



# **AI Enabled Industrial Innovations**

## **Proposal for Use Case Sharing & White Paper Introduction**

Juergen Grotepass, GIO14 RT, Shanghai Sept 20<sup>th</sup>.



# Contents

1. Idea and Motivation
2. Industries Targeted and Use Case Focus
3. Structure & Template of White Paper

# GIO13, Barcelona, 26.03.2024, GIO Workshop

AI Large Language Models (LLM), In Science and 1<sup>st</sup> industrial Applications

## AI Developments are progressing fast

- Need for use case sharings of best practice incl deployment, execution & value assessment
- Need for training of employees & enterprises deploying AI in industries

## Agreement among Participants

- Initiate a living exchange of Work in Progress” - AI enablement of industries



# Large Scale AI Models for Industry Workshop

Offered a cross industries communication platform to exchange latest trends on AI LLM

## Participants:

Barcelona: 12

Online 17: EU 4, JP 2, China 11

*Co Host: SCI4.0, OPC-UA*

Organization	Name	客户姓名
Chinese Academy of Engineering	Peigen Li	李培根
Open Platform Communications (OPC) Foundation	Stefan Hoppe	Stefan Hoppe
Open Platform Communications (OPC) Foundation	Erich Barnstedt	Erich Barnstedt
Standardization council Industrie 4.0(SCI4.0)	Jens Gayko	Jens Gayko
Fraunhofer HHI	Wojciech Samek	Wojciech Samek
Alliance of Industry Internet (AII)	Li Ao	敖立
Eurasian Academy of Sciences	Qi Tian	田奇



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# Industries targeted in White Paper and Use Case Focus

Digitalisation maturity, role, challenges and potential for AI enablement of industries



## Automotive Industries

First Mover and Innovator

- ➔ Value creation in Data Spaces
- ➔ Trend: Digital Product/Battery PP
- ➔ Multi- tier cooperation

❖ Supply Chain Optimisation

## Manufacturing Industries

More conservative follower

- ➔ Expedited Digitalization
- ➔ Trend: Cloud Manufacturing
- ➔ Human-Robot Collaboration

