

Beyond Digital

Das (TUM) Deep Tech Innovations System

Philipp Gerbert

General Managing Director TUM Venture Labs

Munich, 9 November 2023

A joint initiative by



AGENDA

15:55-16:03	TUM Deeptech Innovation Ecosystem	Philipp Gerbert, CEO, philipp.gerbert@tum-venture-labs.de
16:03-16:19	Start-up Pitches, 4 min each	
	Twinu (www.twinu.com) Digital pass for circular and more	Christian Adler, Founder, CEO, christian.adler@twinu.com
	Phelas (www.phelas.com) Long-term storage and optimizer	Leon Haupt, Founder, BD, leon@phelas.com
	Olive Robotics (www.olive-robotics.com), Benjamin Felbrich, Founder, CPO, benjamin@olive-robotics.com Modular robotics	
	asklio (www.asklio.ai) AI co-pilot for procurement	Lukas Heinzmann, Founder, CTO, lukas.heinzmann@trado.app
16:19-16:20	Wrap-up	Philipp Gerbert

The TUM Venture Labs foster deep-tech/life sciences ventures

(www.tum-venture-labs.de)

The **TUM Venture Labs** support **talents** and **teams** to turn their deep tech or life science idea into **scalable businesses with strong real world impact**.

We act as an **integrated network**, combining **exceptional domain expertise** across a wide area of technologies and markets with deep **entrepreneurial experience**.

We are a joint initiative by

- **TUM**, the entrepreneurial university, top-ranked in the EU, and
- **UnternehmerTUM**, Europe's leading entrepreneurship center.

We support teams **across the entire early life-cycle** from idea generation to business launch and impact.

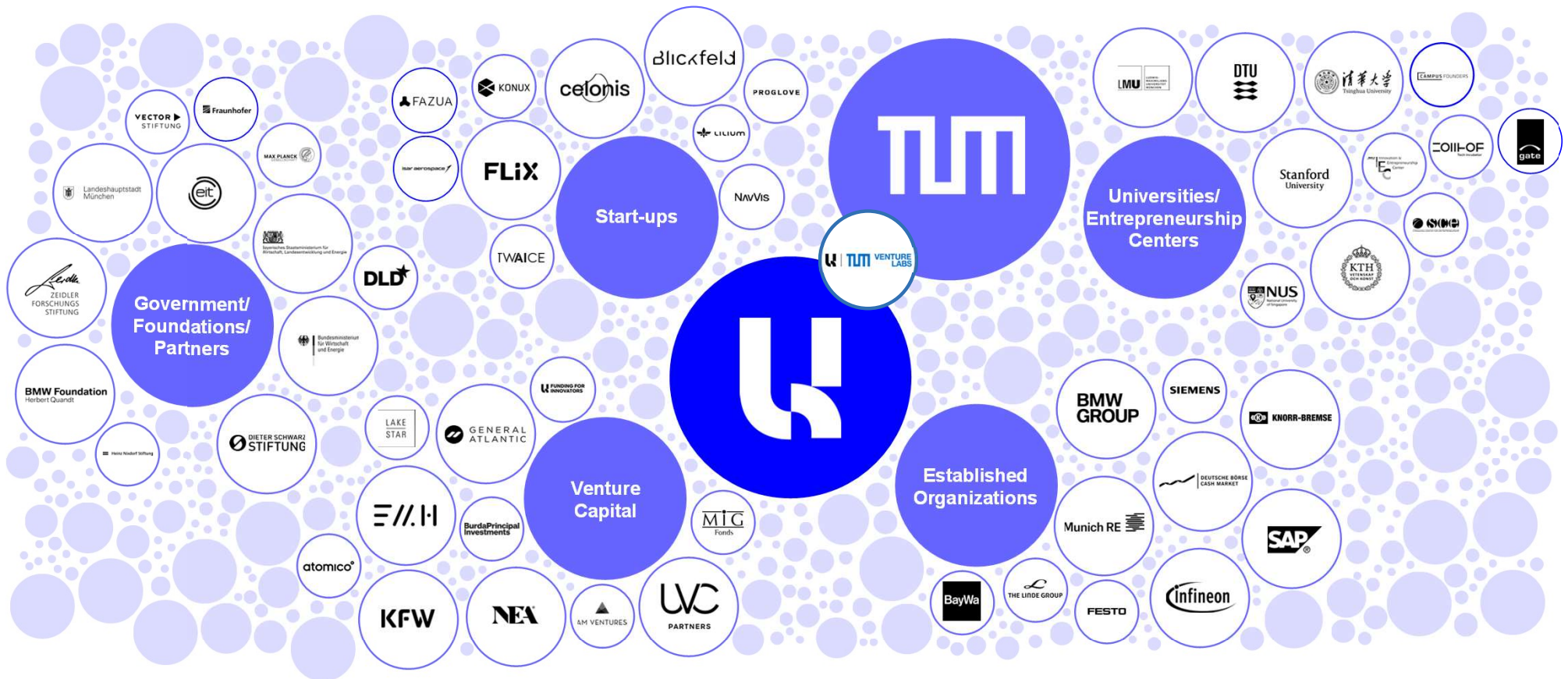


TUM student initiatives are world class

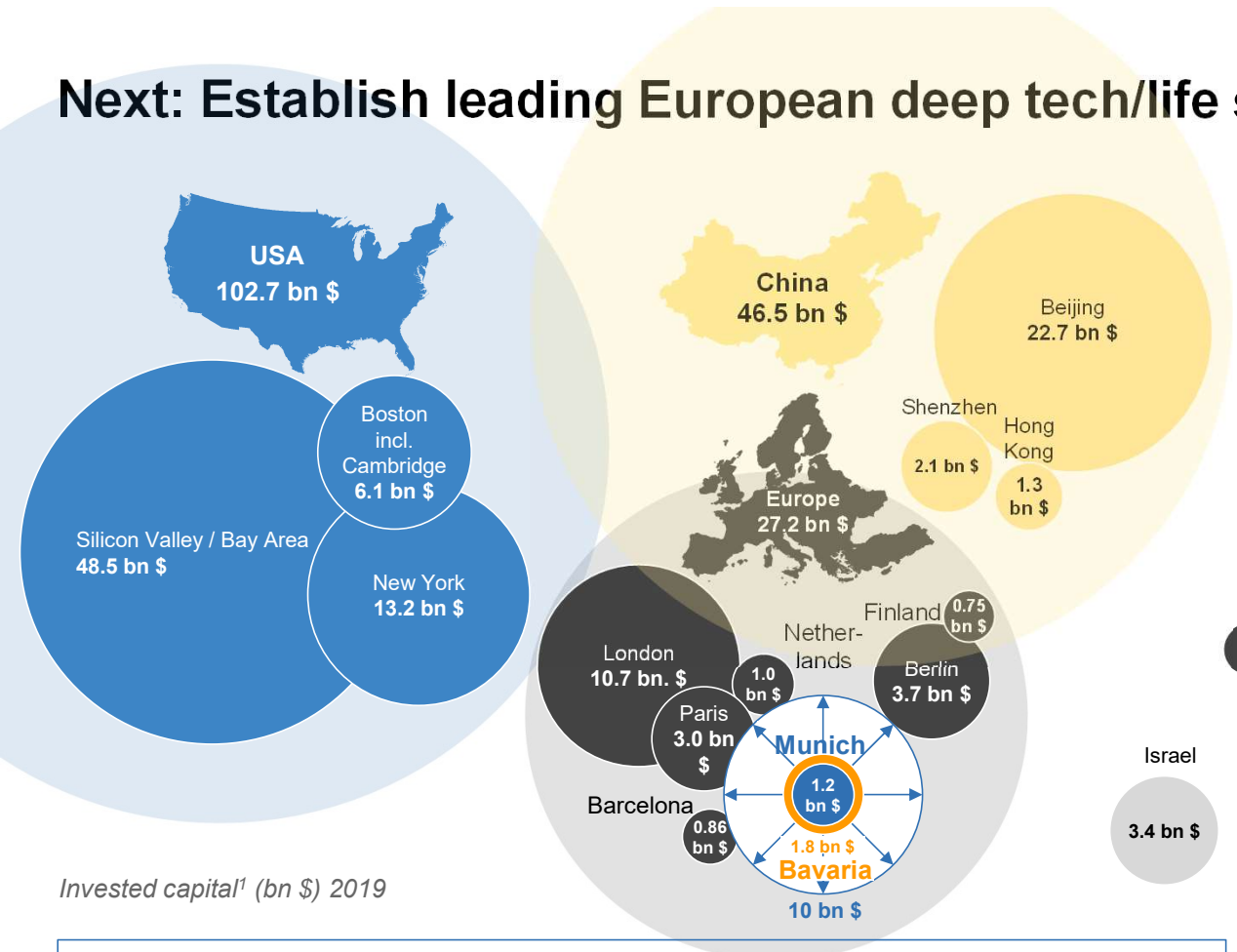


- **TUM Hyperloop** has consecutively won all 4 Hyperloop competitions by Elon Musk
- **TUM Boring** has won the Boring Company competition by Elon Musk
- **TUfast** has won a very long series of global competitions in autonomous, electric races

TUM/UnternehmerTUM have formed a unique innovation ecosystem in Munich and beyond



Next: Establish leading European deep tech/life sciences hub



Invested capital¹ (bn \$) 2019

Key problem for Germany/EU identified: Venturing is the bottleneck when leveraging outstanding research for economic growth

