Human-AI Collaborative Intelligence in Manufacturing via Knowledge Graphs

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Franz Krause, University of Mannheim

September 26th 2023 @BluePoint Brussels

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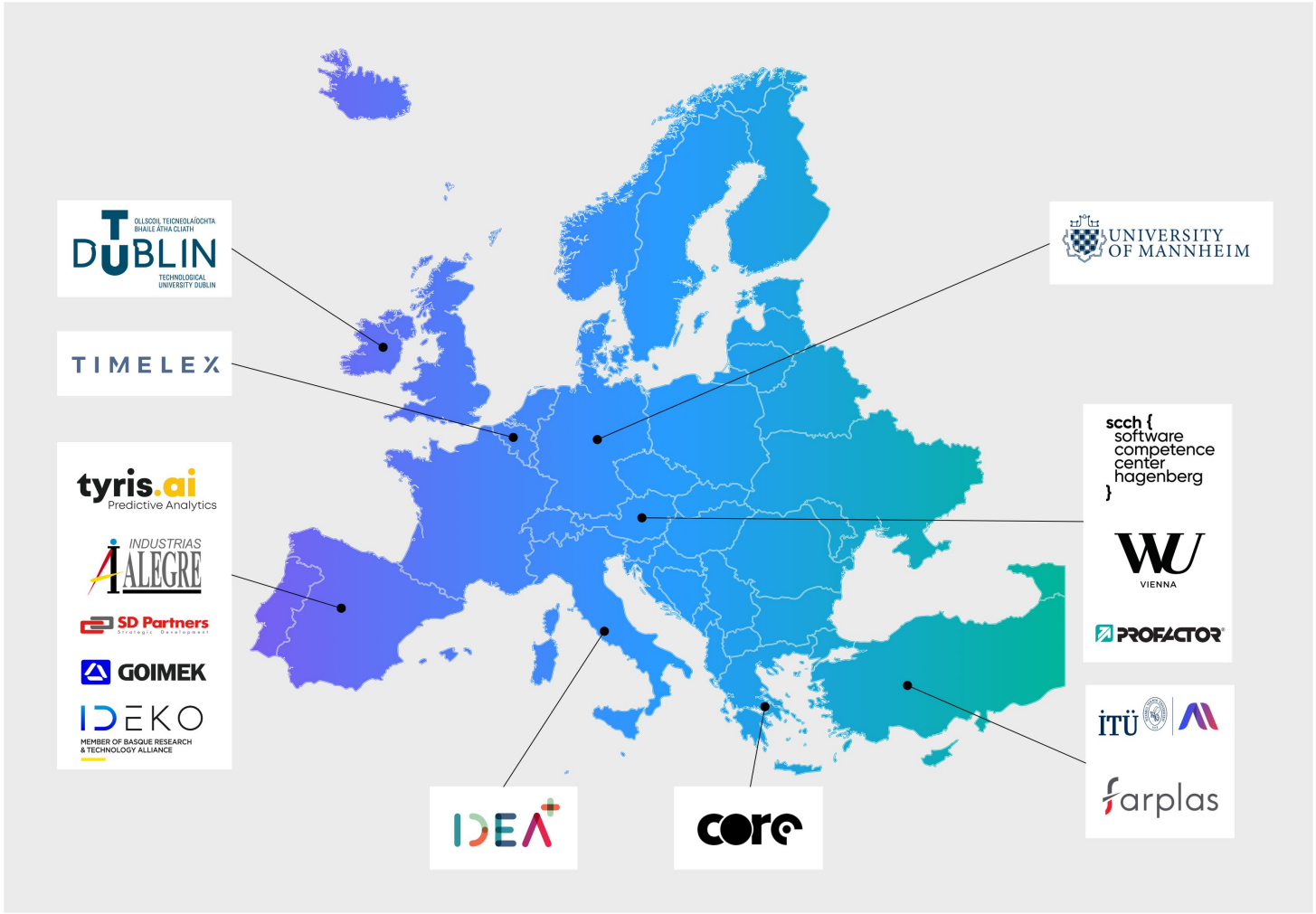
WHO WE ARE

15 Partners



8 Countries

5.7M €
EU Funding

42 Months
2021-2024
incl. 6-month extension

FACTS AND FIGURES

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Project Objective

A New Paradigm of Human AI Collaboration

Overcoming the lack of flexibility as a limiting factor WHILE ensuring the role of the human by means of human-centered AI collaborations

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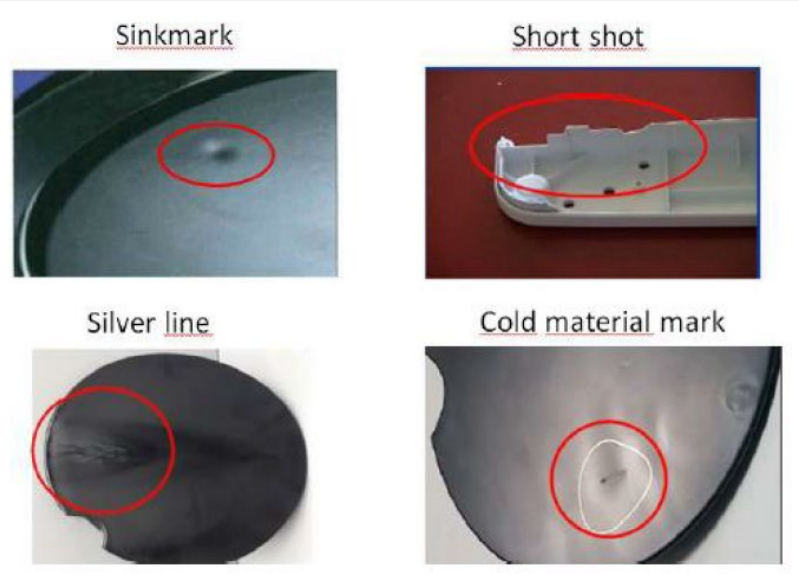
The three TEAMING.AI

Use Cases

Use Cases

1



Quality Inspection

Transfer learning based robust quality inspection (for plastic injection sector)

farplas

Turkey

2

Use Cases

2

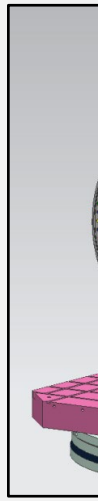
Machine diagnostics

Machine diagnostics for plastic injection sector to improve quality and reduce waste