❖ Dialogue functions, Co-pilot

## Process Industries

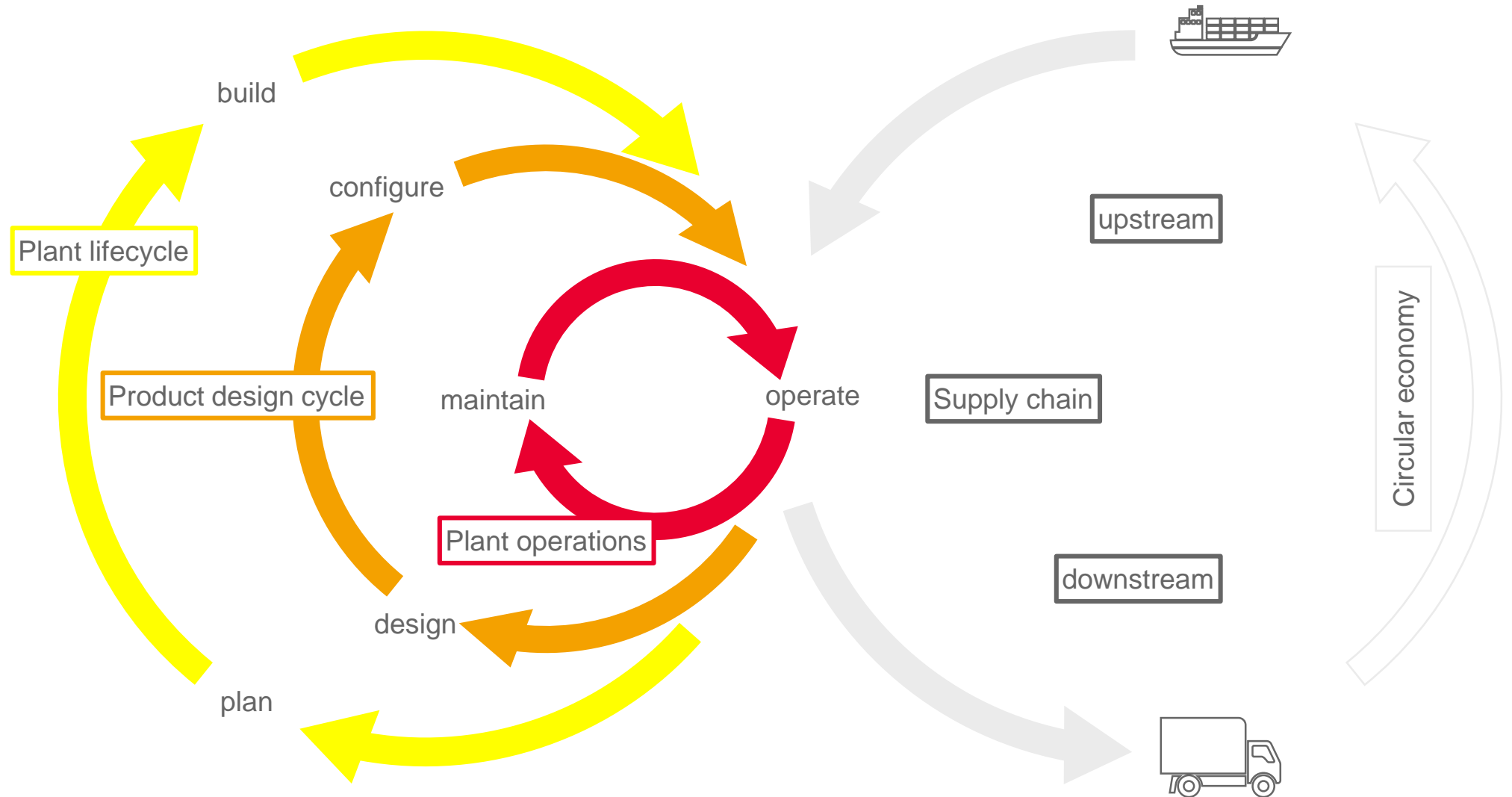
Traditional Industries, laggards

- ➔ Empirical knowledge
- ➔ Trend: 1<sup>st</sup> digital twins
- ➔ Sensors & model generation

