenheft für Zentrale Fahrzeugsoftware-Lieferungen und Metadaten [10:1↑source] .

4. Lastenheft für Grundverhalten der Applikation [10:2↑source] .

5. Lastenheft für Hochvolt-Bordnetz ungeschirmt [10:3↑source] [10:6↑source] .

6. Konzern Grundanforderungen Software [10:4↑source] .

7. Bauteillastenheft Bedienelemente Lenkradgeneration 2026 [10:5↑source] [10:7↑source] [10:8↑source] [10:9↑source] [10:14↑source] [10:17↑source] .

8. Allgemeines Querschnittlastenheft für Bediensysteme (EEI2) [10:19↑source] .

9. XXXX logationsunterlagen [10:1↑source] [10:15↑source] .

10. Anfragelastenheft! XXXX [10:13↑source] .

Diese Dokumente enthalten die spezifischen Anforderungen und Beding

Kontexten und Anwendungen.

User

Welche Anforderungen an Temperaturbereiche gibt es?

KOSTAL ChatGPT 3.5

Die Anforderungen an die Temperaturbereiche sind in mehreren Dokumenten beschrieben. Hier sind die wesentlichen Punkte zusammengefasst:

1. Allgemeine Anforderungen:

◦ Alle Forderungen müssen uneingeschränkt in einem Temperaturbereich von -20 °C bis 50 °C erfüllt werden (Temperatur der Luft des Fahrzeuginnenraums). Außerhalb dieses Bereichs dürfen graduelle Abweichungen auftreten, wenn diese durch den Auftraggeber freigegeben werden [4:2↑source] [4:3↑source] .

◦ Es gelten die in der Norm XXX genannten Standardwerte für die relative Luftfeuchtigkeit [4:0↑source] .

2. Spezifische Anforderungen für Einbauteile:

◦ Innenraum ohne besondere Anforderungen: Temperaturbereich von -40 °C bis 80 °C (Temperaturkollektiv 1) [4:0↑source] .

◦ Innenraum mit Sonneneinstrahlung: Temperaturbereich von -40 °C bis 105 °C (Temperaturkollektiv 2) [4:0↑source] .

3. Displays und optische Komponenten:

AI searches ~20k customer requirements based on semantics.

Problem and approach

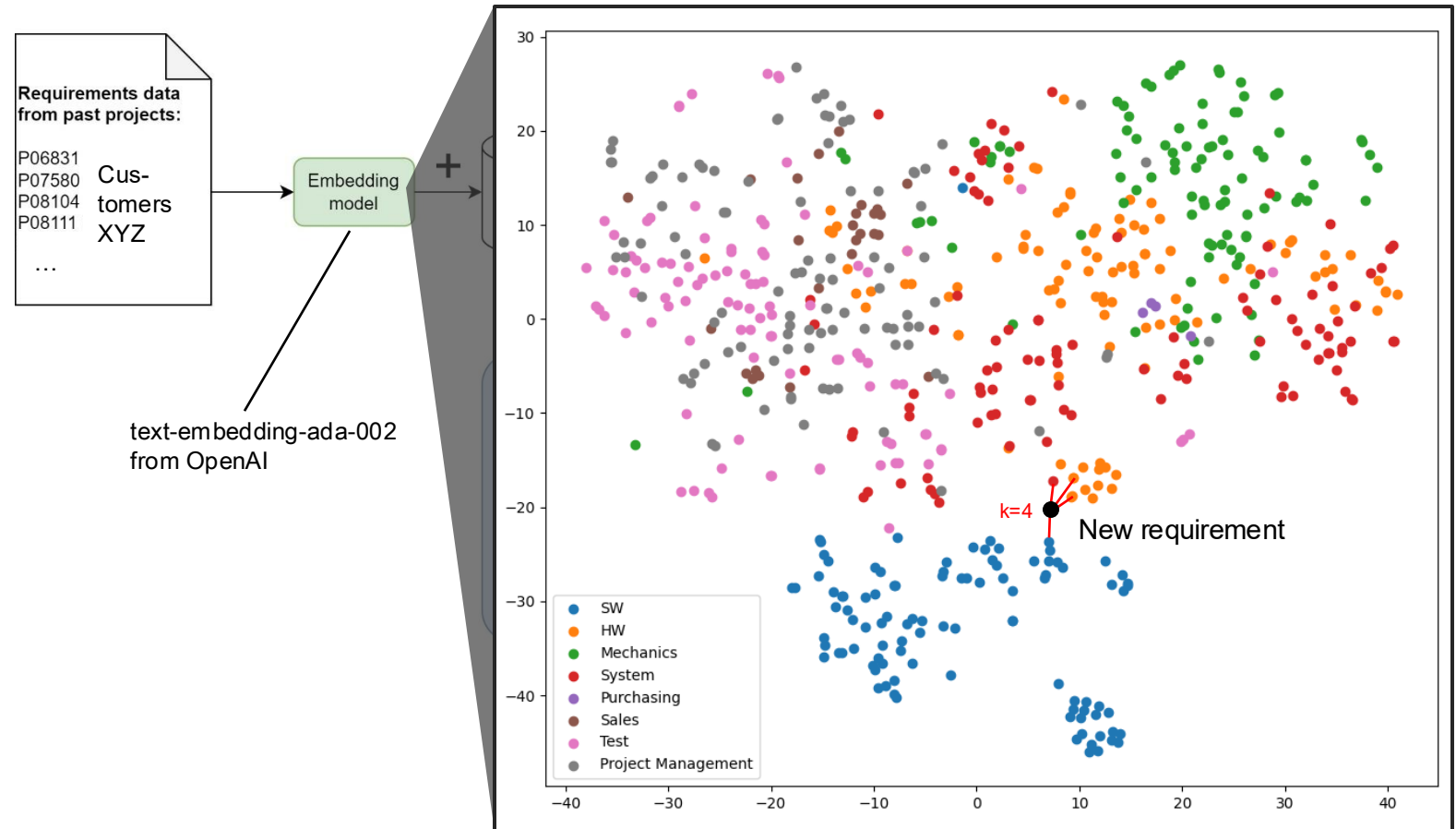
Problem:

