data innovation alliance

Zürcher Hochschule
für Angewandte Wissenschaften

School of Engineering

Vom Wert der Daten: Wertschöpfung in industriellen Dienstleistungen

Gaia-X Inside

14. Juni 2023

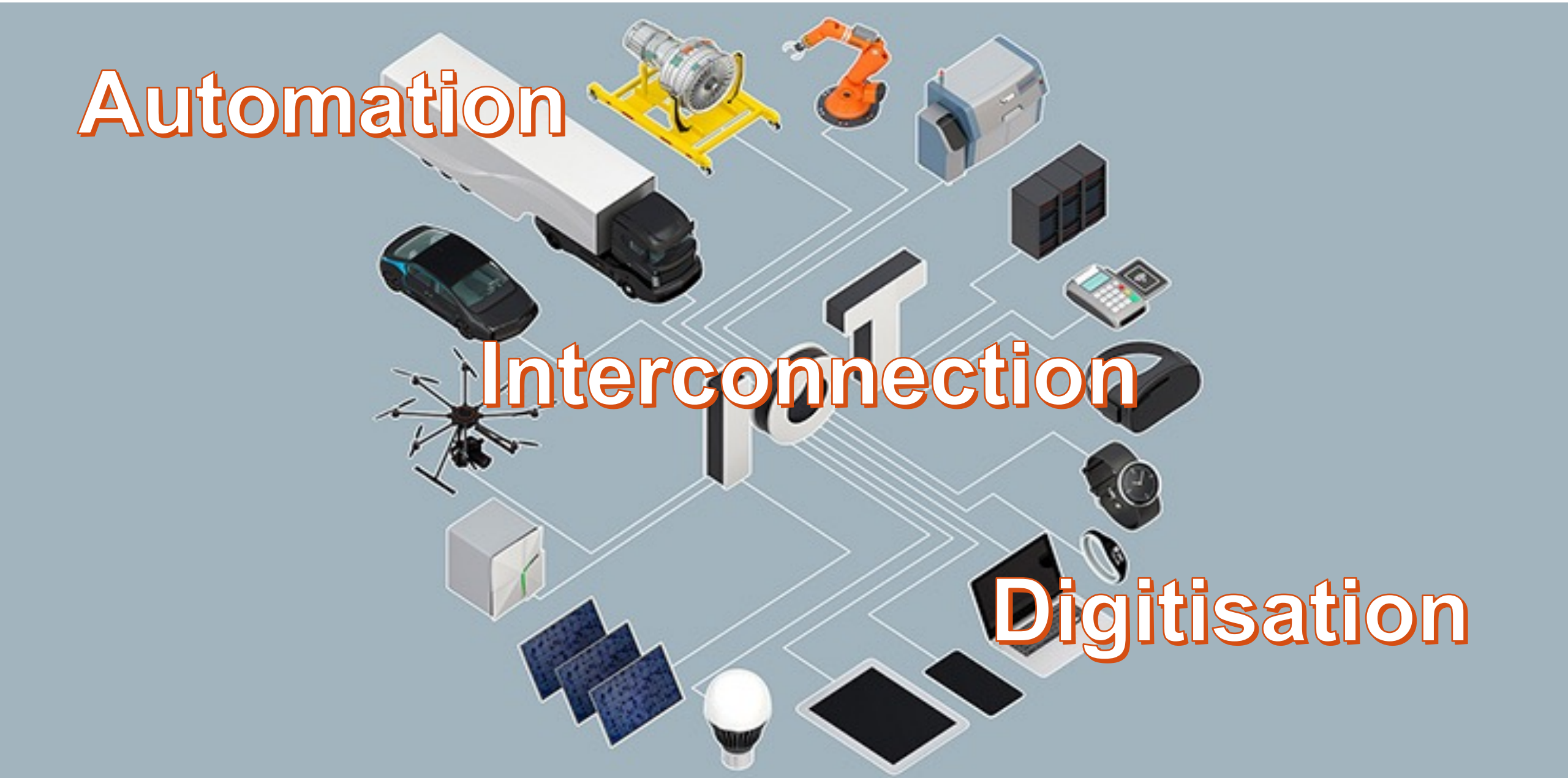
Dr. Jürg Meierhofer, ZHAW Zurich University of Applied Sciences