❖ Predictive AI

# Focus Areas of AI enabled Industry Innovation and Paradigm Change

Effecting: 1. Design & Engineering    2. Operations    3. Maintenance



# The Customer becomes Co-designer getting AI support

## Autonomous production

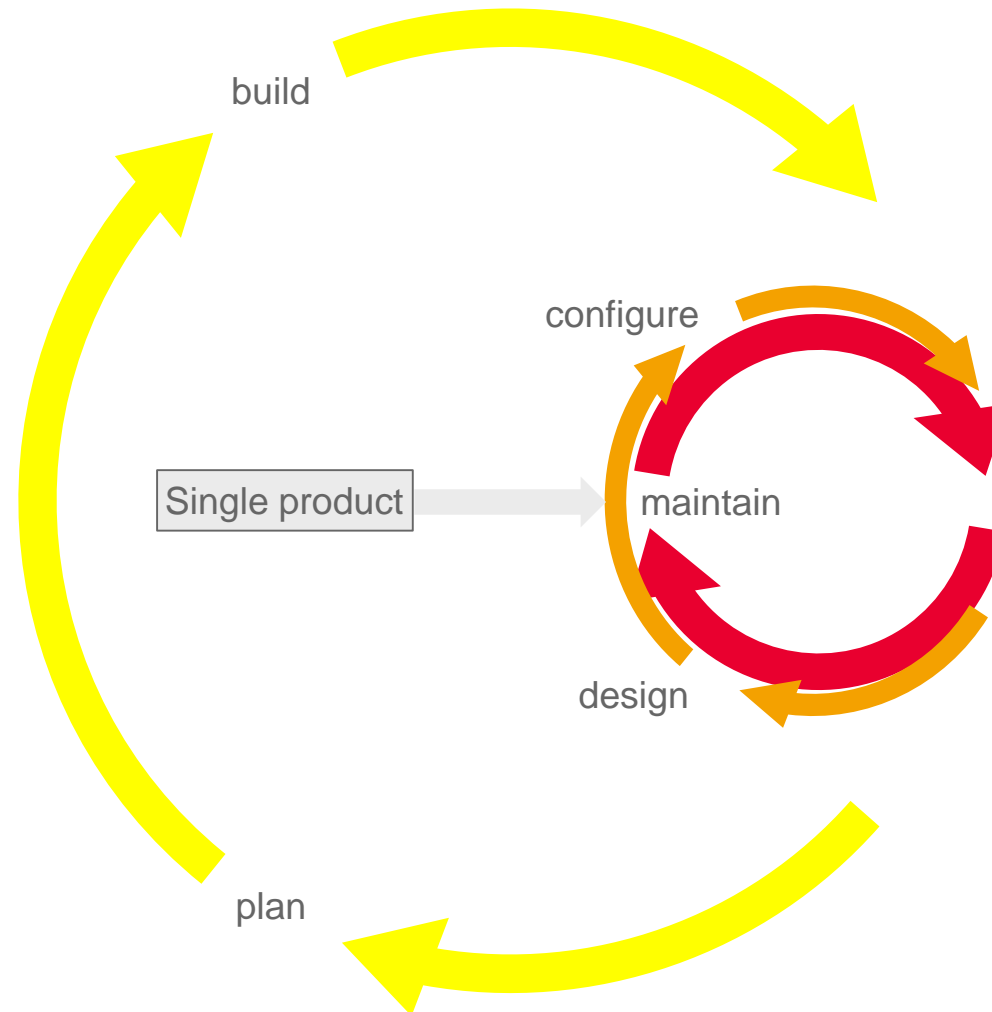
Lot size 1 requires a plant that can accommodate greater variations of products. An autonomous plant does not need re-configuration, but can handle different product designs in a flexible configuration. AI to adjust production based on the design on the fly

## Enabling technologies:

Additive manufacturing, robotics assembly, flexible material flow (e.g. autonomous guided vehicles – AGV)

## Plant structure:

Engineering effort is mainly in building the plant in a very flexible way. Once built, the factory can handle the product design cycle as part of operations.



