Use case DOME4.0 and OntoCommons
Lessons learnt for ontology-based commons:
Semantically Empowered Industry 4.0 @Bosch

Evgeny Kharlamov, Bosch AI

Bosch I4.0 Use Cases
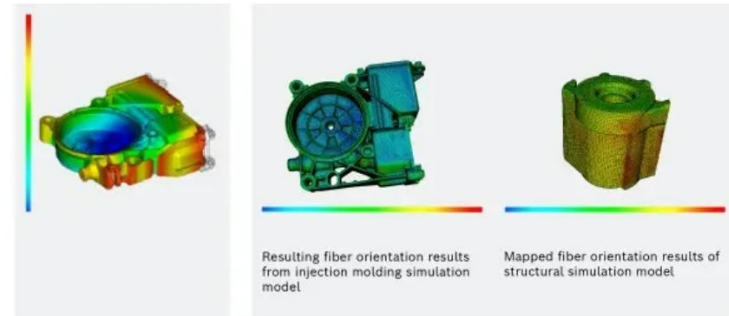## Smart Manufacturing + Smart Materials

- Welding UC: Optimize welding quality
  - Combine data from multiple sources to reduce manufacturing errors
  - Ontologies to unify
    - welding data
    - background knowledge: Welding Practices, Welding optimization tasks, ML Routines
  - Standardization of welding ontologies
  - Democratizing of AI using Ontologies
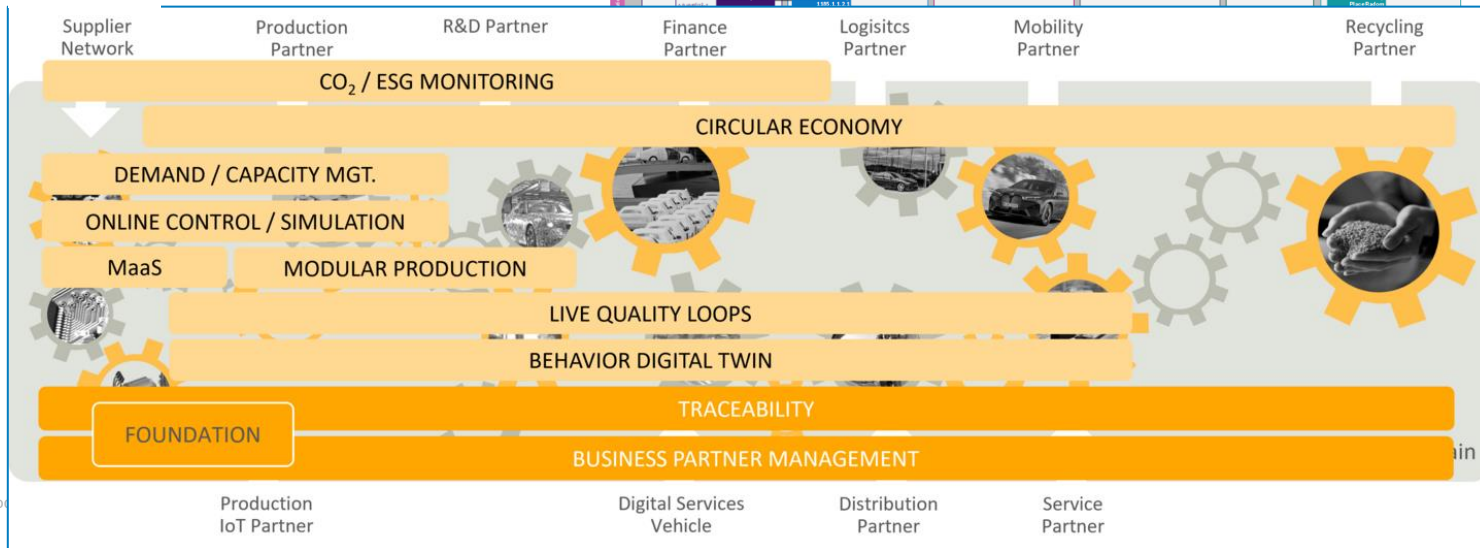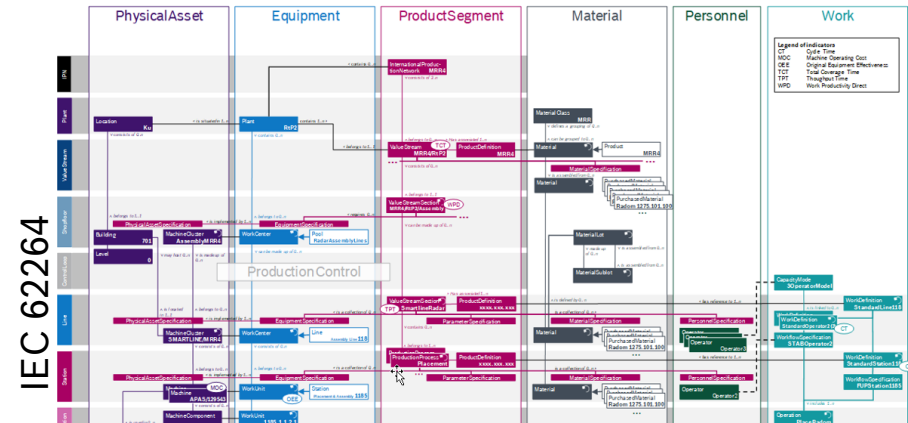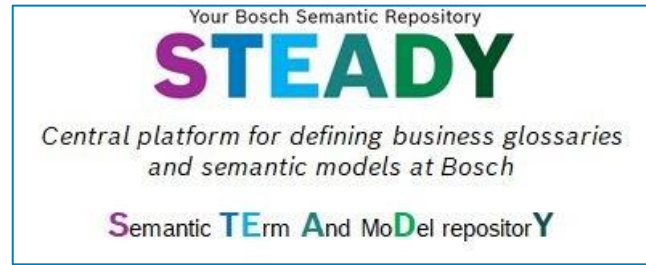