Source: Crunchbase/EY, BCG Analysis

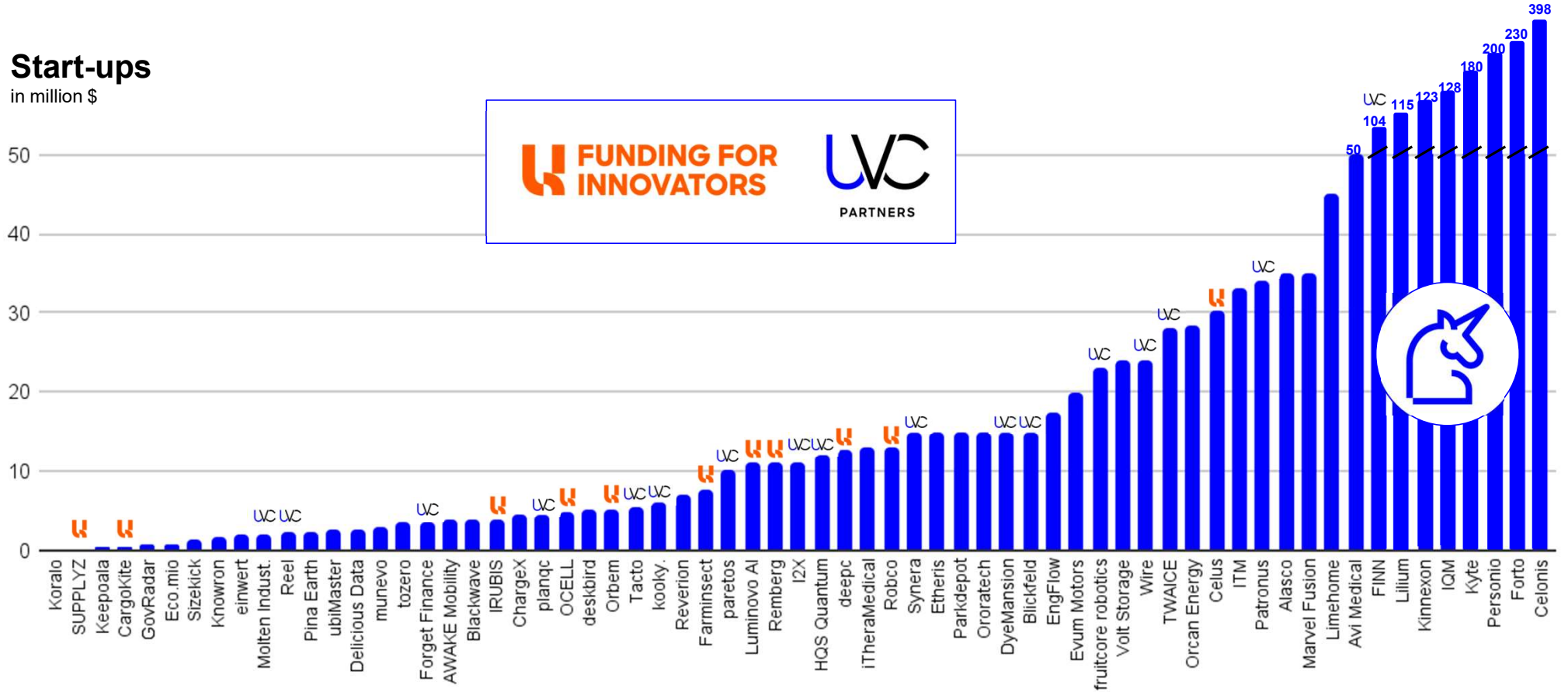
1. Invested capital includes seed, series and angel investment, no IPO or post-IPO Funding

Reaching full potential to make Munich **the entrepreneurial tech center in Europe** and a critical hub for European technological sovereignty.

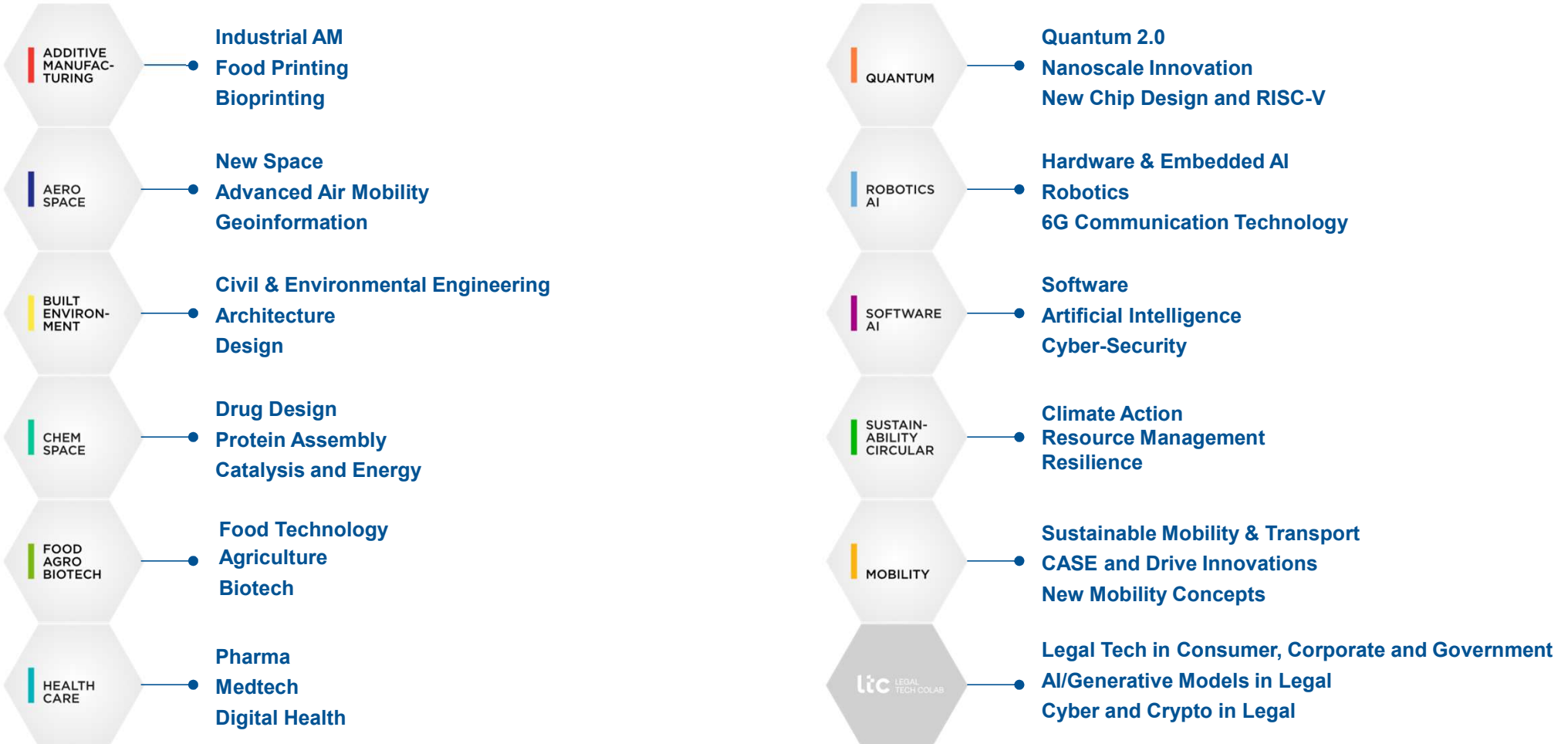
	2020	2030
€ Invested capital/year	1 bn \$	10 bn \$
New employment/year	1,000	10,000
Scalable spin-offs/year	50	250
Priority patent applications	50	500
Corporate partners	100	500
VL talent/year	5,000	25,000

By 2022 we have already increased invested capital to US\$ 2.2 billion

Start-ups in million \$



TUM Venture Labs Overview



LegalTech Colab as adjacent organization; VL Mobility to be ramped up

Core Partner Ecosystem TUM Venture Labs

Drivers of the initiative



Anchor & Platinum Partners



focus Agro



focus Built Environment



focus Robotics/AI/6G



overall focus



focus ChemSpace



focus Circular Economy



focus Healthcare



focus Food



focus SW/AI

Foundations & Other



focus TUM VL Heilbronn and overall



focus Digital Health



MUC Summit

focus AI

Public support



Bayr. StM für Wissenschaft und Kunst

focus overall



Bayr. StM für Wirtschaft, Landesentwicklung und Energie

focus Quantum & Robotics



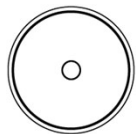
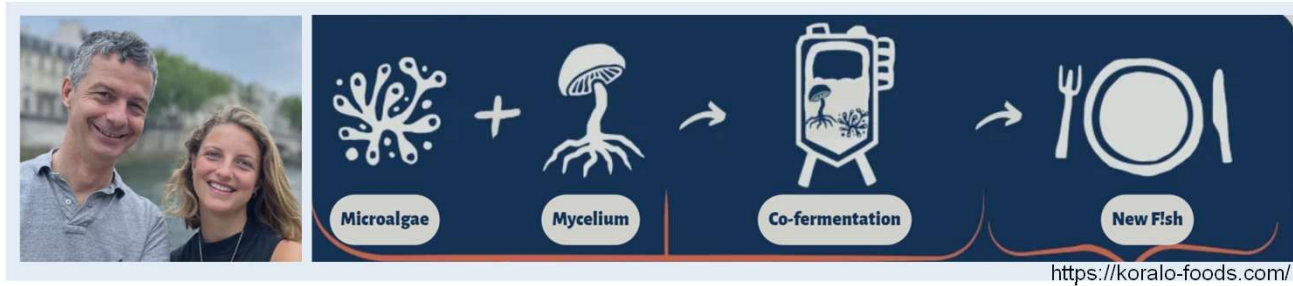
Bayr. StM der Justiz