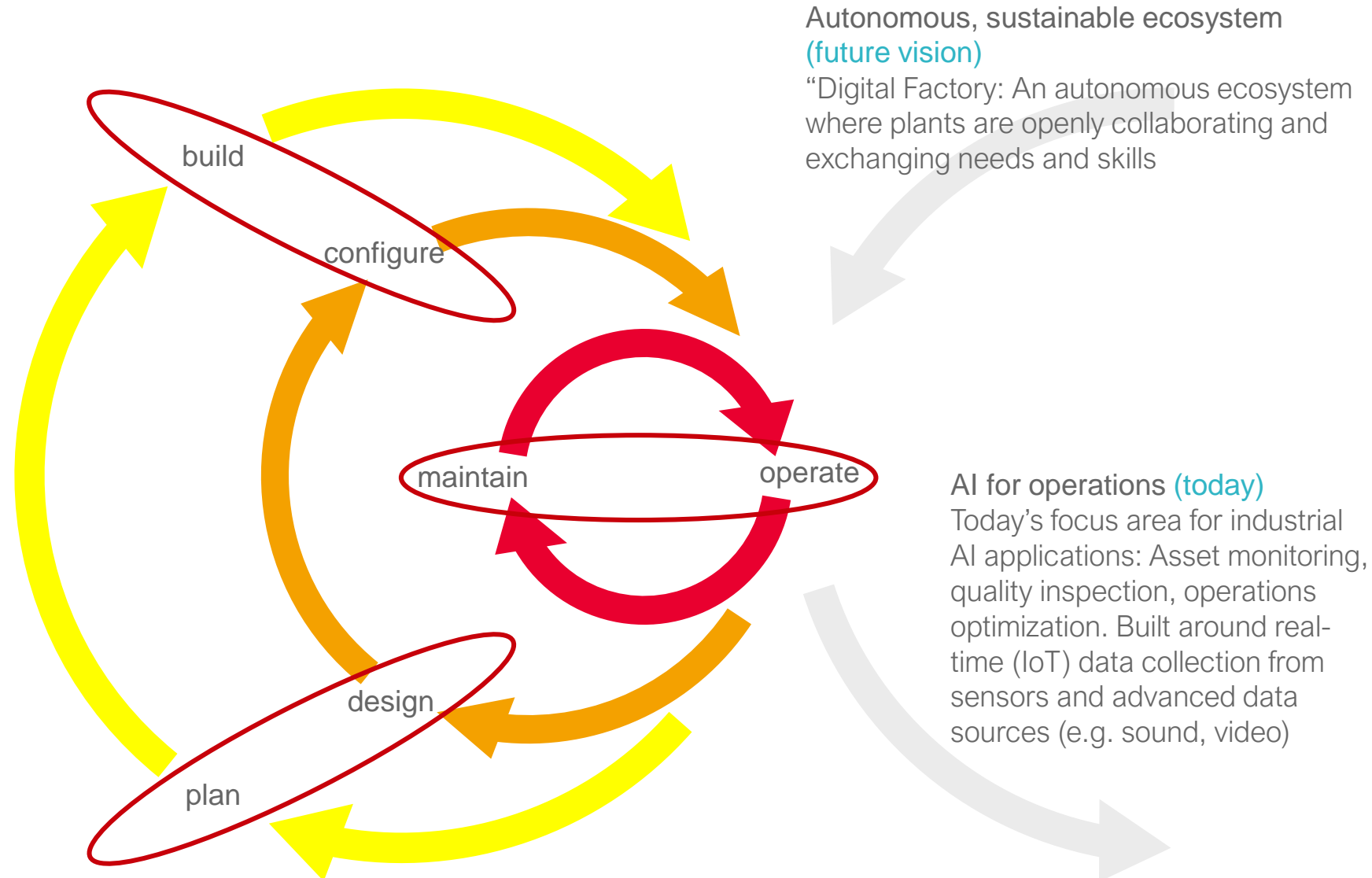
# Use Case Selection in 3 Areas of the Stage Gate Process

## Towards autonomy (future)

To automatically re-configure a plant for a new product design or to even build it (e.g. robotic construction) is a research topic today

## AI for engineering (early stage)

Generative design gaining traction together with additive manufacturing (3D printing) for mechanical and building design. Less explored for system / plant engineering.



## Autonomous, sustainable ecosystem (future vision)

"Digital Factory: An autonomous ecosystem where plants are openly collaborating and exchanging needs and skills"

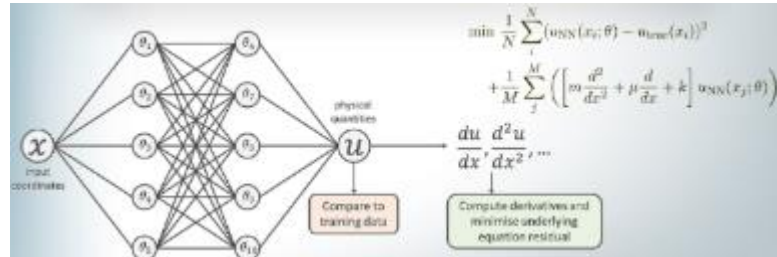
## AI for operations (today)

Today's focus area for industrial AI applications: Asset monitoring, quality inspection, operations optimization. Built around real-time (IoT) data collection from sensors and advanced data sources (e.g. sound, video)

# The Use Case collection in the White Paper covers the full range Industry mature solutions – PoC in Industries – R&D Stage