- Plastic Simulation UC: Optimize simulation
  - Combine data from multiple labs to enhance simulation processes – less time, better quality
  - Ontologies to capture
    - Plastic simulation routines
    - Simulation data
  - Two players: Bosch internal and F-IWM (Fraunhofer Institute for Mechanics of Materials)

Resulting fiber orientation results from injection molding simulation model

Mapped fiber orientation results of structural simulation model

BOSCH

Bosch Onto Standardization, OntoCommons
State of the Art

Your Bosch Semantic Repository
STEADY
Central platform for defining business glossaries and semantic models at Bosch

Semantic **TE**rm **A**nd Mo**D**el repositor**Y**

- Bosch established working groups that aim at standardized practices around ontologies
  - Usage of standardized tools
  - Common library ~ 500 ontologies
  - Embracing international standards
- Bosch brings onto standardization to large multi-tier projects
  - Catena-X
  - On-top of Gaia-X
 - Onto-Driven data sharing across automotive value chain

IEC 62264

Catena-X
Automotive Network

Bosch Onto Standardization, OntoCommons
Lessons Learned

- Welding ontology
  - Development of the ontology:
  - International standards, existing top level ontologies
  - Validation with OntoCommons crowd
- Hiring to follow Onto standardization
  - 3 interns at PhD level to work on OntoCommons
    - Uni Galway
    - ISTC - CNR (Trento), Uni Madrid
  - 1 PhD student with Uni Madrid to start in 2023 to follow up and implement standards
- Spin our industry working group
  - Siemens Energy, Uni Oslo, Total Energy, BMW
  - Workshop @ ESWC 2022

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OntoCommons + Dome 4.0
## Why both are relevant for Bosch?

- **Bosch should know** what it knows **+** what it does not
  - Finding the right dataset is vital for AI enhancements
  - Common onto: vital for linking data inside/outside of Bosch
- Bosch @ Dome 4.0
  - Use case, OntoCommons alignment, etc
  - Bosch in house dataset search methods → Dome 4.0 platform
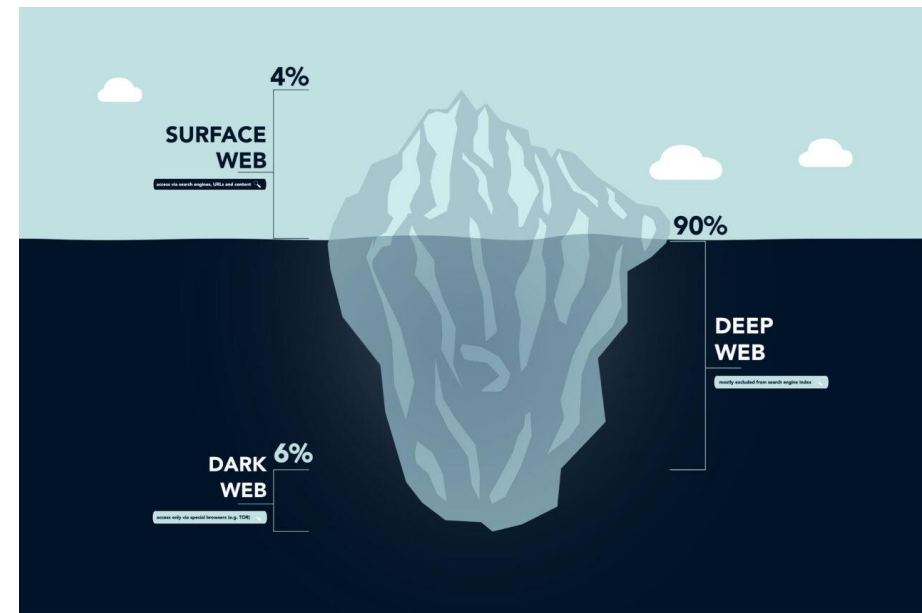
IEEE TRANSACTIONS ON KNOWLEDGE AND DATA ENGINEERING, VOL. 35, NO. 2, FEBRUARY 2023   1227