INDUSTRIAS ALEGRE

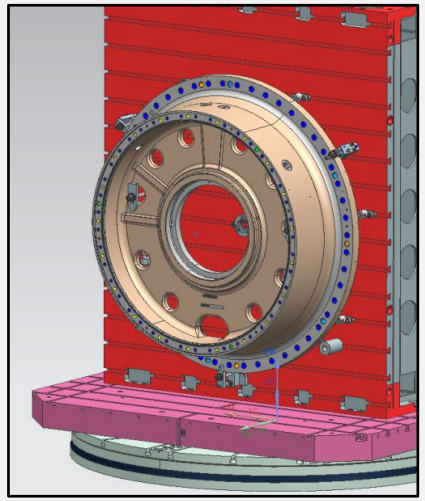
Spain

3



Use Cases

3



Ergonomic risk prevention

Ergonomics and risk prevention in large part manufacturing

GOIMEK

Spain

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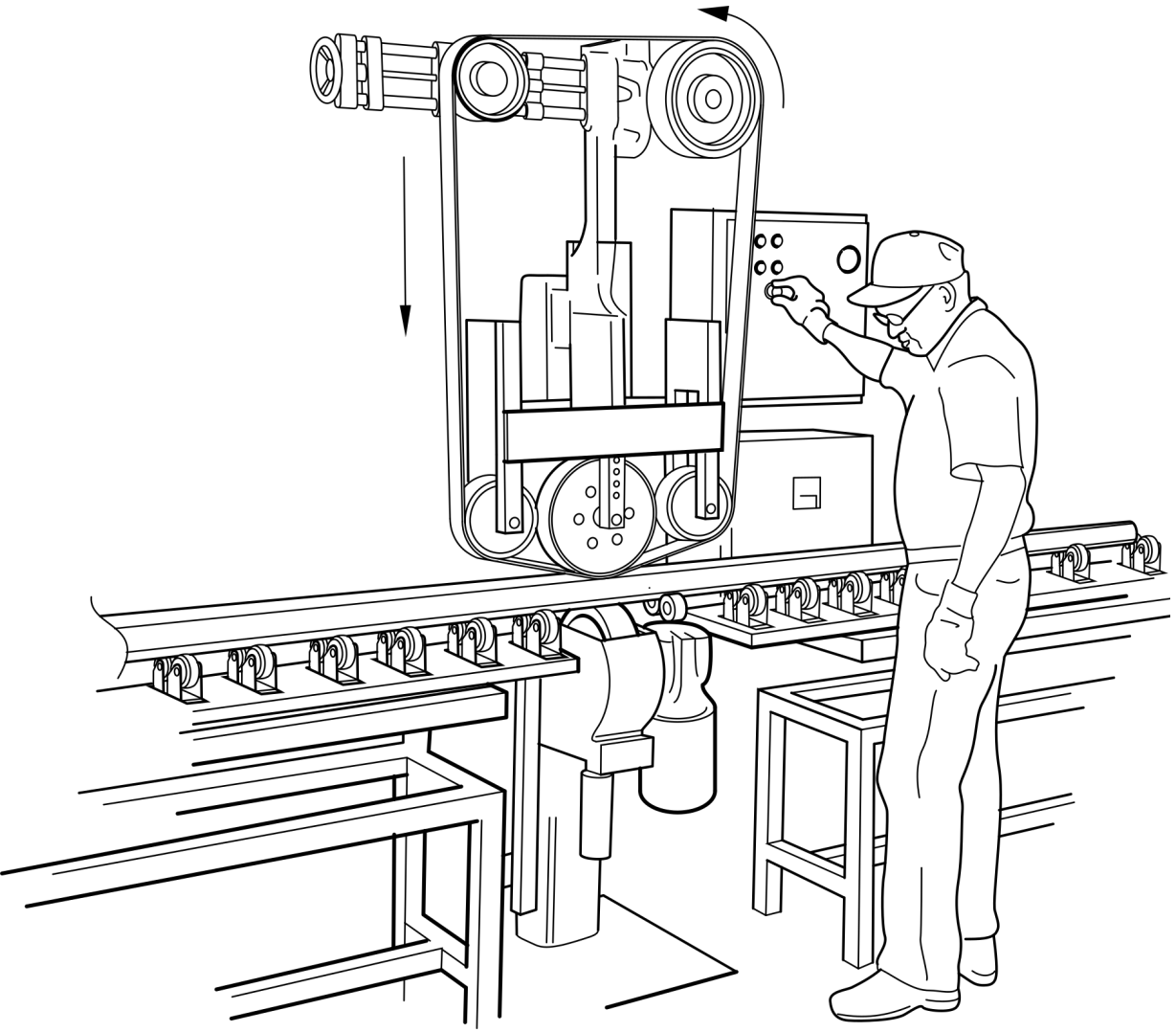
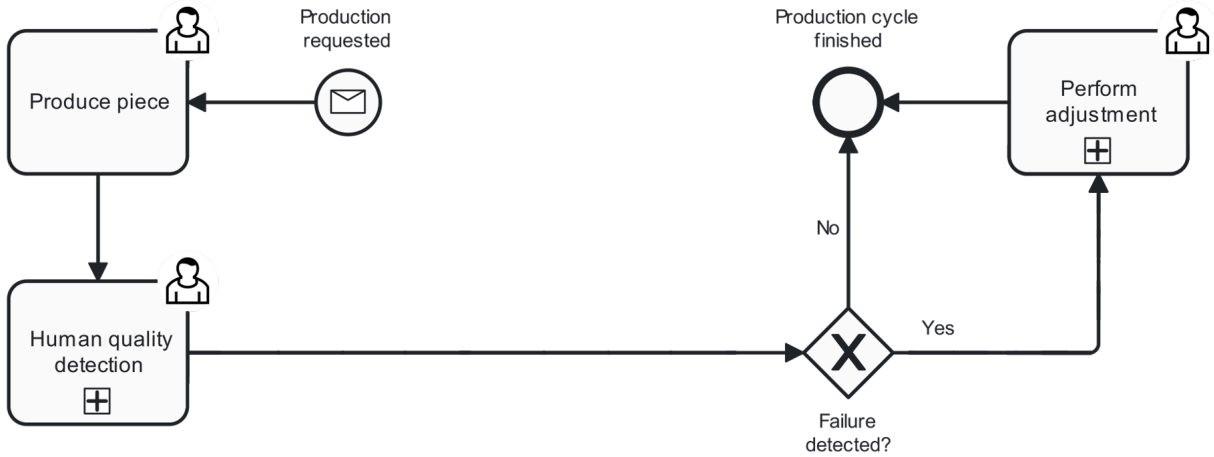
The Story of a

Smart Manufacturing Project

THE STORY OF A SMART MANUFACTURING PROJECT





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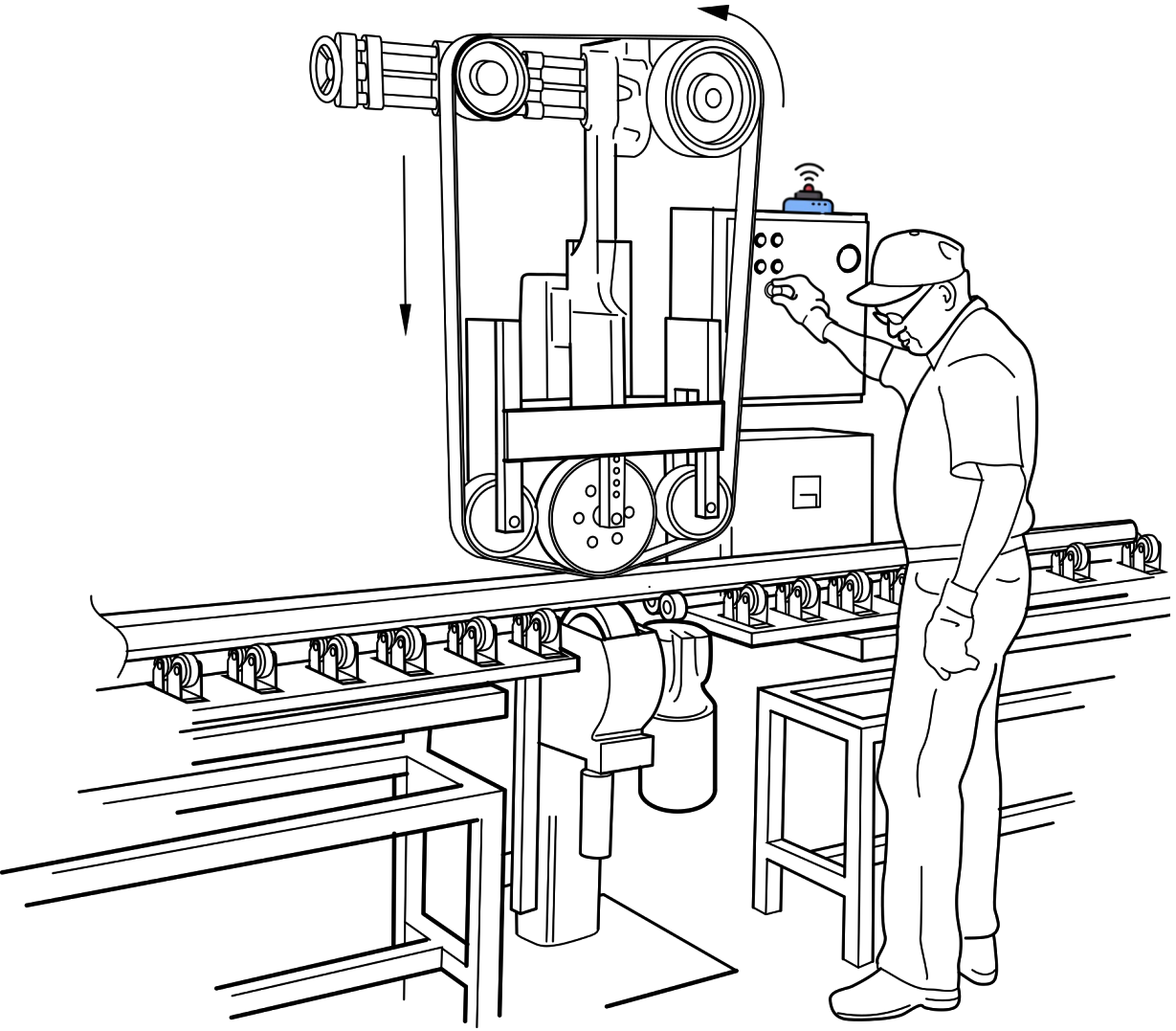