Machine learning & Pattern Recognition



Physical informed NN



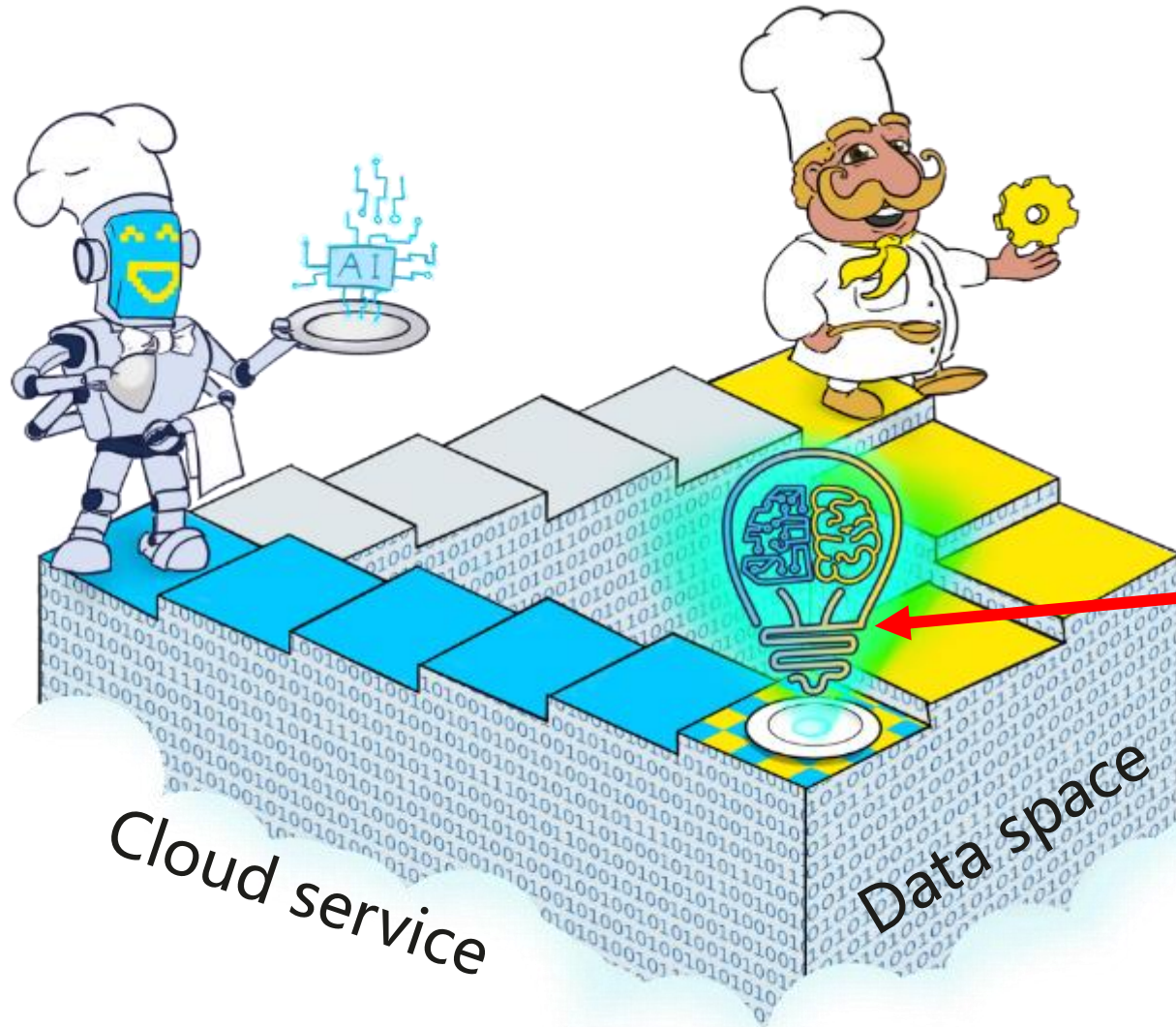
Generative AI under Assessment

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# Introduction to the White Paper

Greetings from the “Kitchen of Innovation”