BANDAR: Benchmarking Snippet Generation Algorithms for (RDF) Dataset Search

Xiaxia Wang, Gong Cheng, *Member, IEEE*, Jeff Z. Pan, Evgeny Kharlamov, and Yuzhong Qu
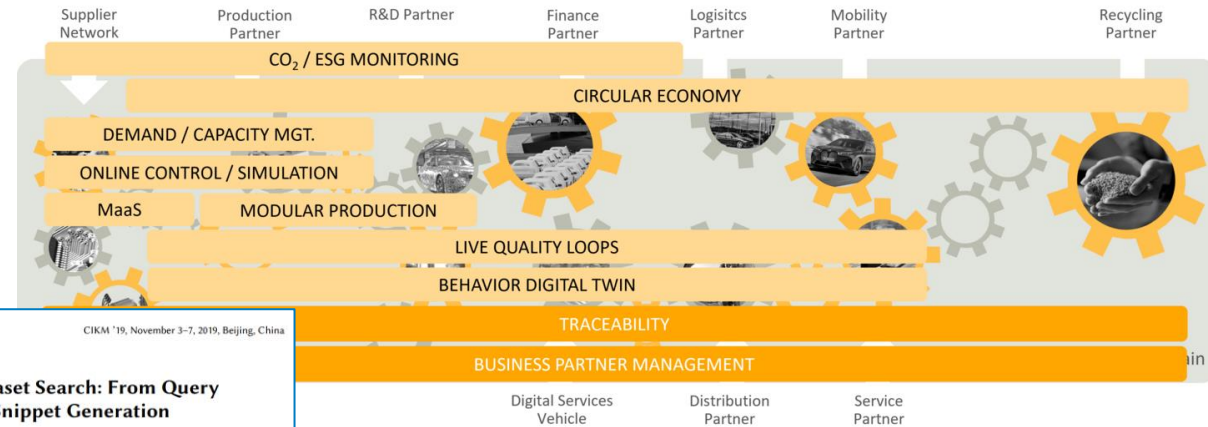
A Framework for Evaluating Snippet Generation for Dataset Search

Xiaxia Wang[1], Jinchi Chen[1], Shuxin Li[1], Gong Cheng[1(✉)], Jeff Z. P
Evgeny Kharlamov[4,5], and Yuzhong Qu[1]

Session: Short - Search   CIKM '19, November 3–7, 2019, Beijing, China

Towards More Usable Dataset Search: From Query Characterization to Snippet Generation

Jinchi Chen	Xiaxia Wang	Gong Cheng
National Key Laboratory for Novel Software Technology, Nanjing University, China	National Key Laboratory for Novel Software Technology, Nanjing University, China	National Key Laboratory for Novel Software Technology, Nanjing University, China
jcchen@smail.nju.edu.cn	xxwang@smail.nju.edu.cn	gcheng@nju.edu.cn

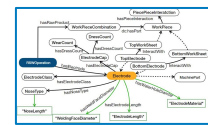| Evgeny Kharlamov	Yuzhong Qu
Bosch Center for AI Bosch GmbH, Germany University of Oslo, Norway	National Key Laboratory for Novel Software Technology, Nanjing University, China
evgeny.kharlamov@de.bosch.com evgeny.kharlamov@ifi.uio.no	yzqu@nju.edu.cn

Dome 4.0 meets OntoCommons
Smart Manufacturing + Smart Materials

Our **goal** is that people should **trust** our AI-based products.
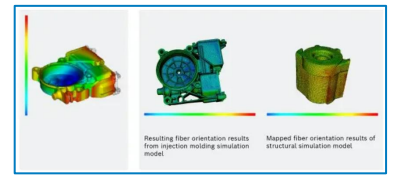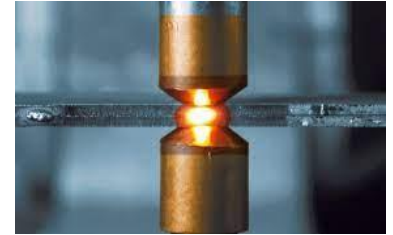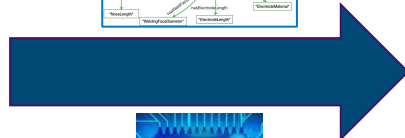
Volkmar Denner
Bosch CEO
#BCW20

EMMO, DCAT, etc

Welding + ML

Welding

BOSCH

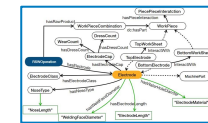# Dome 4.0 meets OntoCommons
Smart Manufacturing + Smart Materials

- Welding UC: Optimize welding quality
  - Ontologies
    - to unify welding data
      + background knowledge
    - of the Market Place
  - 3 collections of datasets
    - Bosch production
    - Customer – found via Dome 4.0 (criteria based)
    - Synthetic – found via Dome 4.0 (on demand)

- Plastic Simulation UC: Optimize simulation
  - Combine data from multiple labs to enhance simulation processes – less time, better quality
  - Ontologies to capture
    - Plastic simulation routines + Simulation data
    - of the Market Place
  - 2 collections of datasets
    - Bosch internal
    - Fraunhofer Institute for Mechanics of Materials

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BOSCH