- Classification of customer specifications for further processing: 300+ documents and up to 20k requirements per project
- Humans can classify up to 200 requirements per hour / attribute

Approach:

- AI based approaches can classify requirements based on previous classifications of similar requirements

Example for customer project



Classification (e.g. responsible domain) of 20.000 requirements instantly based on existing evaluations.

Problem and approach

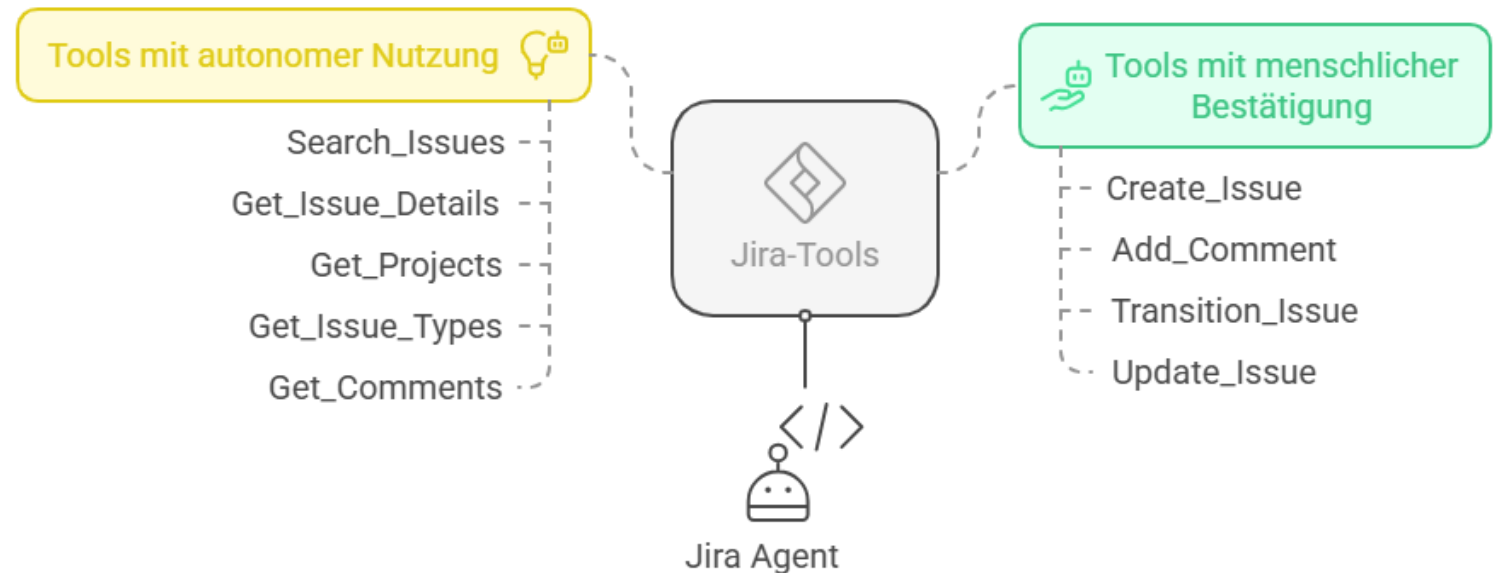
Problem:

- Routine Jira tasks are manual and time-consuming
- Daily use lacks context-aware assistance

Approach:

- AI agent automates queries and analyzes Jira data
- Users confirm pre-suggested actions via chat (dependent on the use case)

Logic of JIRA assistant



Seamless integration of AI and Jira tools enables efficient task handling through intelligent, context-sensitive automation.

Video Platzhalter – wird noch eingefügt.

Info:

- Only Screen was recorded
- Script, Audio and Speaker AI generated

i

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- Internal roll out when “good enough”
- Continuous improvement of tools





1

Automotive Industry in a BANI world

- Market shifts and geopolitical uncertainties
- Dynamic changes in demand (Europe-US-China)
- Increased need for efficiency, speed & flexibility

2

GenAI as key driver for efficiency, speed & flexibility

- Exp. AI-based efficiency potential for industry up to €55 B by 2030
- Focus on processes in indirect functions like R&D
- AI@KOSTAL R&D with several initiatives & use cases

3

Transformation requires action!

- Top Management commitment from Day One
- Strive for fast successes and allow fails
- Keep Pace with Technology

Do not just think and plan – Do it!