focus Legal Tech Colab

Meet some of our TUM Venture Labs Start-ups



Plant-based fish from algae & mycelium



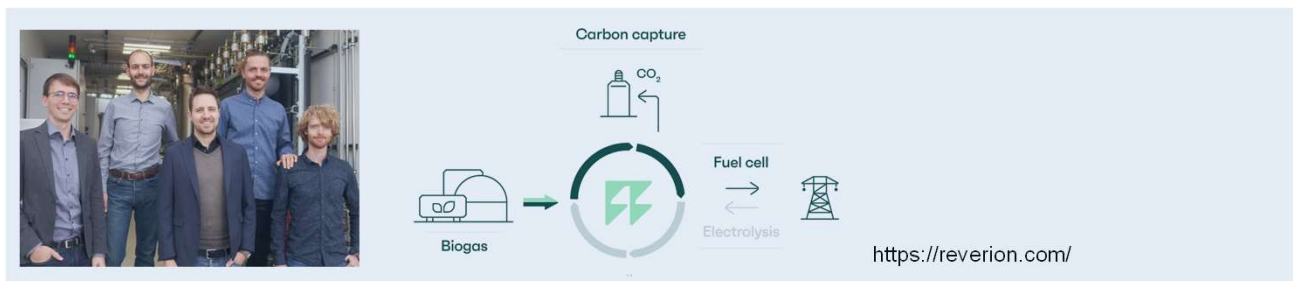
DEVANTHRO
The Robody Company

Remotely controlled humanoid robotic avatars



Reverion

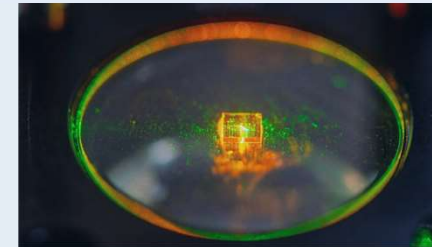
Renewable Energy generation with biogas



Meet some of our TUM Venture Labs Start-ups



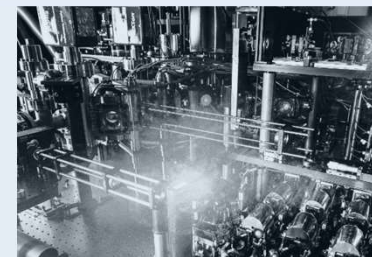
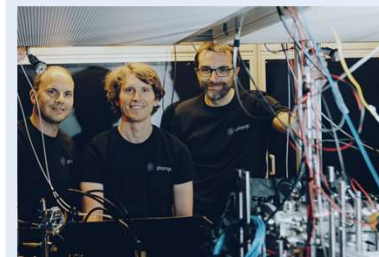
Quantum sensing with NV diamonds



<https://www.quantumdiamonds.de/>



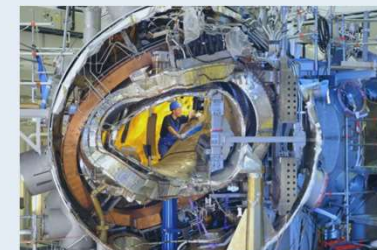
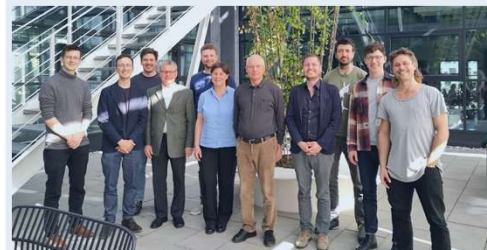
Quantum computers with neutral atoms



<https://planqc.eu/>



Fusion power plants using QI stellarators.

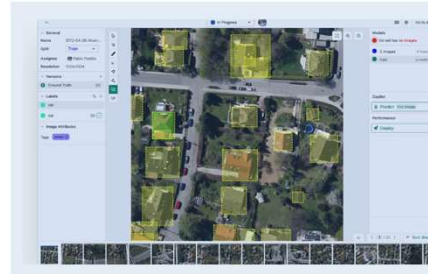


<https://www.proximafusion.com/>
Credit: Wolfgang Filser via Max Planck Institute.

Meet some of our TUM Venture Labs Start-ups



Acceleration of AI in Computer Vision



<https://happyrobot.ai/>



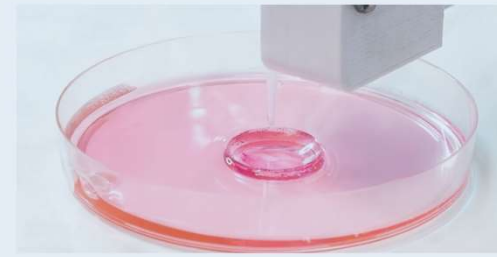
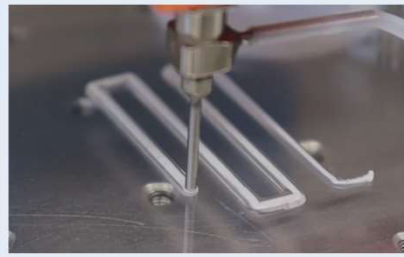
Automated compliance control for product design



<https://www.certivity.io/>



Intelligent bioprinting system



<https://biomotion.tech/>

Sam Altman discusses ChatGPT at TUM

- OpenAI founder visits TUM for his only public event in Germany on his European tour
- He explained what lies behind the success of ChatGPT, why it is not an open-source technology and how it might be regulated

The value of OpenAI is not primarily LLM but the ability to invoke interface via natural language.

- Moderation by Reinhard Heckel



TUM Venture Labs have a comprehensive event offering

Example: Robotics/AI

Our Activities

12x/year



We foster startup interaction.

1x/year



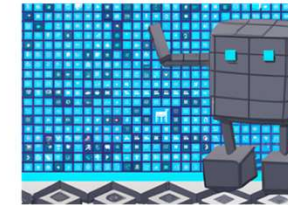
We induce new startup ideas.

1x/year



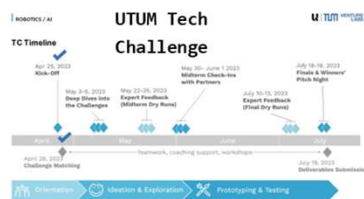
We push the robotic ecosystem.

More to come.



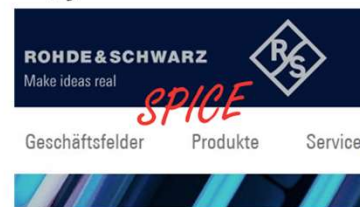
Bavaria and beyond.

1x/year



We activate new talents.

2x/year



We interact with industry.

4x/year

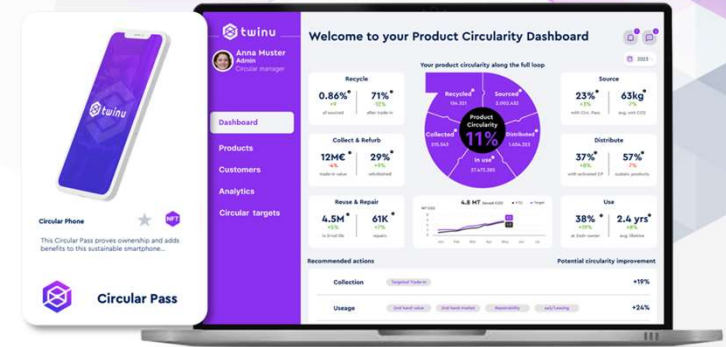


We build on core topics.

Thanks!

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	asklio (www.asklio.ai) AI co-pilot for procurement	Lukas Heinzmann, Founder, CTO, lukas.heinzmann@trado.app
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Enabling circularity with Digital Product Passports.

Committed to sustainable development goals:





Linear economy is reaching the end of the line.

100x more gold in
a ton of e-waste than ore



50% of CO₂ from
products & consumption

Take

Make

Use

Dispose

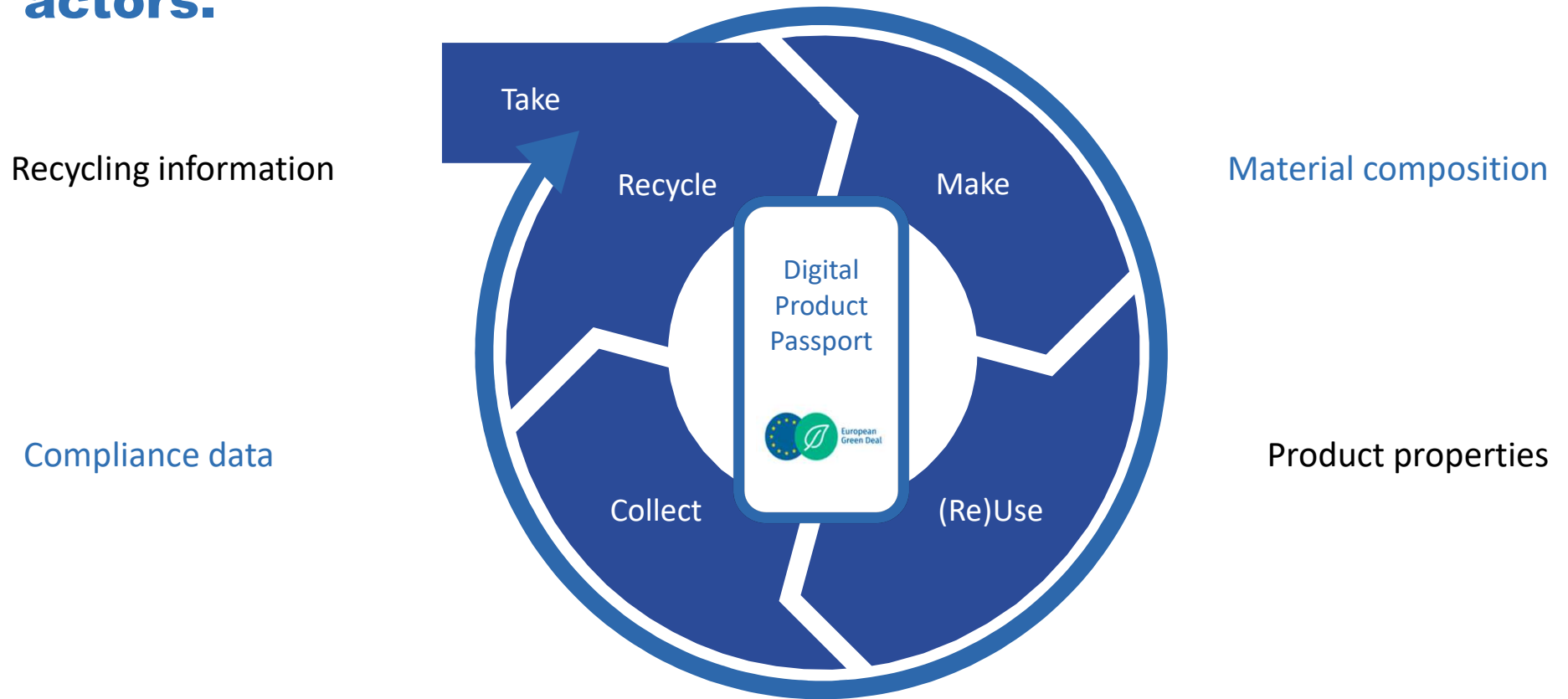


3x of plastic
production by 2060



45s until the next battery
threatens a recycling plant

Digital Product Passports create transparency for all actors.