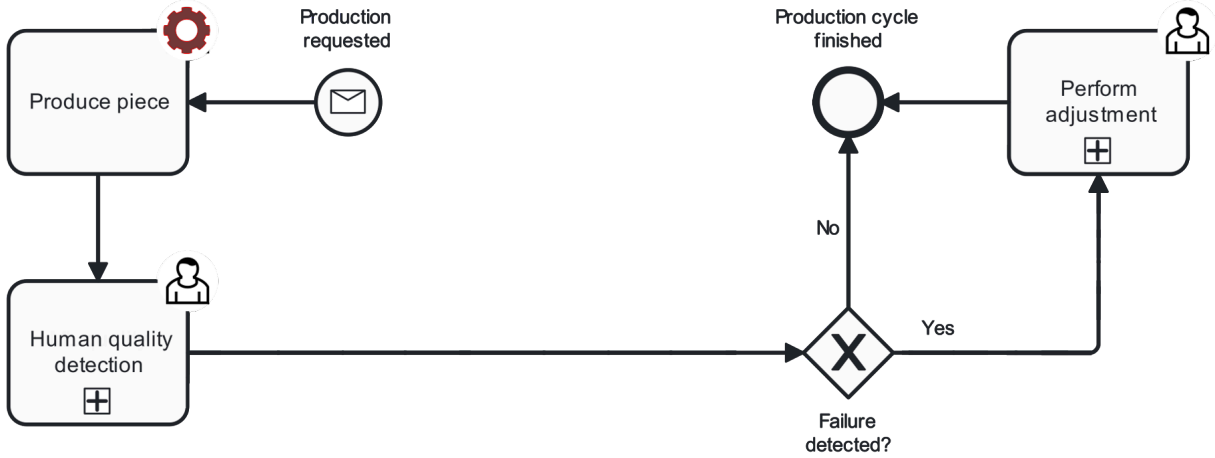

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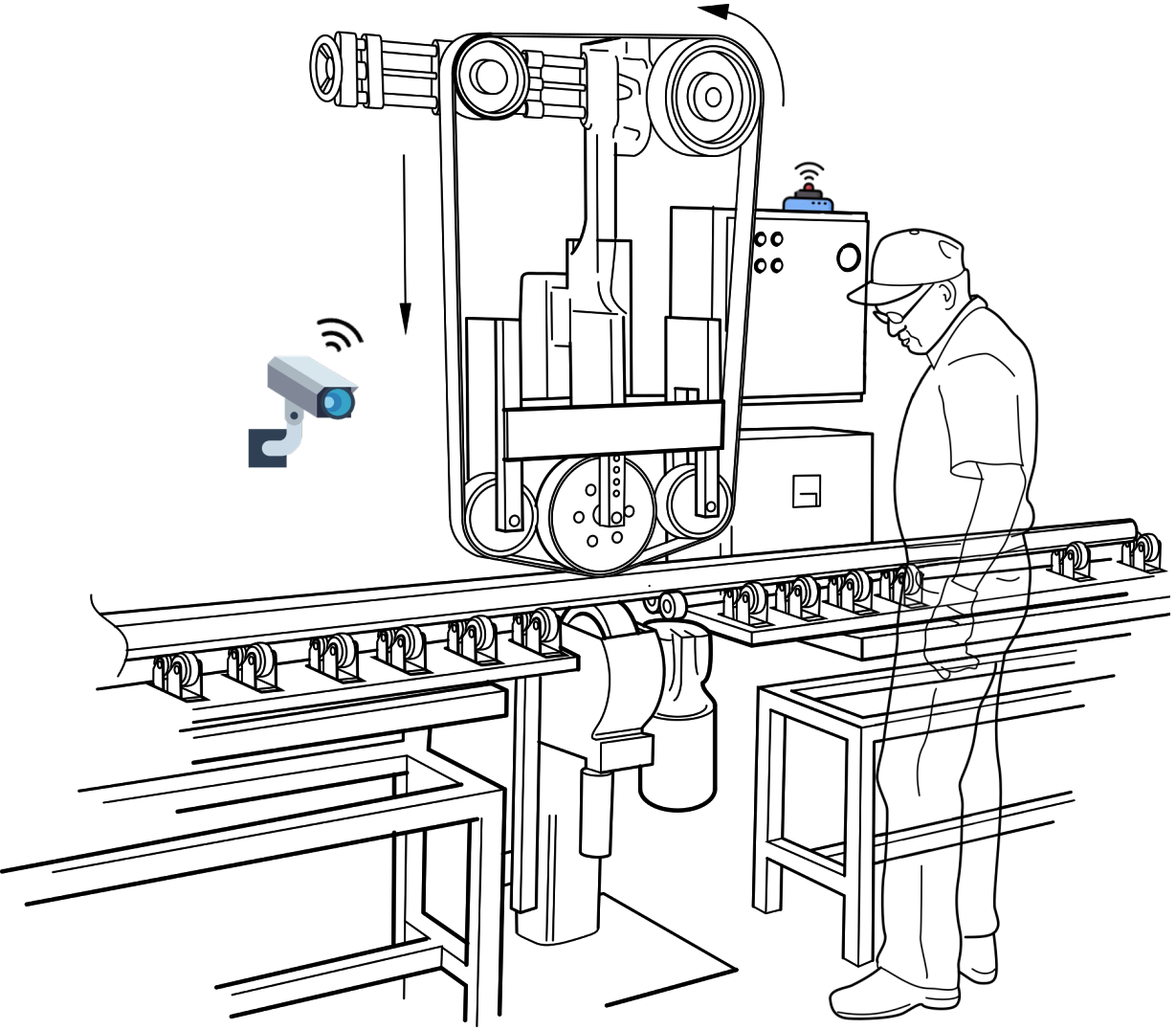

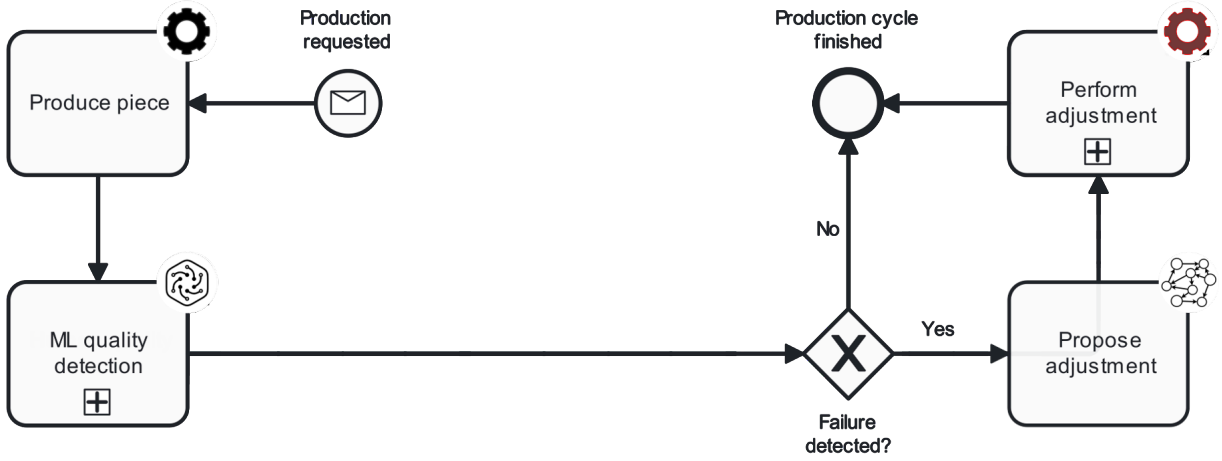

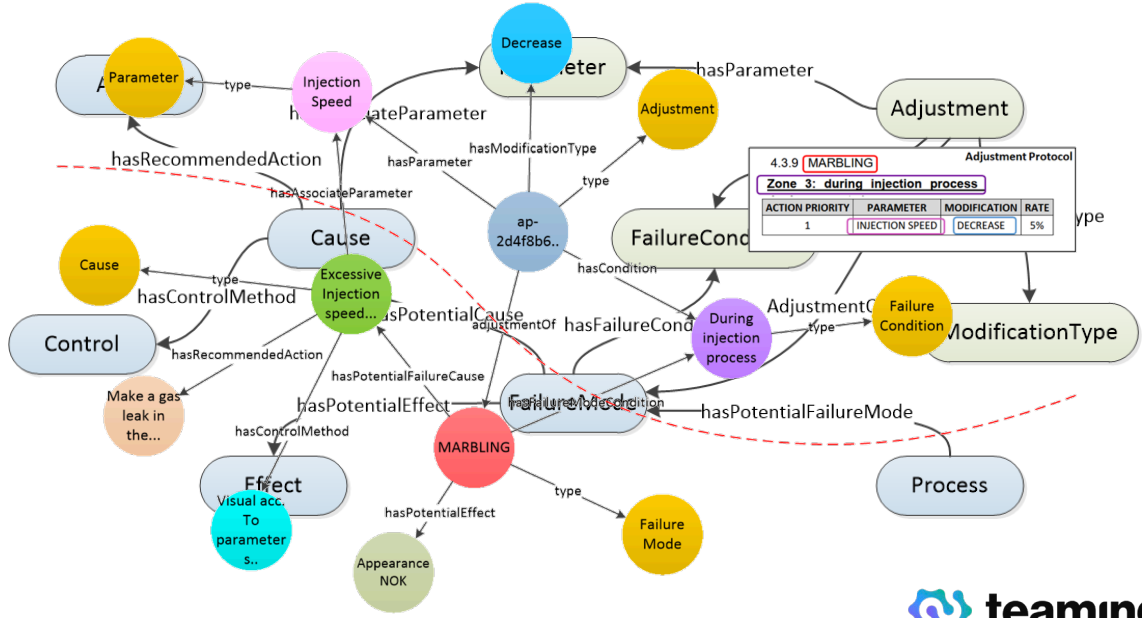

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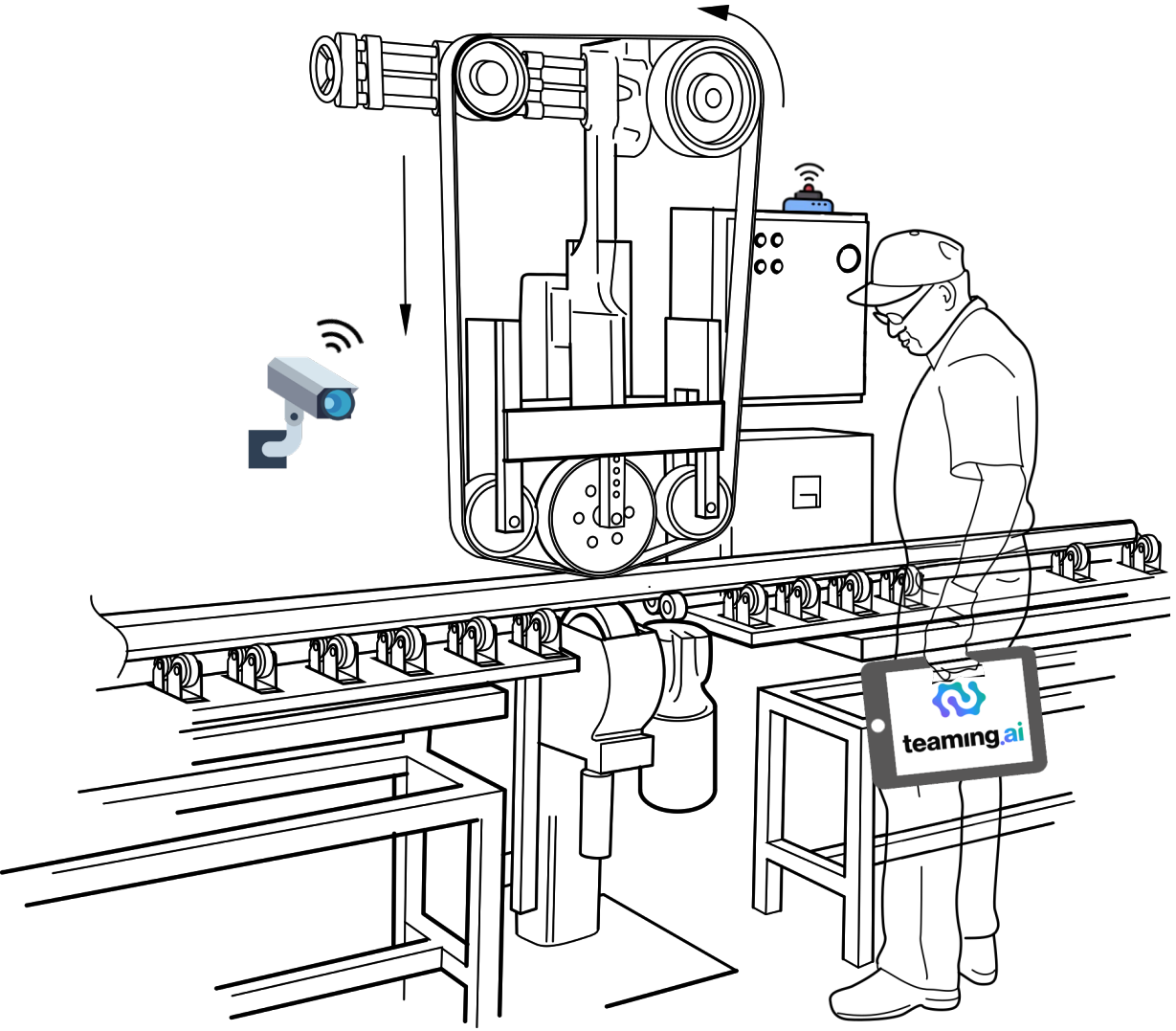