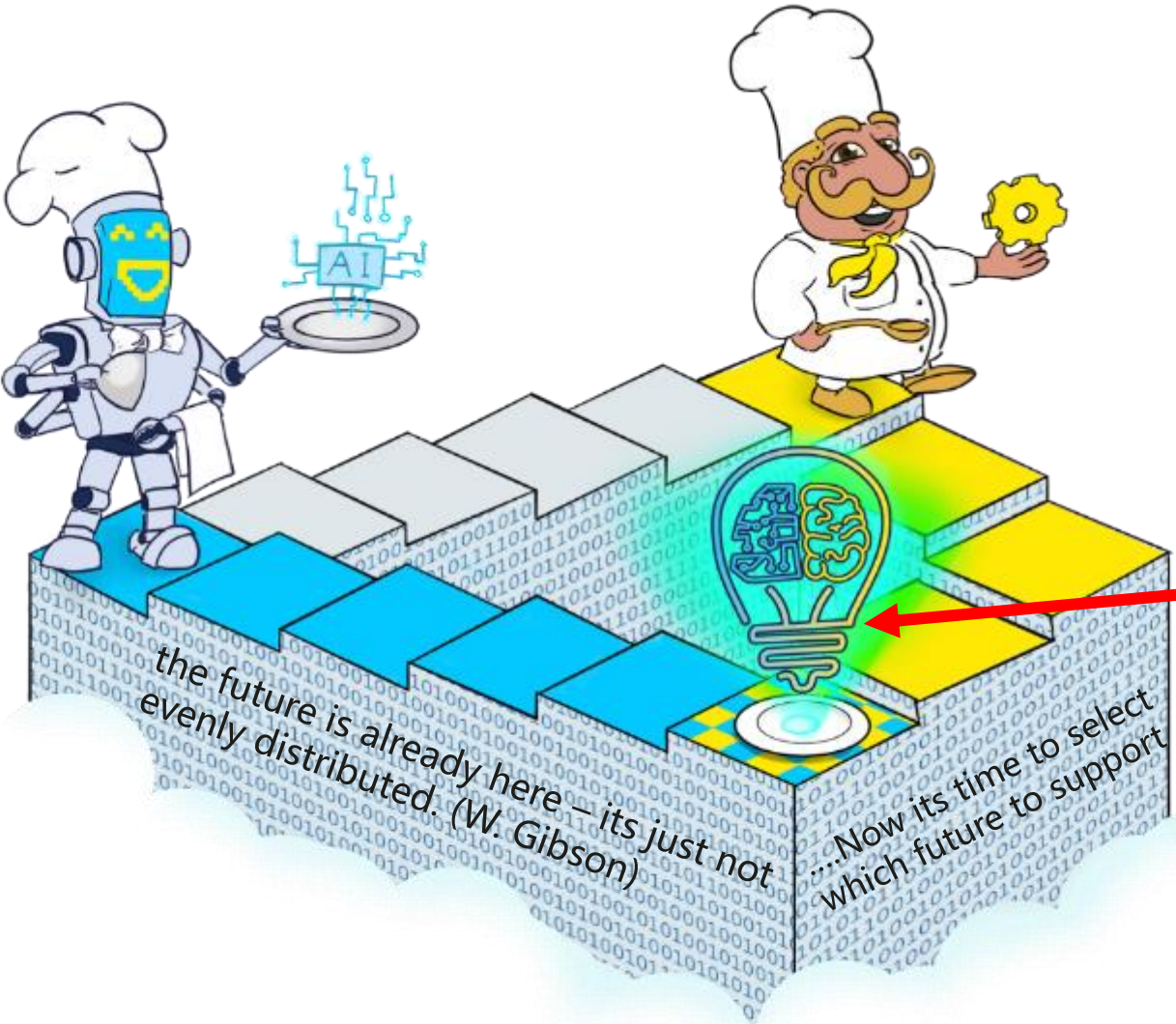


Two Chefs: human and Ai system cooperate in “cooking innovations”, fusing bits and gears in data spaces.

Different pathways of blue and yellow come together to light the bulb of innovation.