Digital Product Passports becoming mandatory.

Digital Product Passport



For all physical products produced, sold or put in service in the EU



Up to **€150bn** implementation cost over the next **10yrs** (EU).

Our CIRCULAR PASS delivers benefits beyond regulation

Example



Patent pending

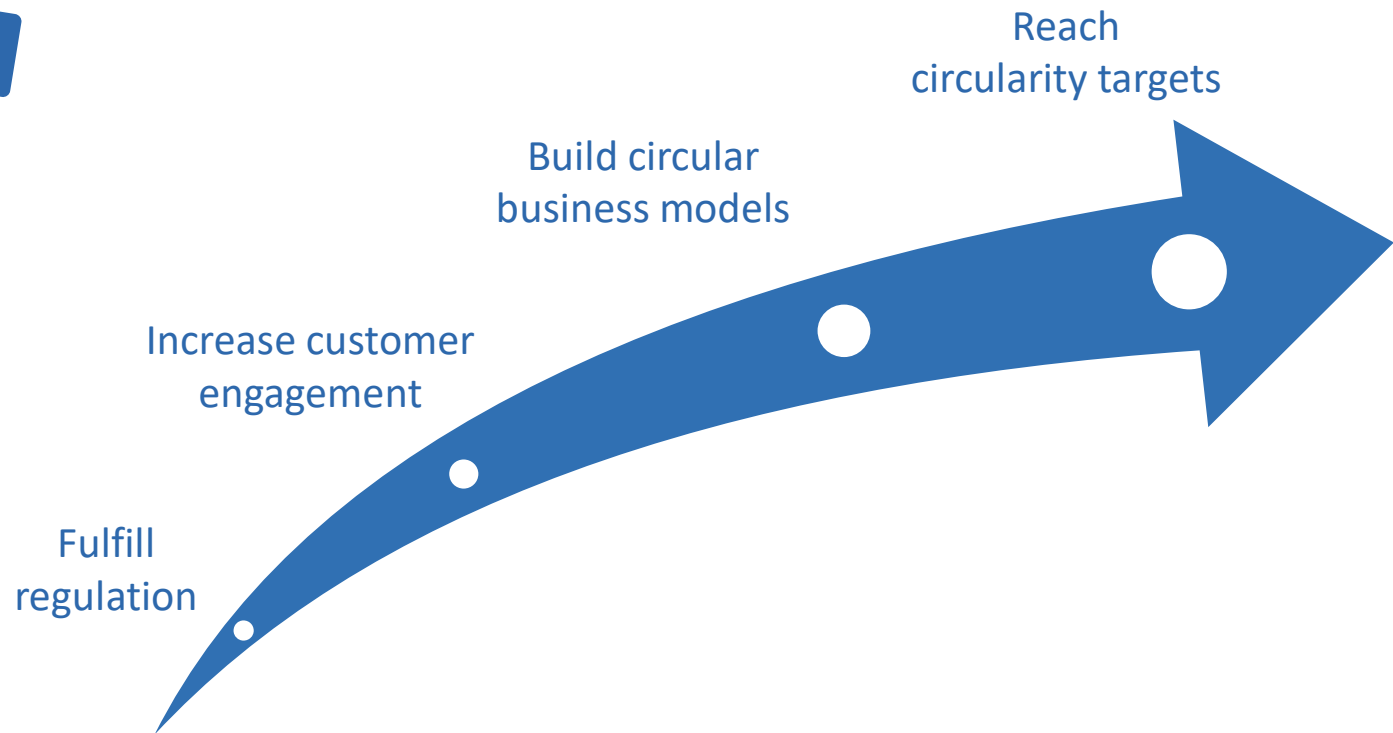
Circular Phone



This Circular Pass offers relevant information and functionality for its product and increases its lifetime and value...



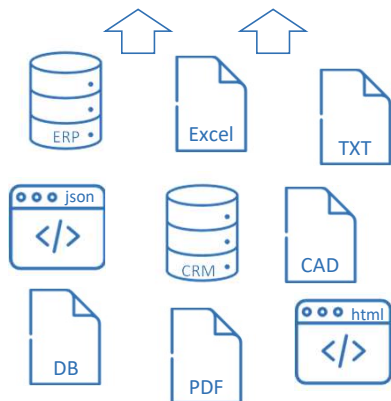
Circular Pass



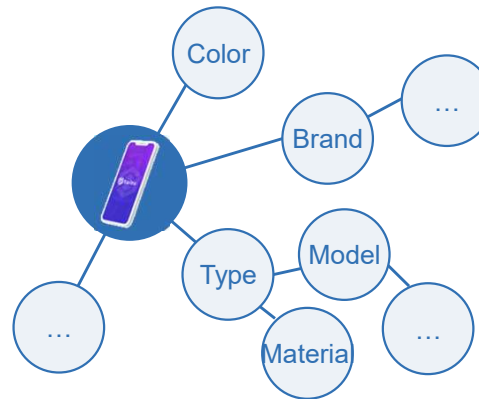
... by combining digital twin, AI and distributed ledgers.

1 Build digital twin model

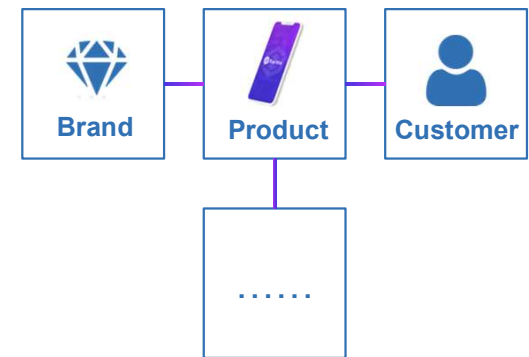
Digital product representation



2 Create semantic AI structure



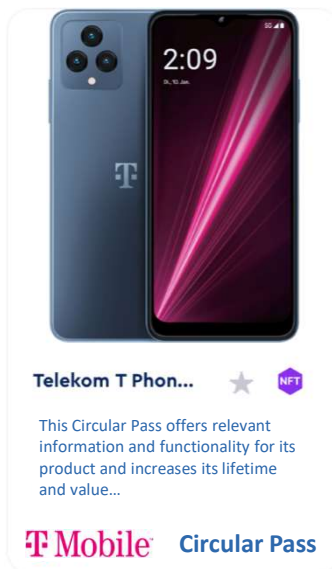
3 Secure on distributed ledger



Solution has three core elements ...

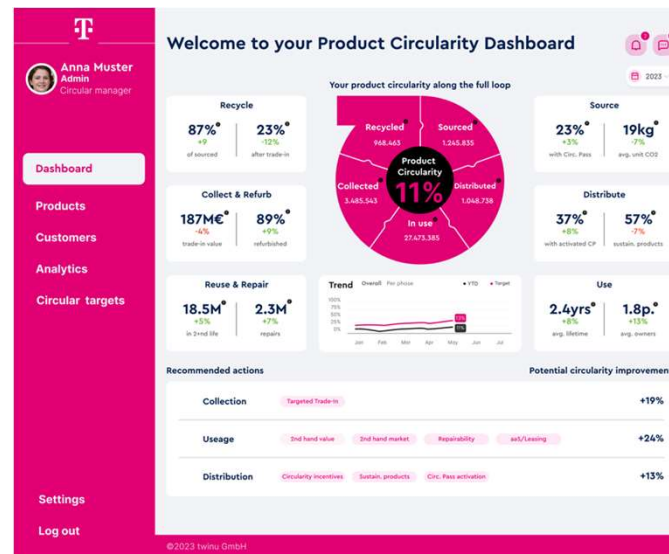
Circular Pass

Identify device & data



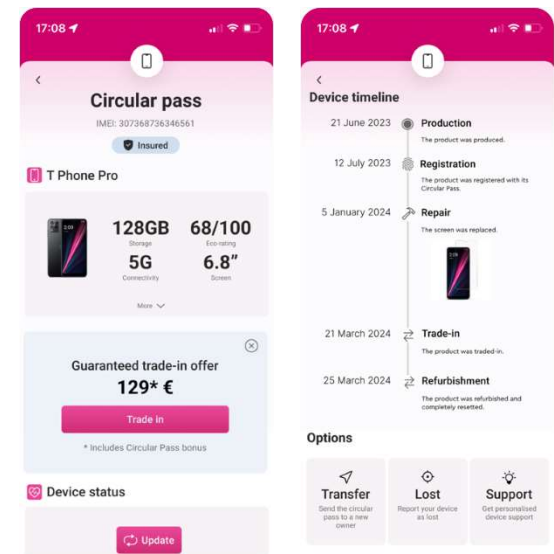
B2B hub

Measure and improve circularity



B2C app

Access information & features



Awarded “**Most Sustainable Solution**” by Deutsche Telekom & T-Mobile

... and enables to chat with a product.



T Phone Pro



Product

Telekom T Phone

The perfect combination of design, performance and ease of use. Fast 5G, built-in Google features and a powerful battery are now available to more users than ever before – without breaking the budget. Deutsche Telekom firmly believes that digital connectivity is a universal right and is not satisfied until everyone is on board.

Was this phone repaired and if yes, what was repaired?

Yes, this phone was repaired. The screen was replaced with original parts by Telekom.

Describe this product

Write a small sales description

List the product properties

Was this phone repaired and if yes, what was repaired?