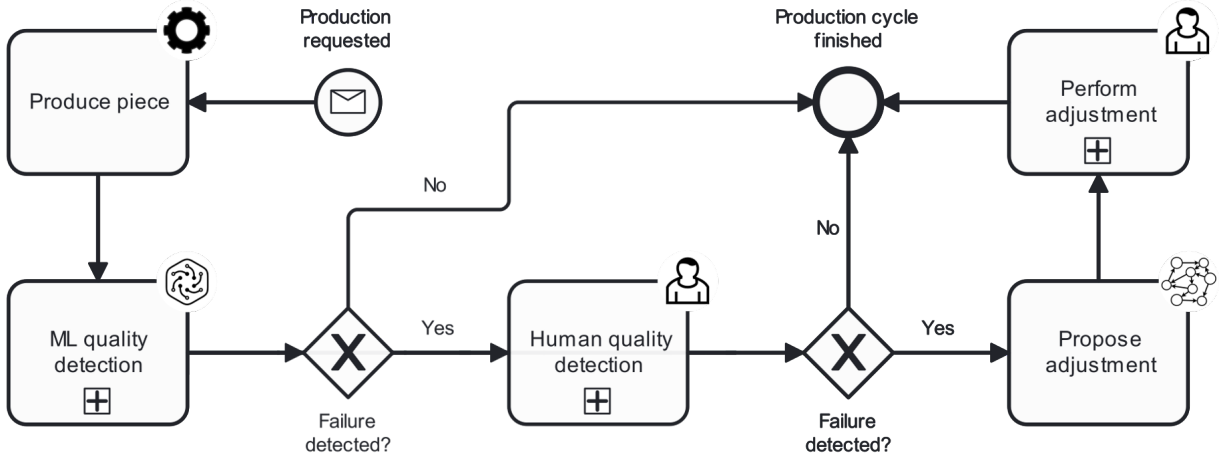

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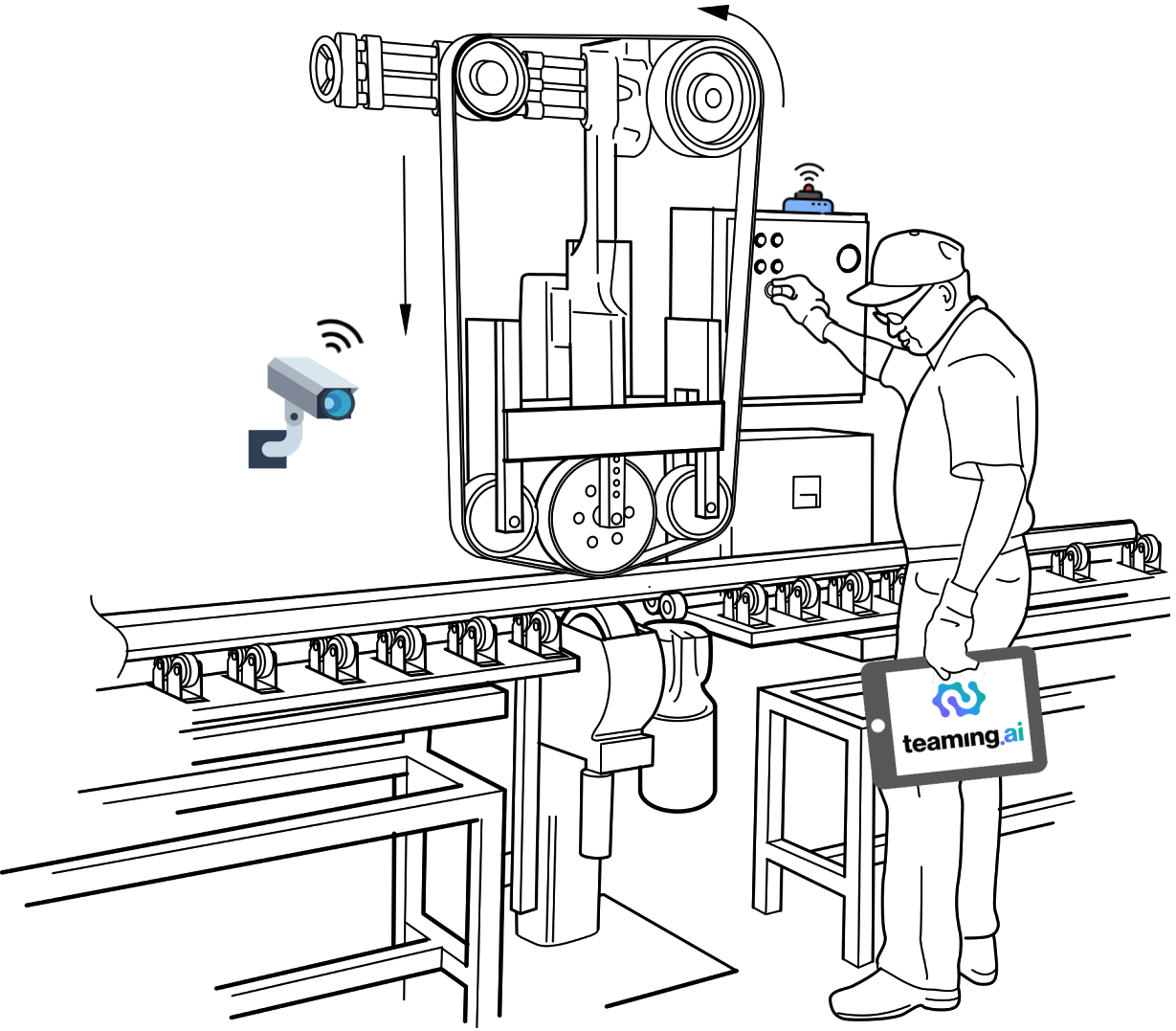