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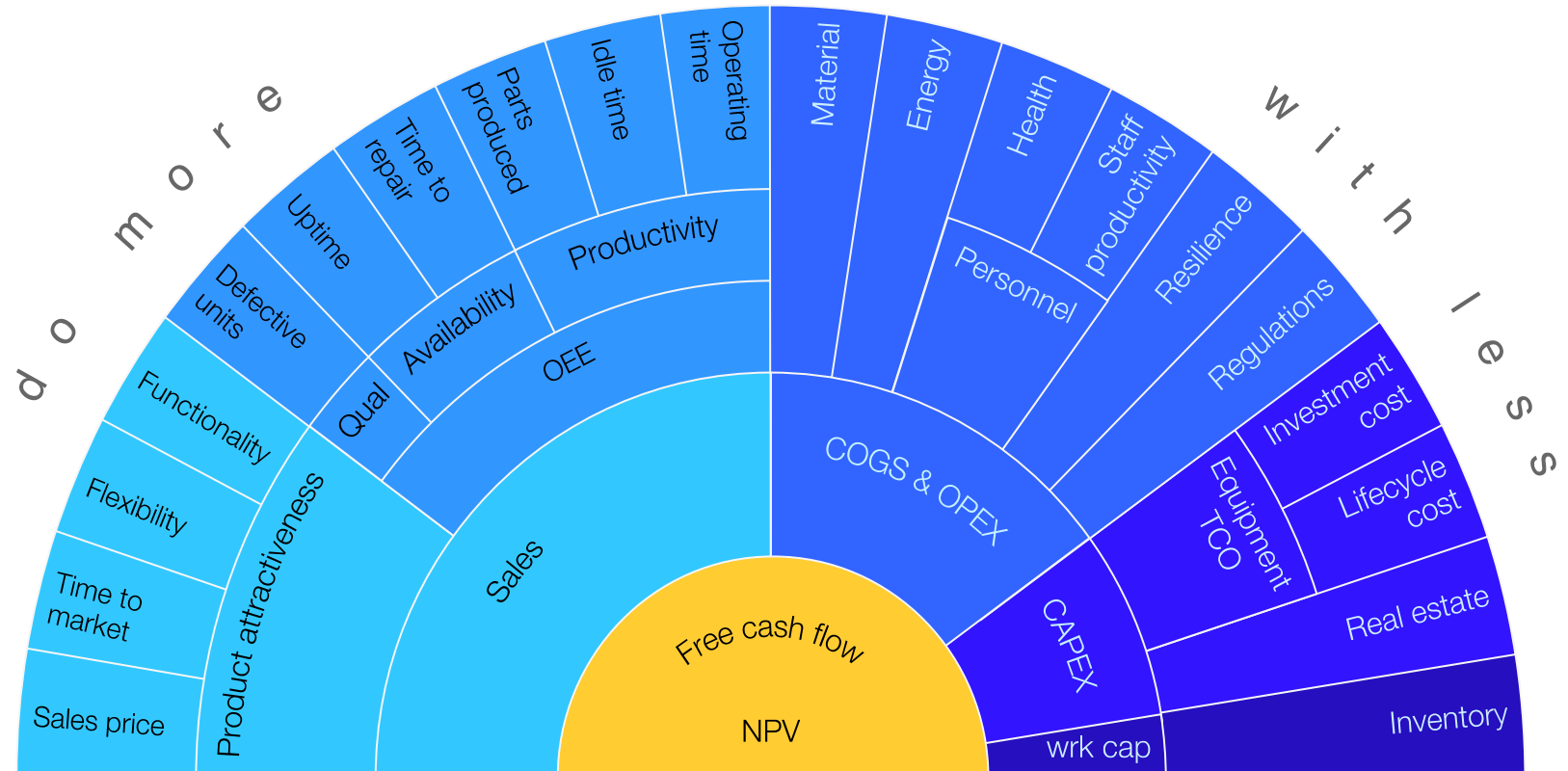
# Introduction to the White Paper of Selected Key Use Cases

For each use case: AI Enablement, Value Assessment and Mapping to Radar Chart

Grouping of use cases into 3 chapters

- Starters: Design & Engineering
- Main Course: Operations
- Desert: Maintenance

Radar Chart for Added Value Mapping



# Introduction to the White Paper

Structure for Use Case Sharing & Dialog: end user – AI supplier

Initial quote:  
eye catcher for story telling (voluntary )