Ask

Get in touch

christian@twinu.com

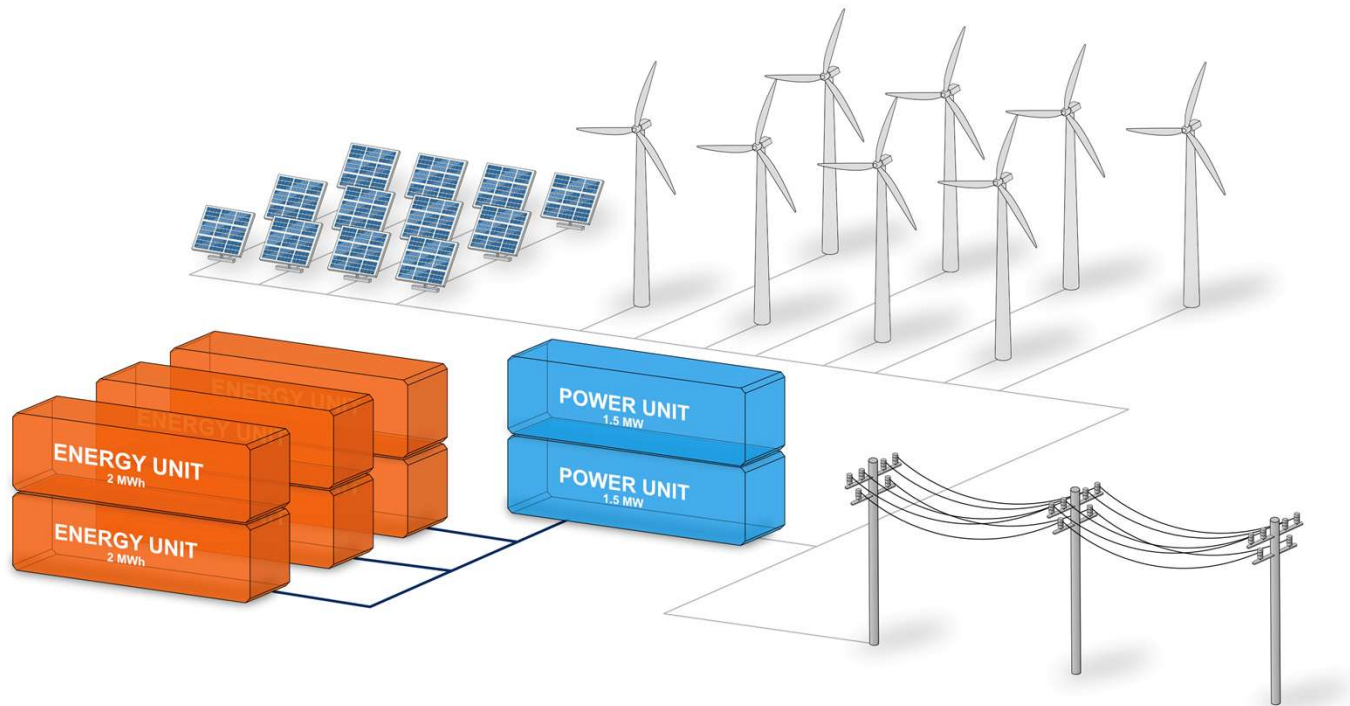
Connect on LinkedIn:



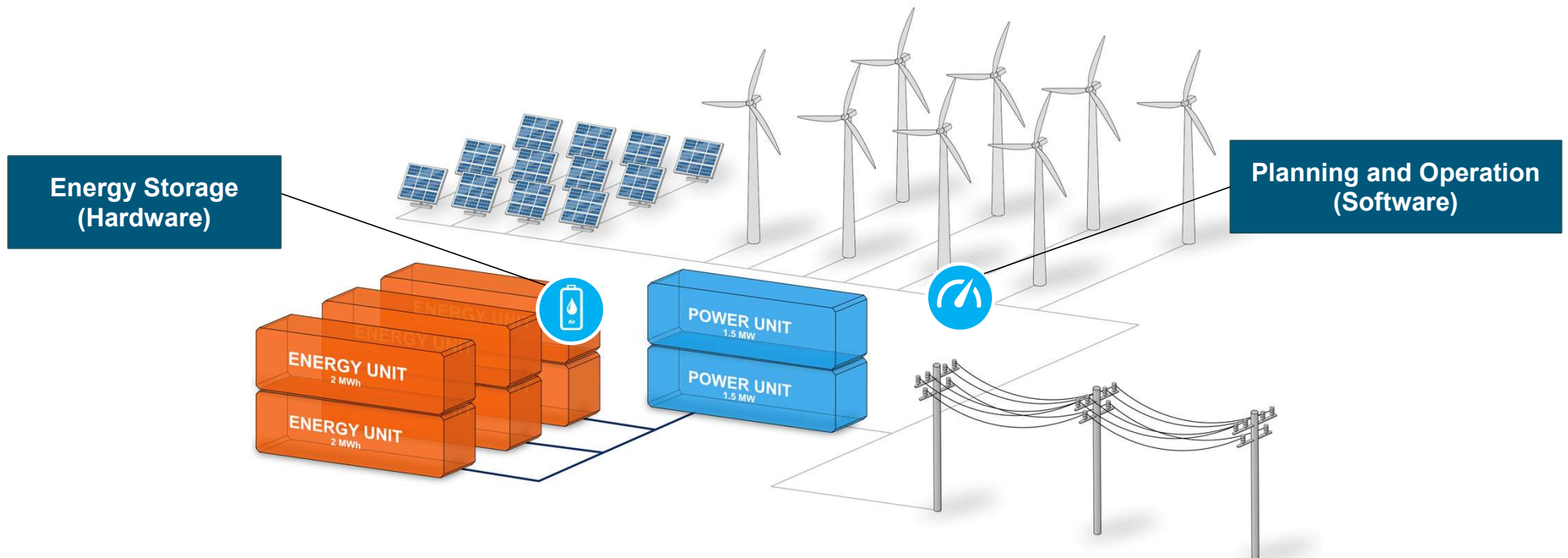
We make the sun shine at night

phelas Energy Storage Solutions

phelas enables large scale renewable energy integration...



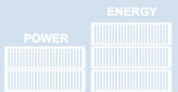
...by providing the tools for utilities and developers.



phelas Aurora: Scalable. Sustainable. Profitable.



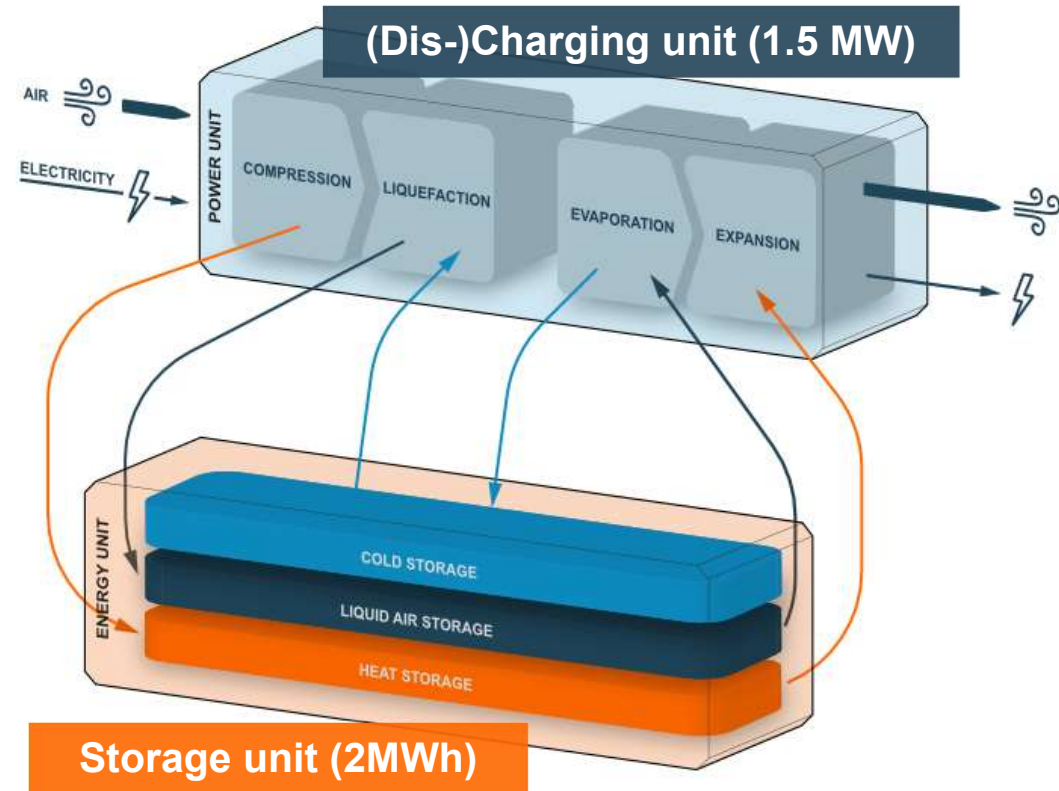
Scalable



Modular & transportable



Unrivalled safety



Catalyst finds you the best storage investment case

① New RE Projects



① Existing Assets



② Storage simulation by Catalyst to yield feasibility, sizing and bankability.



Storage Investment Case

- ✓ Project finances (IRR)
- ✓ Storage technology and size
- ✓ Extensive risk analysis





AURORA

LIQUID AIR ENERGY STORAGE

*Hardware Solution for Utility
Scale Energy Storage*

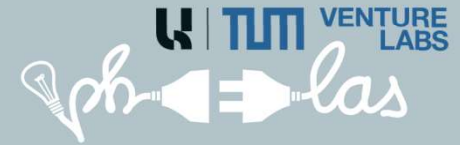


Catalyst

ENERGY STORAGE OPTIMIZATION

*Software Solution for Planning
of Energy Assets*

Our vision:



Wind and Solar.

All Day.

Every Day.