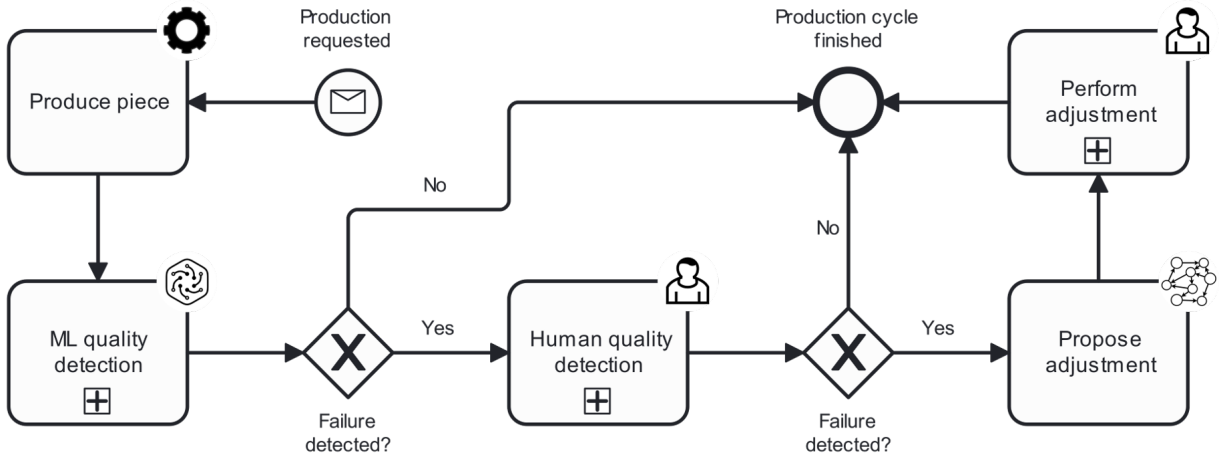

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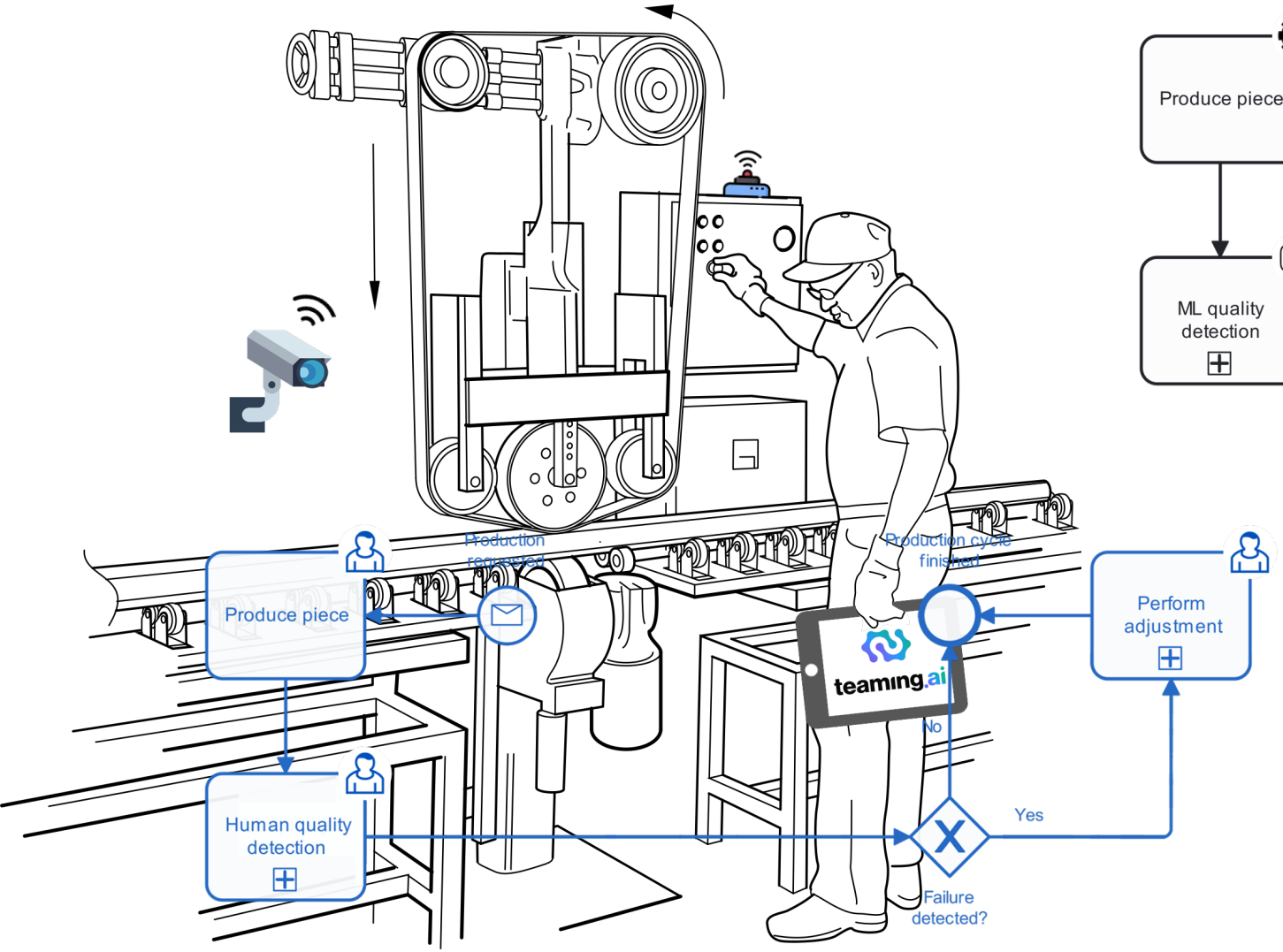

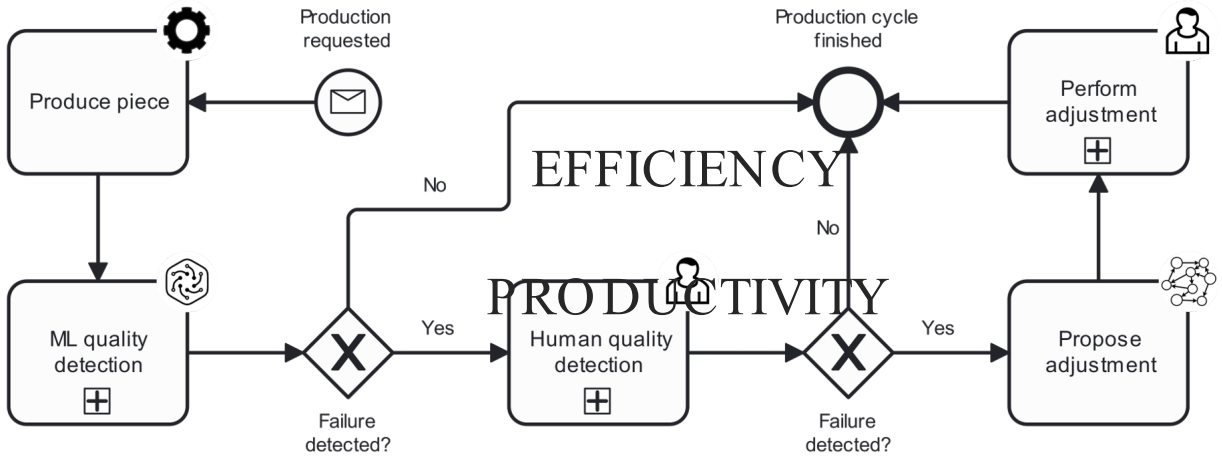

EMPOWERMENT?

HUMAN AUTONOMY?

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KNOWLEDGE GRAPH

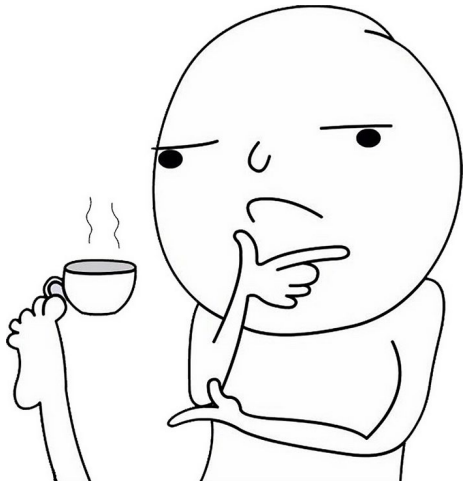
HUMAN-IN-THE-LOOP II

HUMAN

HUMAN-IN-THE-LOOP I

MACHINE LEARNING

SHOP FLOOR



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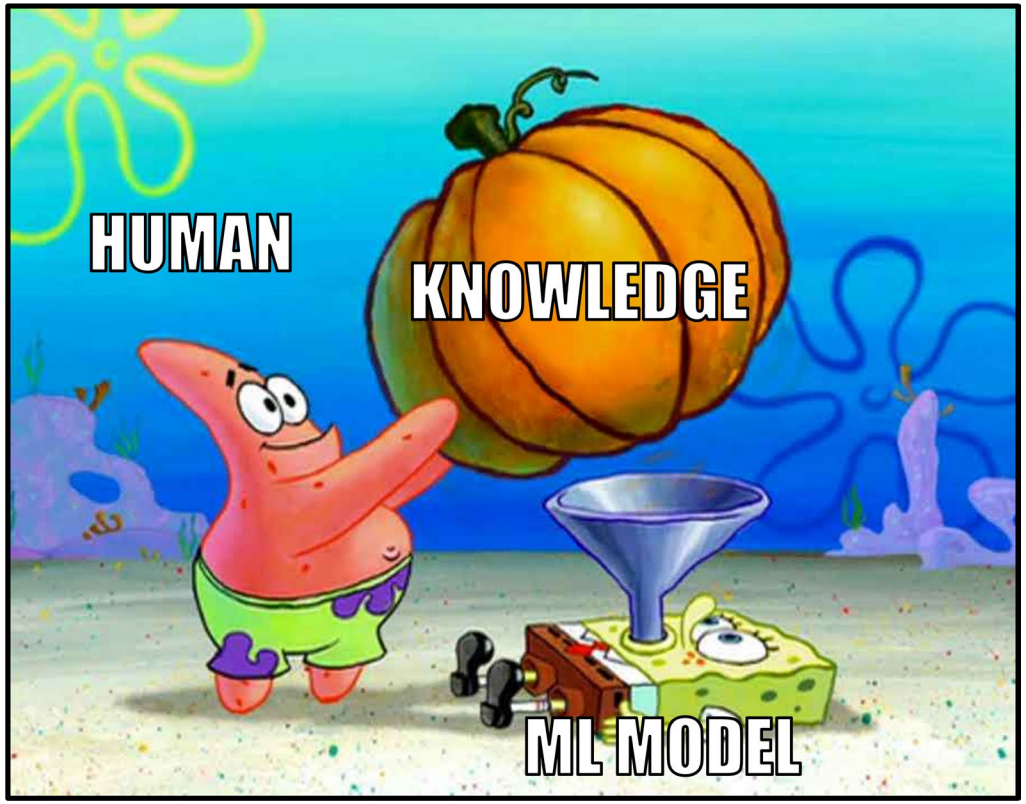
HUMAN-IN-THE-LOOP I