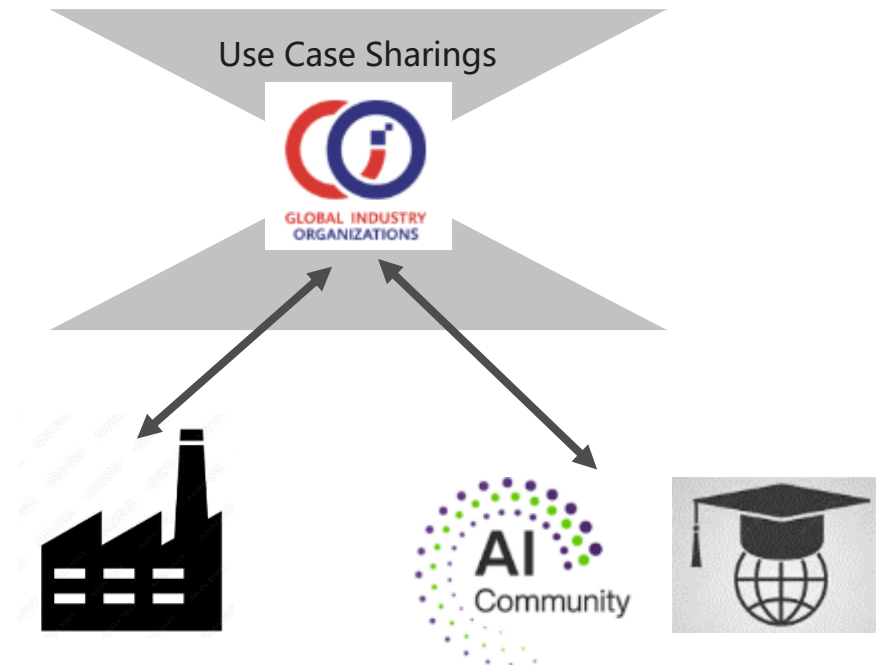
Use Case Description

Customer' s challenge

AI based Challenge

Benefit / Value Mapping on radar chart

Conclusion & Outlook



uploading customer  
pain point & challenge  
Mapped on radar chart

uploading AI enablement  
potential from Science, SMEs  
& AI community

# Introduction to the White Paper -ToC

For each use case: AI Enablement, Value Assessment and Mapping to Radar Chart

## First Course – Design and Engineering

Stone by stone	#Generative design
The future is not a stroke of fate	#CO <sub>2</sub> product tracking
Tactics from the Art of War	#5G Enabled Value Creation
Law of the golden hammer	#Cloud Robotics
Seeing is Believing – or not?	#Optical Inspection
Is it Extra Sensory Perception?	#6G- A Network that can see

## Main Course – Operations

With a little help from my friends	#Manufacturing as a service
Whom the bell tolls	#In-process quality monitoring
The Tree of Souls	#Federated Learning
The future is already here	#Value Creation in Data Spaces
When shall we 3 meet again	#Dynamic predictive risk management
To its own laws	#Autonomous factory

# Introduction to the White Paper -ToC

For each use case: AI Enablement, Value Assessment and Mapping to Radar Chart

## **Dessert – Maintenance**

Which grain will grow?

The goal of forecasting

The Beauty of Triads

6 Hours to chop down a tree

#Predictive maintenance

#Prescriptive AI for foundries

#Collaborative Condition Monitoring

#AI-based service ecosystem

## **New Spices for All Dishes**

#Generative AI



**AI enabled  
dustrial Innovation**

# Two Eye Catchers Selected

## Innovation Triggers for Sustainable Products & Services

The Future is already here- Digital Product Passports (DPP)

Digital Product Passports are innovation triggers according Gardner Hype Cycle 2023 as they enable multi- tier cooperation in complex supply chains. Teams of human domain experts and AI services will be needed to trace data, analyze and select digital twins of services being offered by multiple suppliers in digital markets along the value chain. Environmental requirements on energy and product carbon footprint (CO2 consumption) are optimized.

## 6G- A Network that can see

AI will be both a service and a native feature in the 6G communication system, and 6G will be an E2E (end-to-end) system that supports AI-based services and applications for consumers and industries. Humans and AI systems will team up for skill development to understand environment and given tasks, enabling personal robots to assist humans in daily work, medical care or industrial applications.

Hype Cycle for Environmental Sustainability, 2023



Gartner



Thank you.