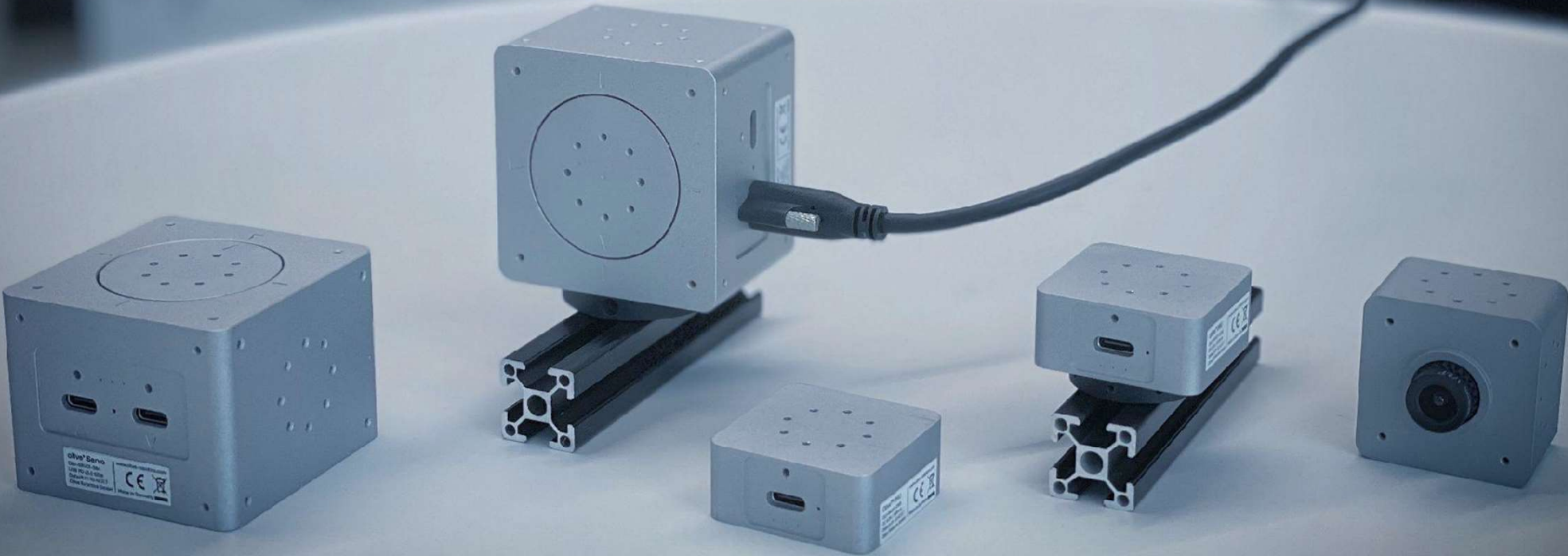


Leon Haupt

Founder / Head of Market
leon@phelas.com

Olive Robotics

PIONEERING INTEROPERABLE ROBOT HARDWARE SOLUTIONS

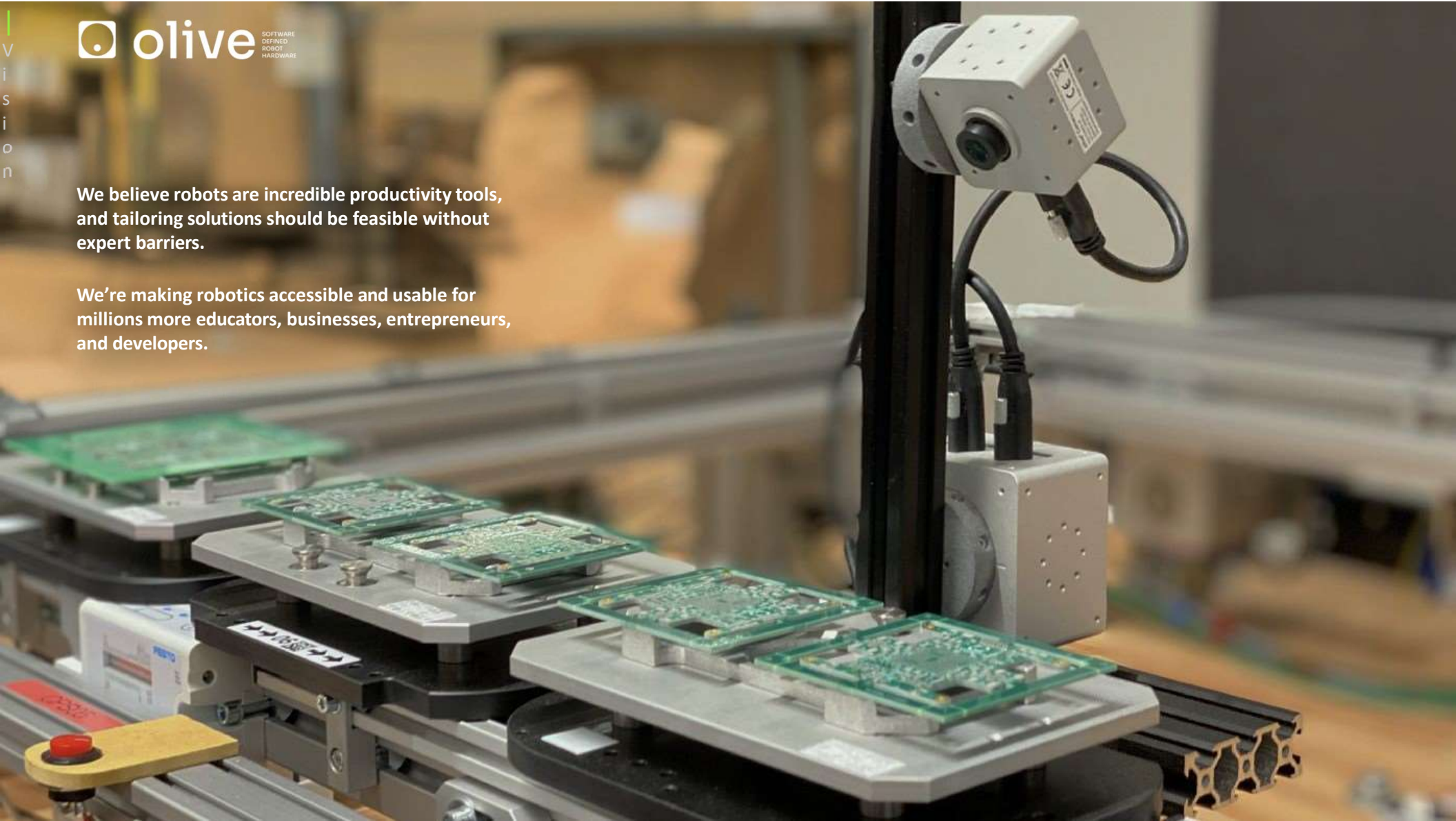


V
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We believe robots are incredible productivity tools, and tailoring solutions should be feasible without expert barriers.

We're making robotics accessible and usable for millions more educators, businesses, entrepreneurs, and developers.



Today's robot development still relies on professional experts, despite...



ROBOTICS EXPERT SHORTAGE

1.2 million unfilled robotics experts position until 2030 in the EU alone



LIMITED PRODUCTIVITY

Global industries lose \$7 trillion annually due to inefficiencies and limited robotics solutions



EDUCATIONAL IMPERATIVE

By 2035, 60% of all jobs will demand robotics or AI knowledge, creating an urgent need for adaptive curricula

We are on the verge of the robotics revolution

Interoperable robot hardware and AI-powered software enables the transition to the autonomous industry.

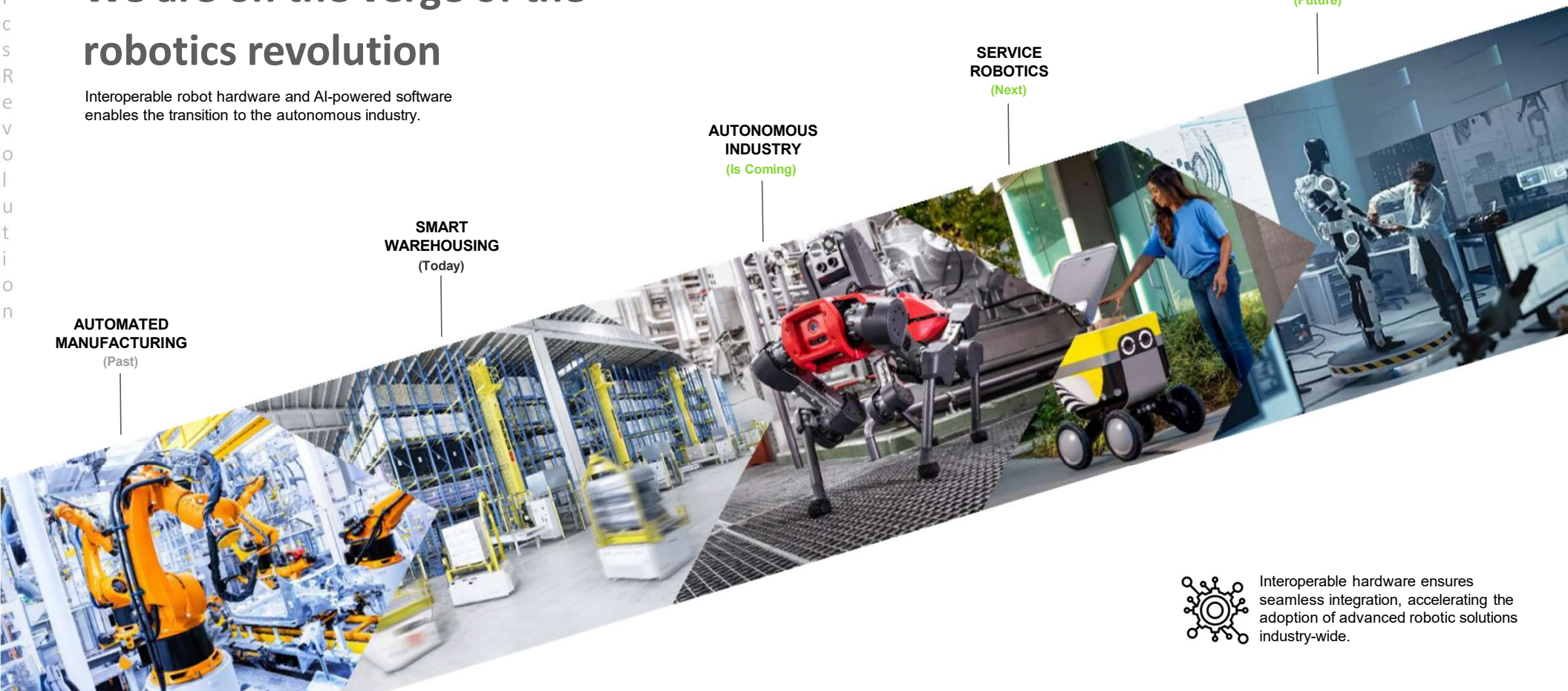
**AUTOMATED
MANUFACTURING**
(Past)