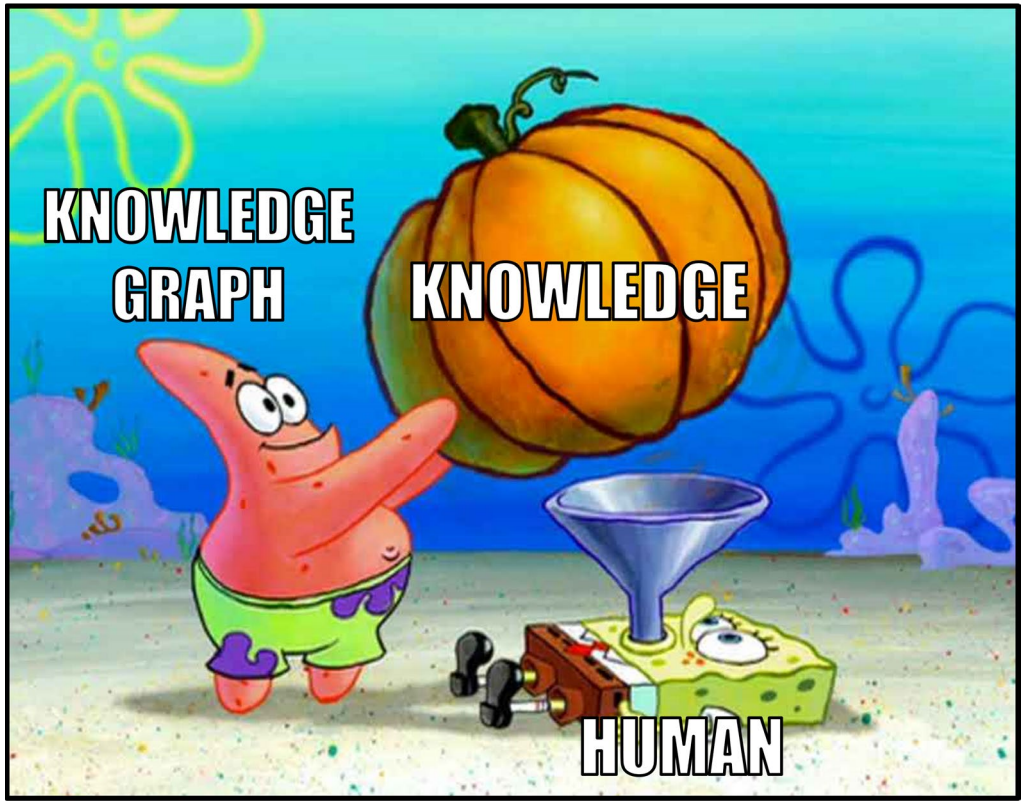
HUMAN X ML

VS

HUMAN-IN-THE-LOOP II

HUMAN X KG





HUMAN-IN-THE-LOOP I

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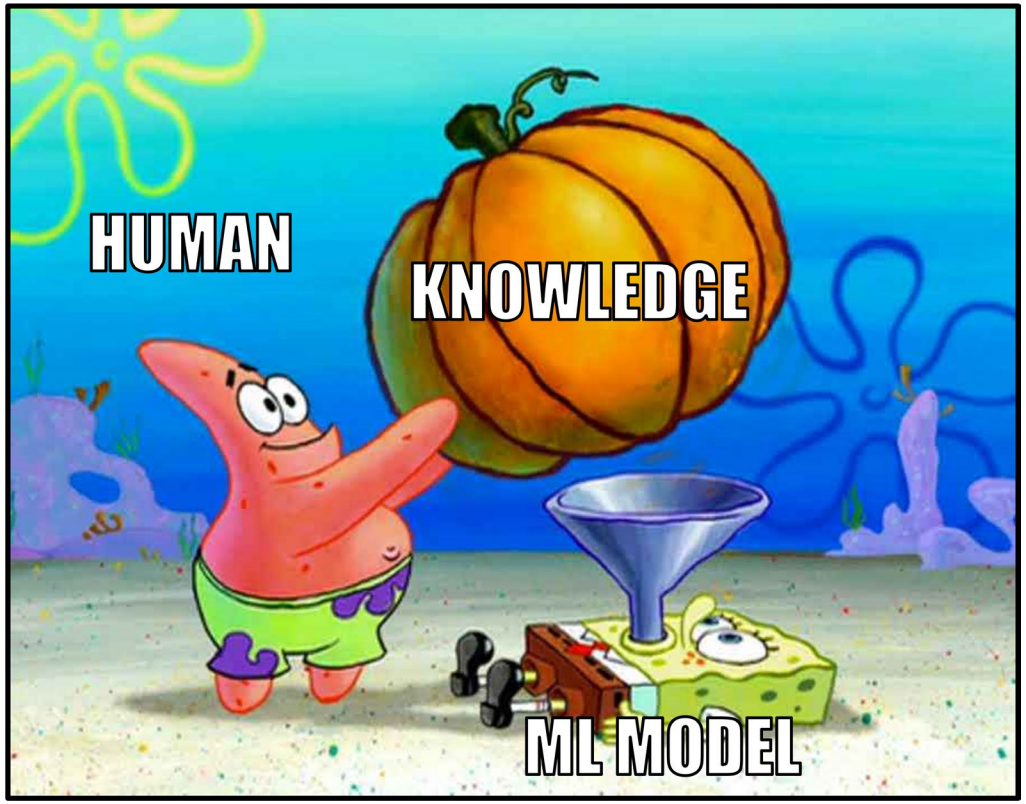
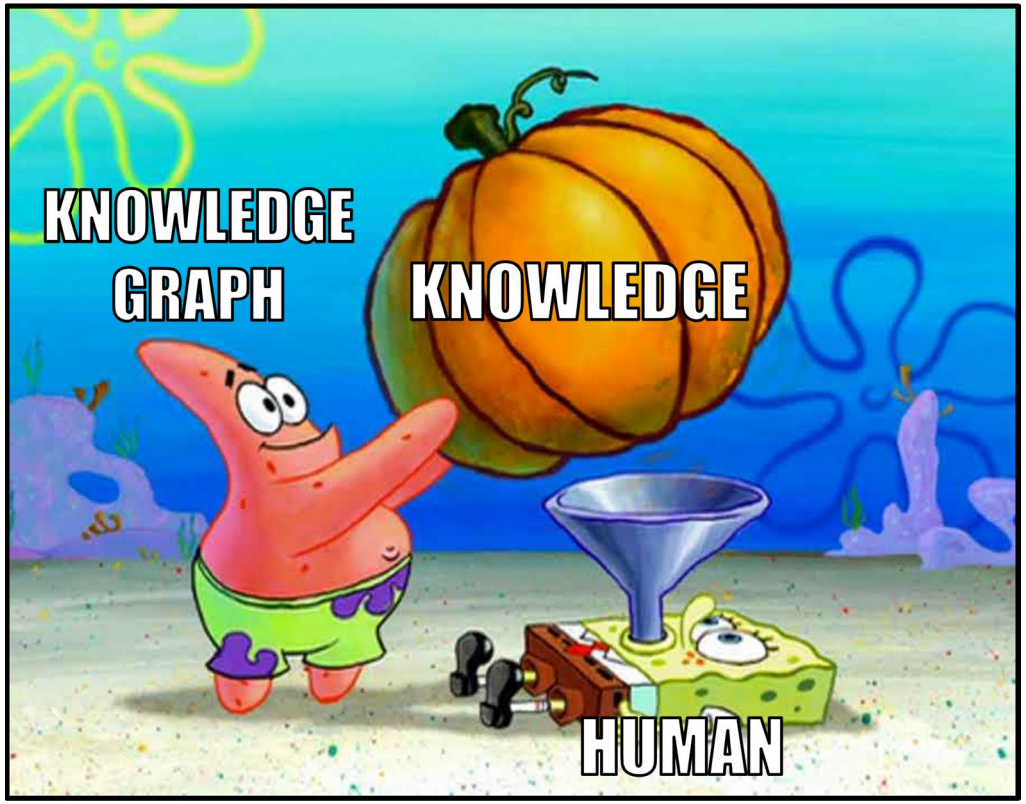
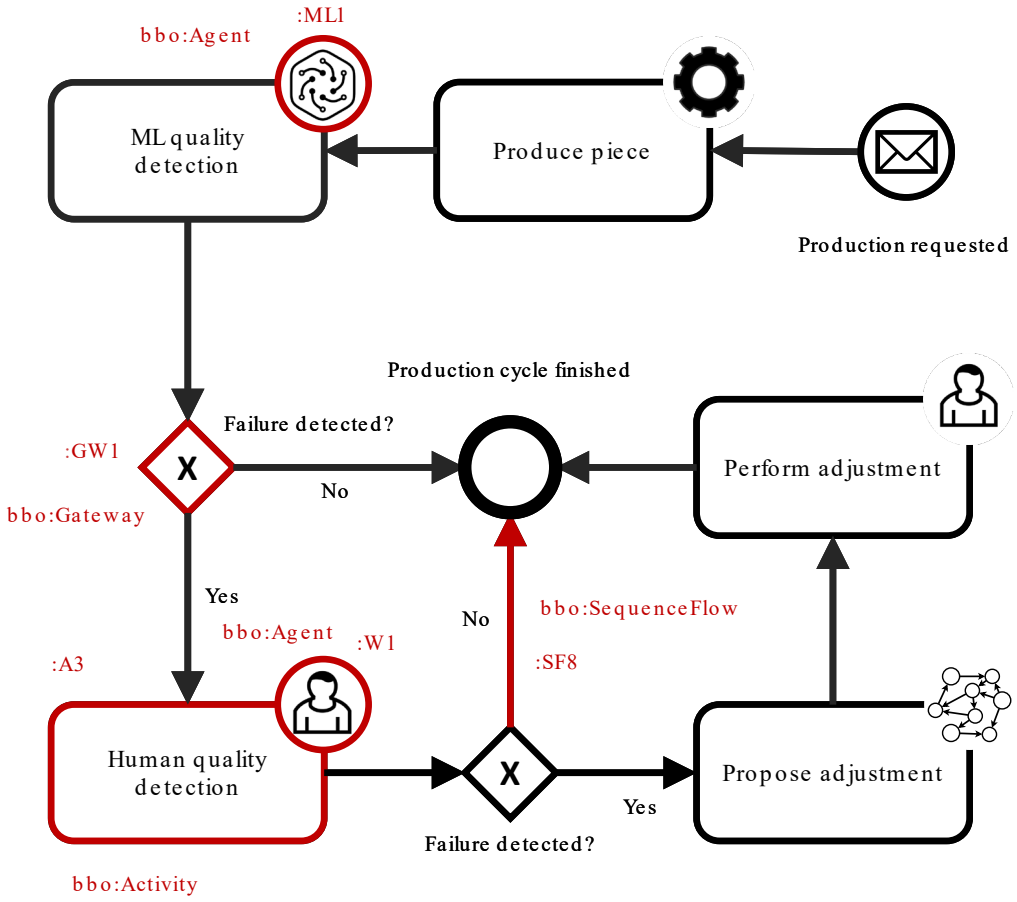
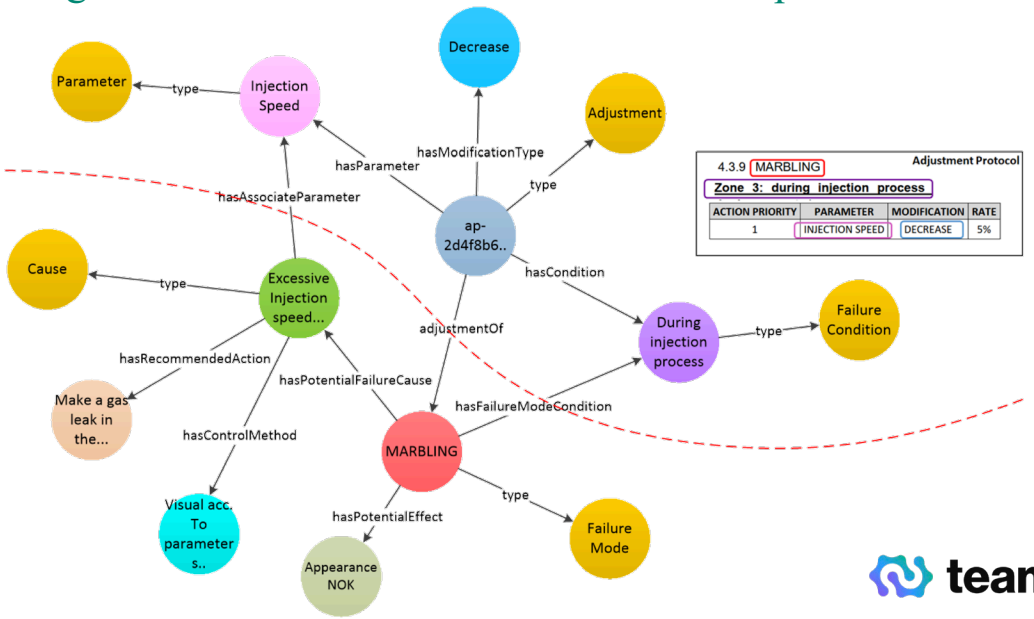




HUMAN KNOWLEDGE + KNOWLEDGE GRAPH



- A knowledge graph is deployed to encode both abstract process models and their concrete executions.
- Process models are semantically enriched by linking them to inherent activities, events, and agent types.
- Besides integrating ML and human activities, the KG serves as a digital shadow of Human-In-The-Loop scenarios.