**SMART
WAREHOUSING**
(Today)

**AUTONOMOUS
INDUSTRY**
(Is Coming)

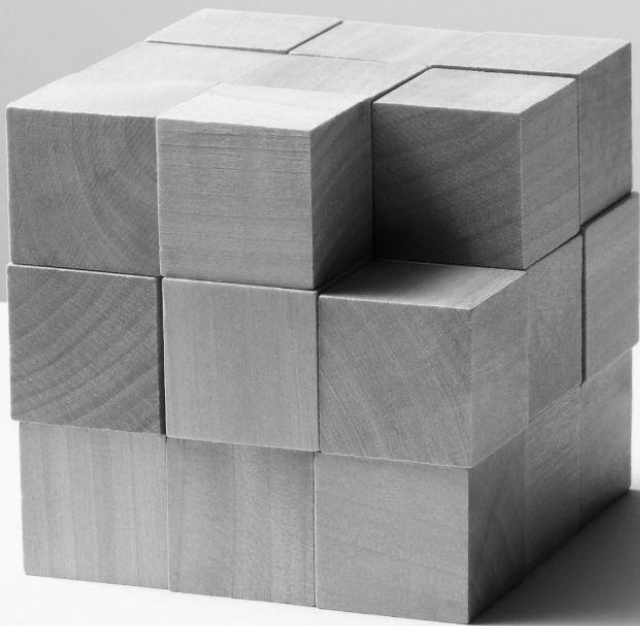
**SERVICE
ROBOTICS**
(Next)

**DIY CUSTOMIZED
SERVICE ROBOTS**
(Future)



Interoperable hardware ensures seamless integration, accelerating the adoption of advanced robotic solutions industry-wide.

| Problem



Interoperability,
the silent bottleneck in
robotics



92%



of robotic developers in the industry suffer from **complex hardware integration** and limited compatibility between components.

84%



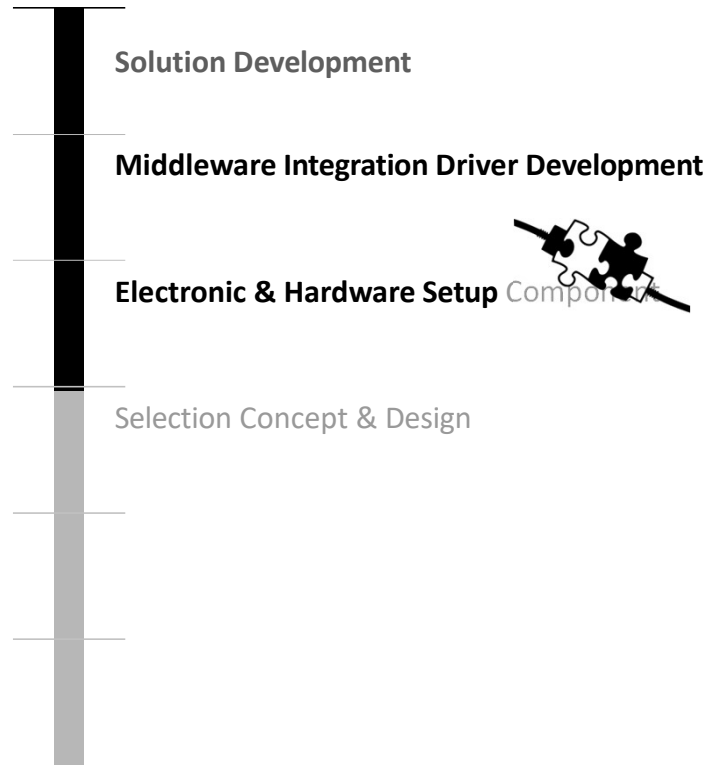
of educational institutions offering robotics courses struggle with **outdated hardware** and complex integration requirements.

70%




of system integrators that encounter **time-consuming development** processes and compatibility issues trying to adopt the Robot Operating System (ROS).

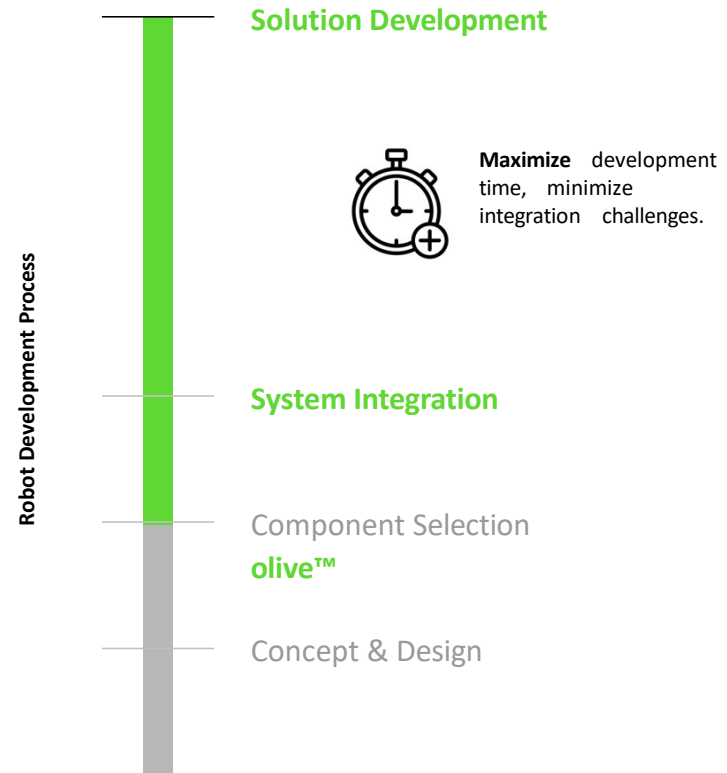
Robot Development Process



| Aim

We enable
developers,
educational institutions and
system integrators
focus on the solution.

 Interoperability ensures a broader talent pool can
engage in robotic development, democratizing
innovation.



Solution

We are creating
**AI ready, and
interoperable robot hardware**
that provides seamless
system integration and flexibility,
enabling efficient DIY robotics.



2018
Robotics Research
TUM

2019
World's first
interoperable
sensor in action

2020
System architecture
and EdgeROS
technology

2021
World's first
ROS-native sensor
introduced

2022
Olive Robotics spin-off
olive

2023
Certified & first
sales interoperable
ROS hardware

10x
Faster Setup

5x
More Flexibility

2x
Better Precision

100%
ROS-Native

100%
Interoperable and Plug & Play


200x
Low-Latency Robotic System



The world's most advanced robot hardware solution

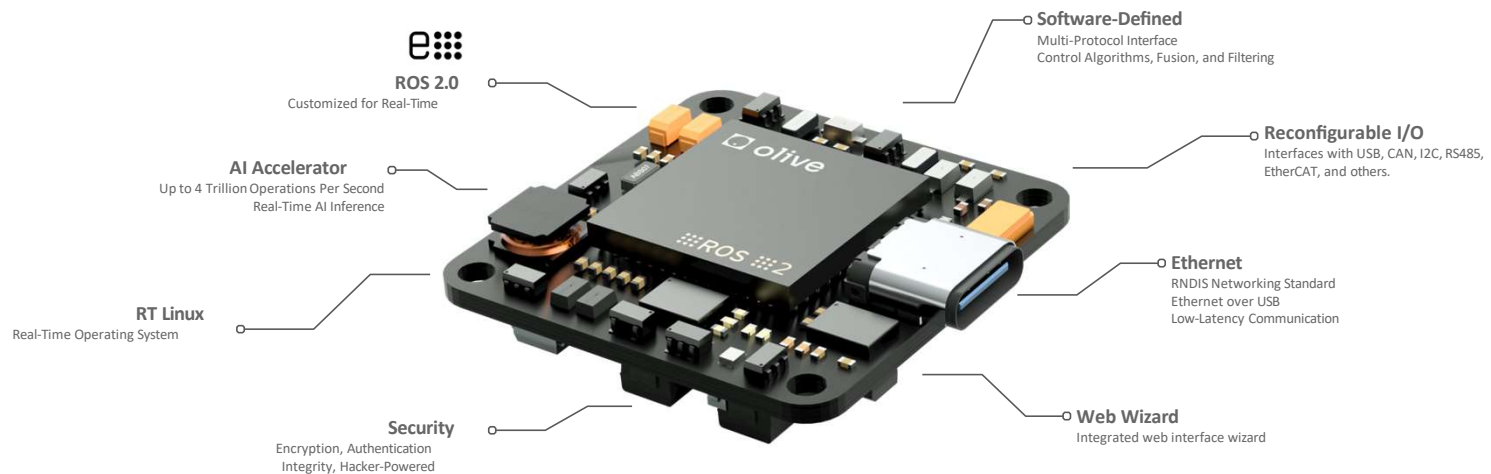
- Interoperable
- Software-Defined
- Plug & Play
- AI Ready
- ROS-Integrated



 There are hundreds of robotic companies making incompatible hardware. We solve this problem through **EdgeROS**, an interoperable interface for robots.

olive™ Universal System on Module (SOM)

The world's first and most compact & lightweight EdgeROS™ unit



✔ Olive embedded OS software for all types of sensors and actuators.
Enables ROS-integrated components for industry-grade applications.
World's only EdgeROS™ unit with AI accelerator.