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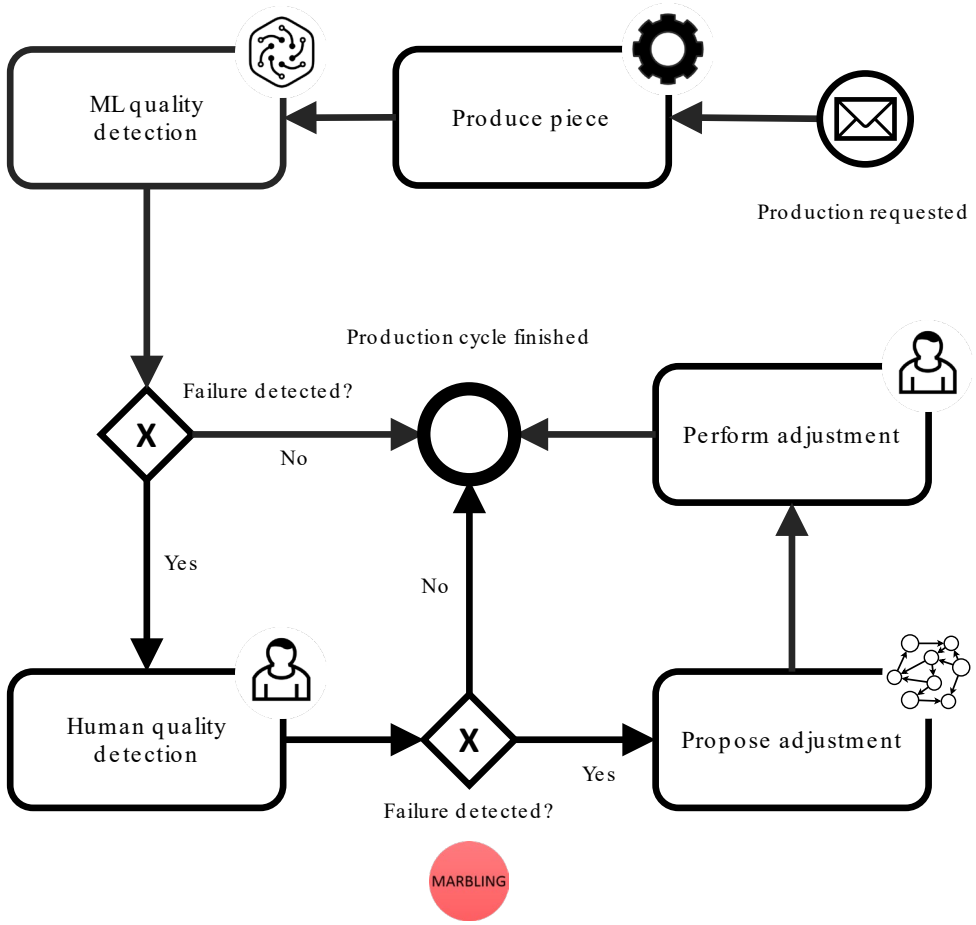
HUMAN KNOWLEDGE

KNOWLEDGE GRAPH



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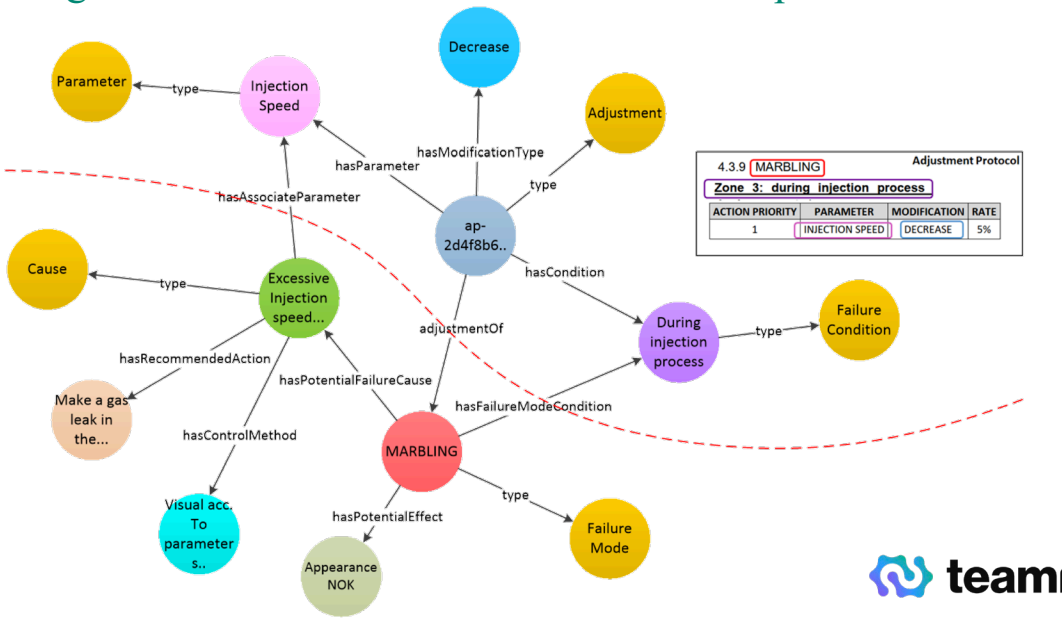

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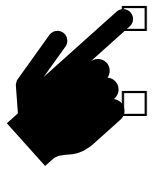
Maq: 22 Mol: 1756

Reporte de reparación

FECHA	HORA	TURNO	DEFECTO	SUB-DEFECTO
22.08.2023	14:35:36	1	Brillos	Zona 2

Procedimiento para arreglar defecto numero:

1. Temperature de herramienta +10°C ☐ 3
2. Temperatura de derretido +10°C ☐ 1
3. V/P punto -2mm ☐
4. Velocidad de inyección +2% ☐ 2
5. Presión de inyección -2% ☐
6. Presión de empaque -2% ☐
7. Tiempo de empaque -0.5“ ☐



Detalles de la incidencia:

Hecha y hora: 12:24:01 22.08.2023
Tipo de deffecto: Brillo
Subtipo de defecto: Cara “A” entera
Frecuencia de aparicion: 1/180 min
Tiempo medio de resolucion: 122”
Difficultad de resolucion: media

Comentarios

Partes OK obtenidas después de temperature de herramienta aumentada y temperature de derretido aumentada.

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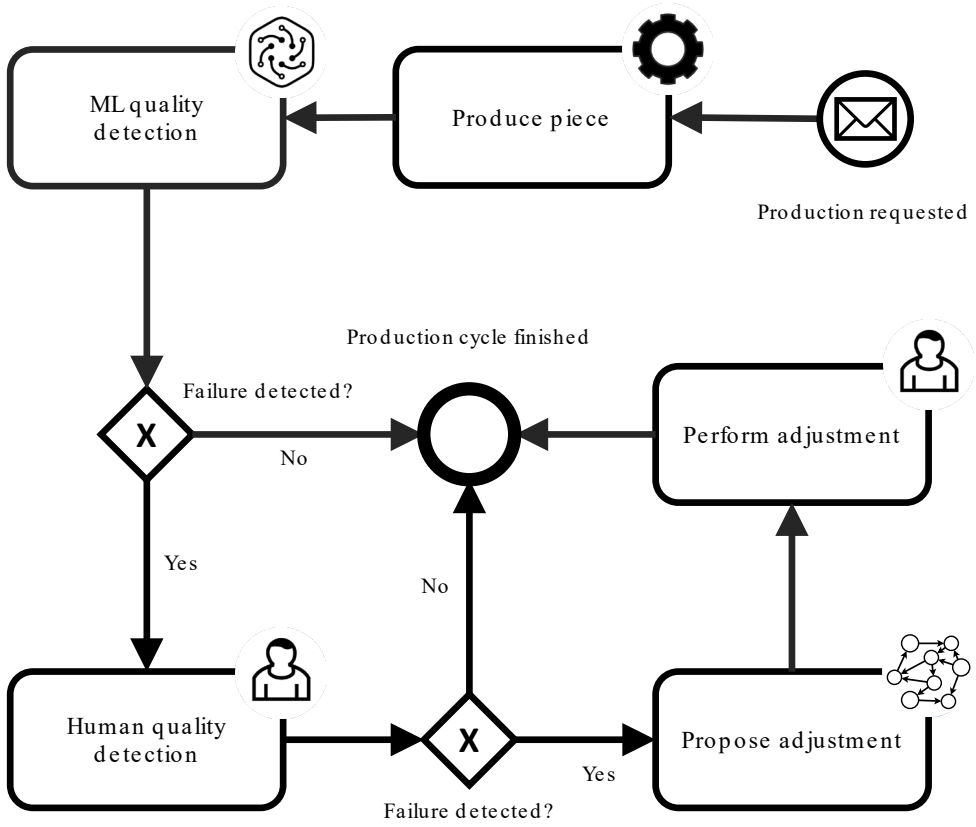
HUMAN KNOWLEDGE + KNOWLEDGE GRAPH