Product Portfolio



olive™ SERVO

Modular, Software-Defined Robot Servo Motor ROS and ROS 2-Native, Re-Programmable



olive™ AI CAMERA

Modular, Software-Defined Robot AI Camera ROS and ROS 2-Native, Re-Programmable, TPU



olive™ IMU

Modular, Software-Defined Robot IMU Sensor ROS and ROS 2-Native, Re-Programmable



olive™ OWL Kit

Customizable, Software-Defined Perception Robot Kit, ROS and ROS 2-Native, Re-Programmable



olive™ GNSS/GPS

Modular, Software-Defined Robot GNSS/GPS Unit ROS and ROS 2-Native, Re-Programmable



olive™ RADAR

Modular, Software-Defined Robot RADAR Sensor ROS and ROS 2-Native, Re-Programmable



olive™ EdgeROS™

Universal Software-Defined Robot Edge-ROS SOM ROS and ROS 2-Native, Re-Programmable, 5-grams



olive™ ANT Kit

Customizable, Software-Defined Mobile Robot Kit ROS and ROS 2-Native, Re-Programmable

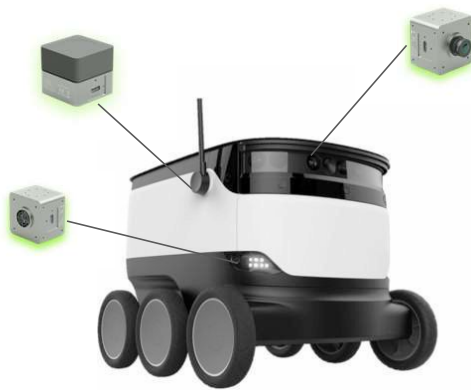
➔ *Production: PCBA part sourcing and assembly outsourced to SHENZHEN JDB TECHNOLOGY (+500 employees global footprint). CNC service and Mechanical parts outsourced to HUBS (Proto Labs, Inc.). Scalable to thousands of components p.a.*

➔ *Extension of Portfolio: Partnering with world's leaders (Octavo Systems, Bosch, Infineon, Wurth electronics) specialized in integrated SIP and sensor technology. Working with SMC Powers Ltd, specialized in advance BLDC drive systems. Partnering with Siemens, specialized in automation solutions.*

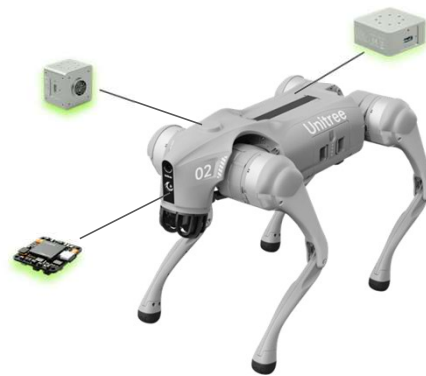
| Markets & Opportunities

Integrate **olive**TM in any robotic systems

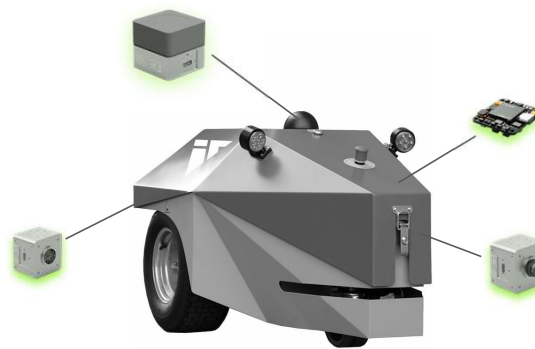
For developers, Integrators, and educators, easy-to-integrate components aren't a luxury, they're a necessity.



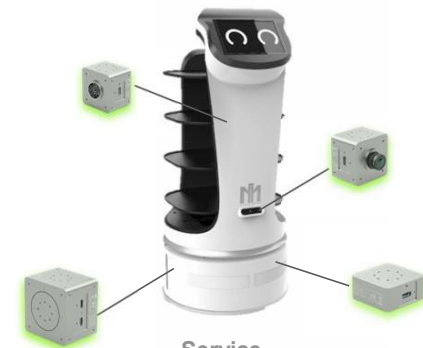
Last Mile Delivery
Source: Starship Robotics



Inspection
Source: Unitree Robotics



AMR System
Source: Innok Robotics



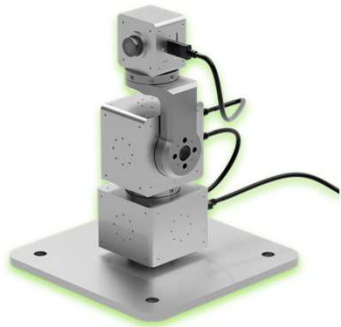
Service
Source: Pudu Robotics

➔ Robot builders chase efficiency;
plug-and-play components are their first pick.

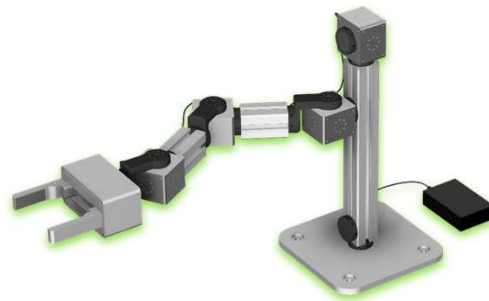
| Markets &
Opportunities

Build any robot with **olive™** hardware

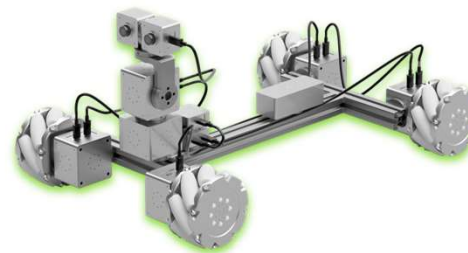
With Olive's easy-to-integrate components and kits, developers, integrators, and educators can effortlessly construct a fully functional robot.



Perception Systems



Manipulation



Mobile Robotics



Service Robotics

→ Robot educators chase simplicity;
plug-and-play components are their first pick.

60+

years of combined robotics experience.

A dynamic fusion of interdisciplinary skills and unique perspectives, united by a shared vision



Mojtaba Leox Karimi

CEO

PhD, 8 years in robotics

Management &
Robotics Development



Benjamin Felbrich

CPO

PhD, 6 years in robotics

Production &
Embedded Engineering



Edwin Babiains

CTO

PhD, 8 years in robotics

Technical Development &
Software Engineering



Víctor Mayoral-Vilches **CCO**

PhD, 12 years in robotics

Business Development &
Marketing



Ekehard Steinbach **CSO**

Prof. Dr. -Ing., 28 years in robotics

Strategy &
Chief Scientist



Thank You!

www.olive-robotics.com

contact@olive-robotics.com

Olive Robotics GmbH, Munich Nov. 2023

Appendix

Olive Robotics

Every Robot Deserves Seamless Integration!

Munich, Aug. 2023





The AI-Copilot for Procurement





Vladimir
Keil
Founder &
CEO



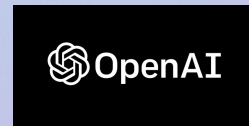
Lukas
Heinzmann
Founder & CTO



Till Wagner
CPO



Johannes
Theisen
Tech



90% of procurement is language based

Communicate with
employees

Search vendors &
prepare
documents

Communicate with
Vendors

Automate 80% already today

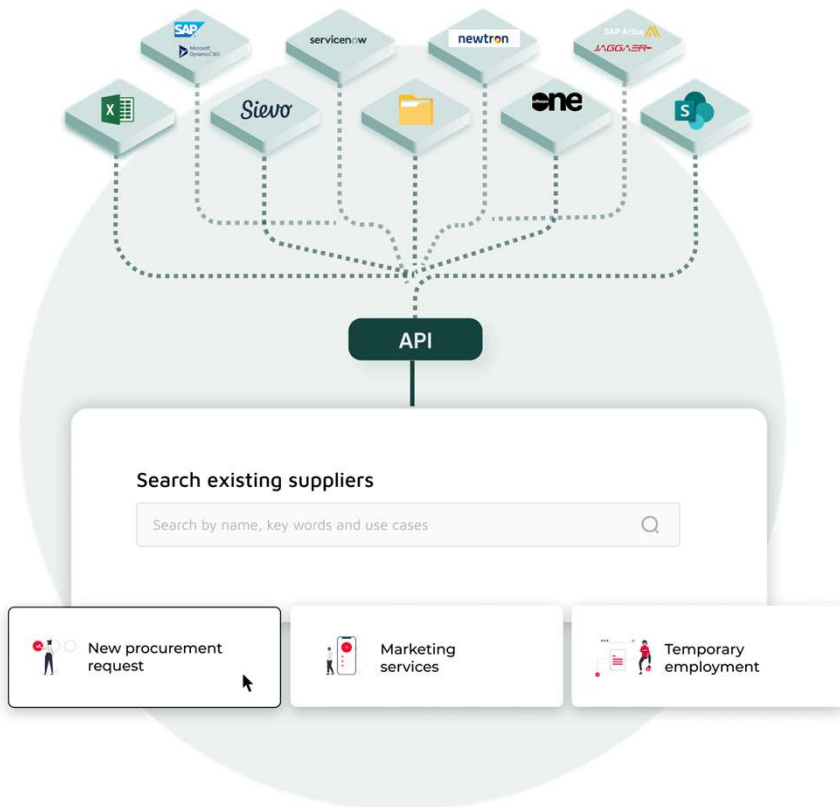
Communicate with
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askLio AI Agents

Procurement Efficiency with Generative AI









Trado Assistant

Hallo , ich brauche Mailchimp für meine Abteilung

Hi Marie , 🤖 **Mailchimp** für Mail-Automation ist im Unternehmen leider noch nicht verfügbar.

Ich habe aber einige Alternative Tools gefunden:

-  Marketo 
-  Salesforce 
-  HubSpot 

Wäre einer dieser Alternative in Ordnung?

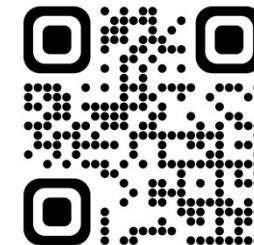
HubSpot klingt gut. Dann würde ich gerne 25 neue Lizenzen haben.

Building the AI- Copilot for Procurement



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TUM Venture Labs – the Springboard for Deep-Tech and Life Sciences Ventures



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