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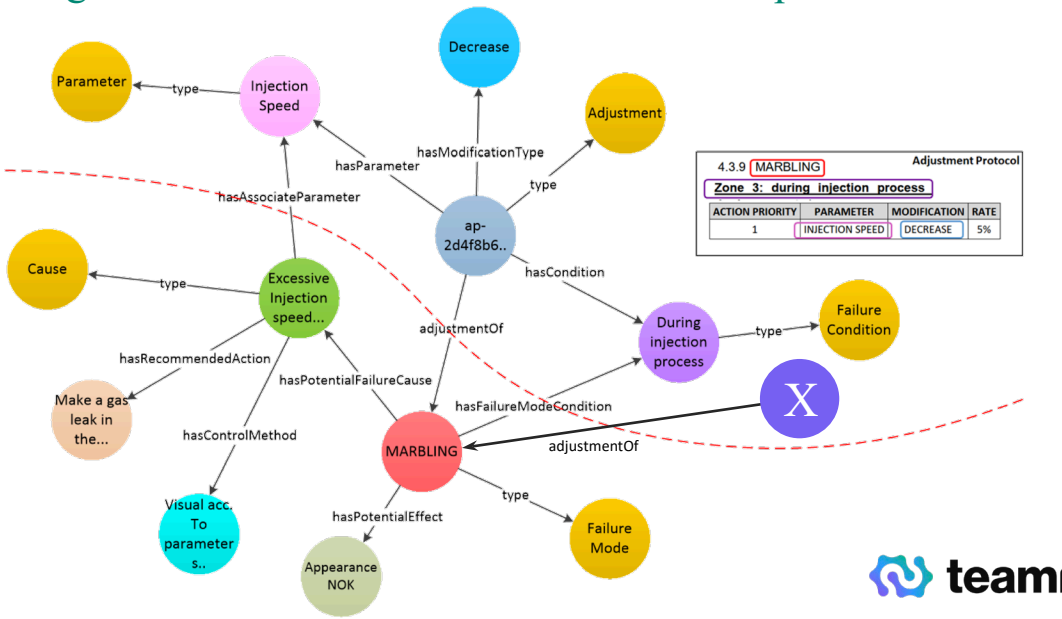

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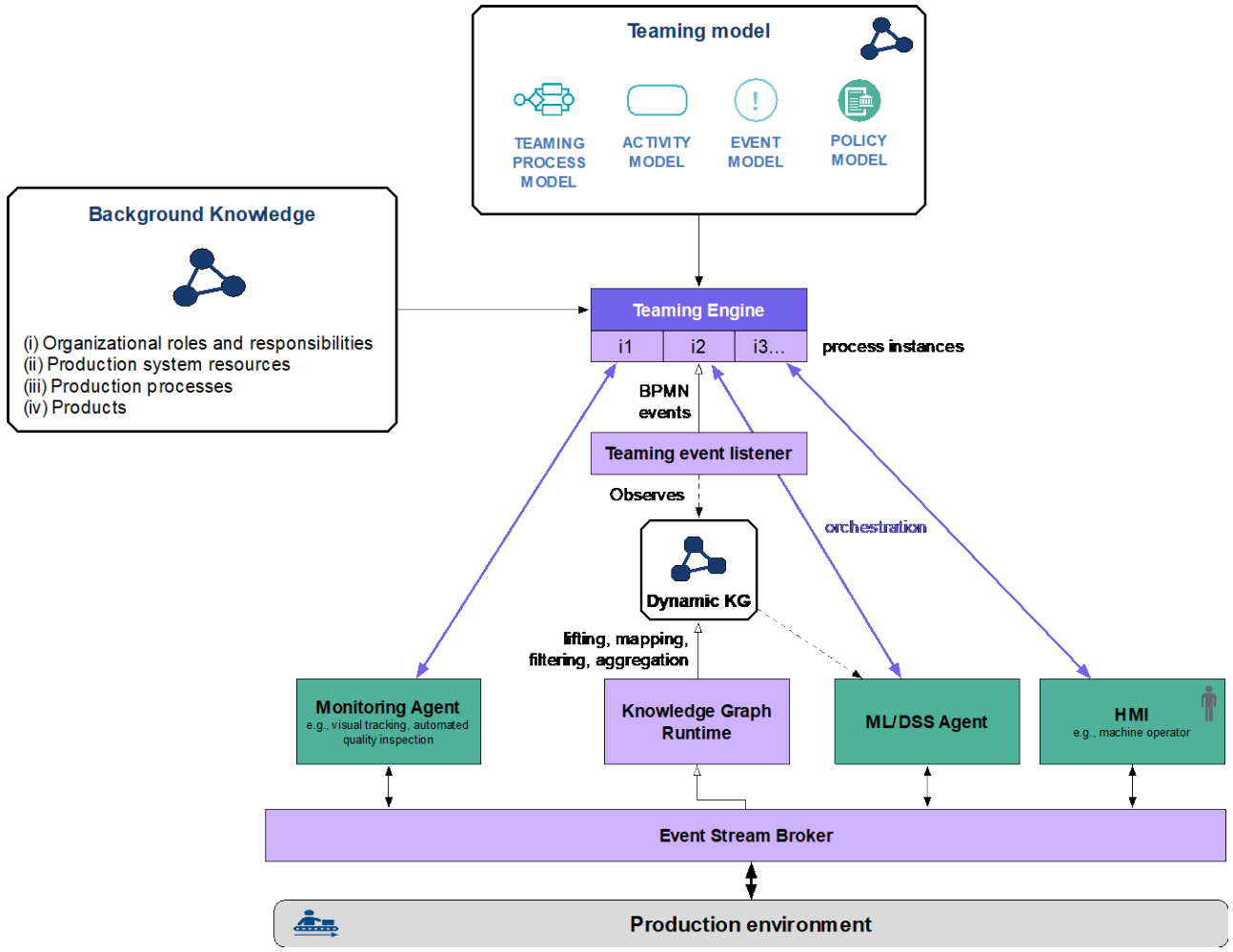
The Teaming.AI Platform as a

Software Product

THE TEAMING.AI PLATFORM AS A SOFTWARE PRODUCT



- The Teaming.AI platform will be made available as an open-source framework.
- Due to its adaptivity, the Teaming.AI platform can be re-used for various new use cases.
- KG-based inference methods and consistency techniques can be applied, such as:
  - Rule-Based Reasoning
  - KG Embeddings
  - Relational ML
  - Knowledge Completion & Verification

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The Teaming.AI Project

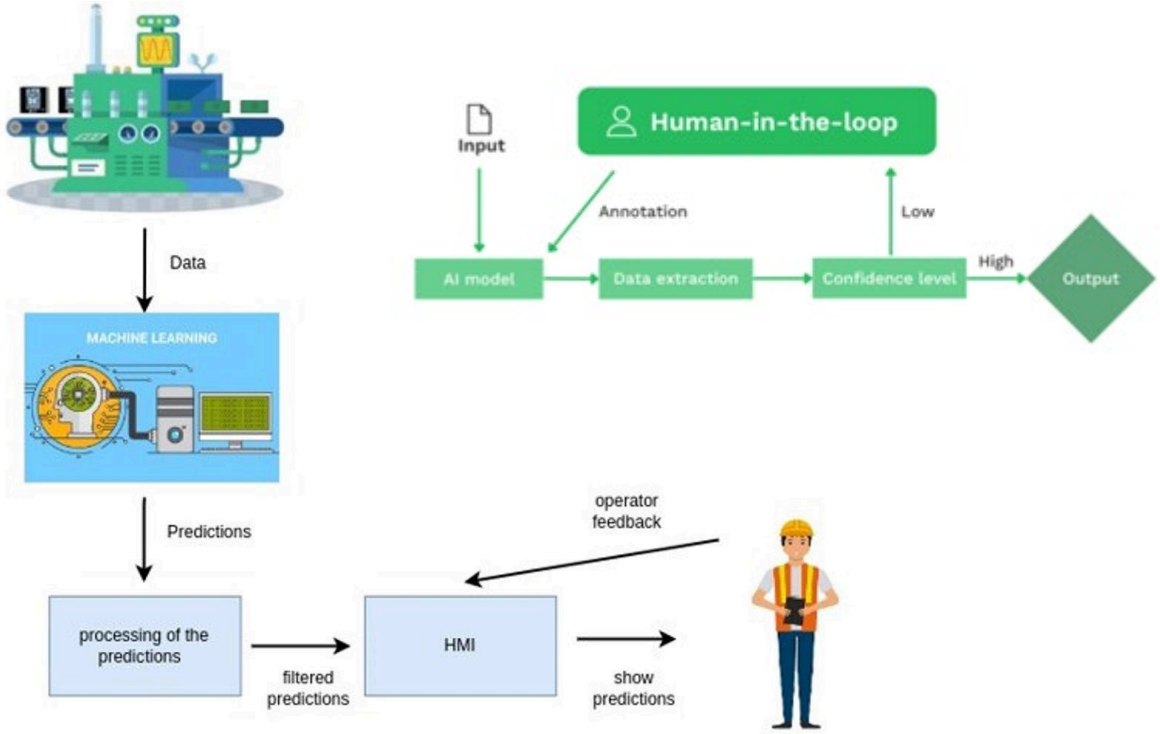
Conclusion & Outlook

TEAMING.AI: CONCLUSION & OUTLOOK

Ongoing AIREDGIO 5.0 Horizon project
-> SCCH task lead on Collaborative Intelligence platform for Edge-AI

AI REDGIO 5.0

https://www.airedgio5-0.eu/



TEAMING.AI follow-up proposal … foreseen for call
A human-centred and ethical development of digital and industrial technologies (HORIZON-CL4-2024-HUMAN-01)

- method/concept extensions
- new use cases

TEAMING.AI platform -> further domains (besides manufacturing)

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Stay connected with us!

www.teamingai-project.eu/

Teaming AI Project

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