https://www.zhaw.ch/de/engineering/institute-zentren/idp/forschungsthemen/data-driven-service-engineering/

https://data-innovation.org/smart-services/

The Digitalization Paradox

The fourth Industrial „Revolution“

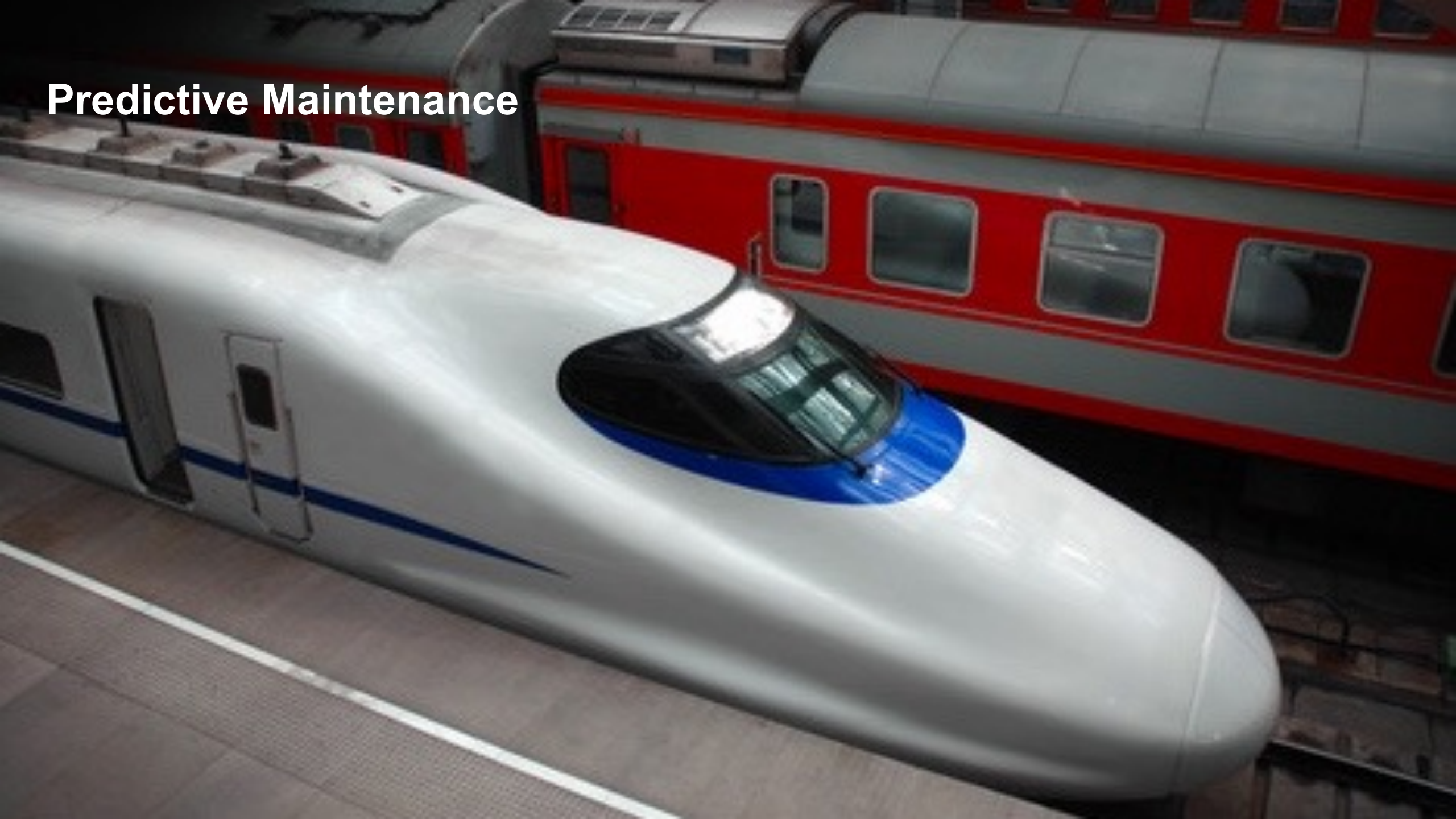


Servitization of Manufacturing Bsp. „power-by-the-hour“

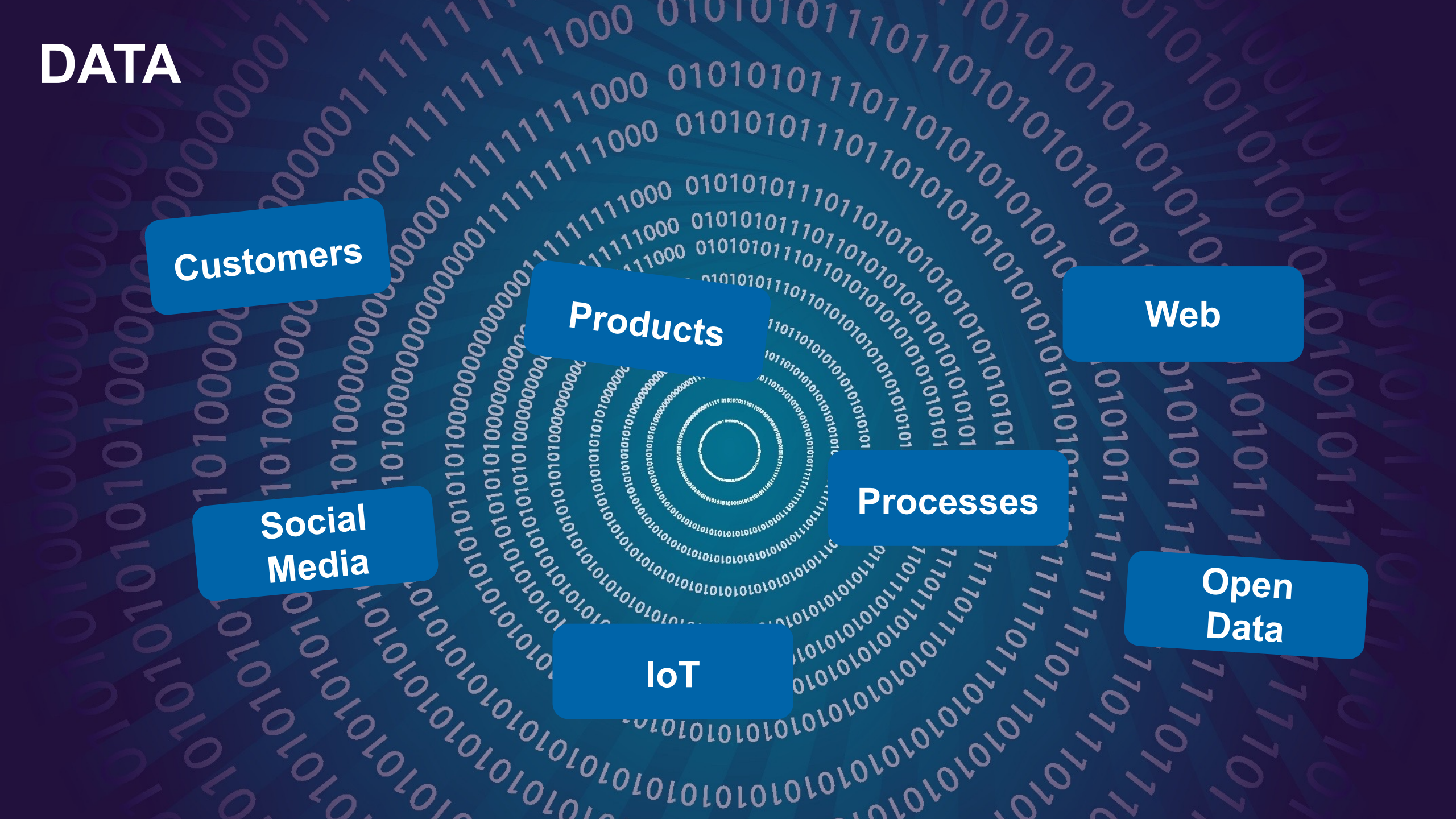
Servitization Business Models

Bsp. Flottenmanagement

Predictive Maintenance



DATA

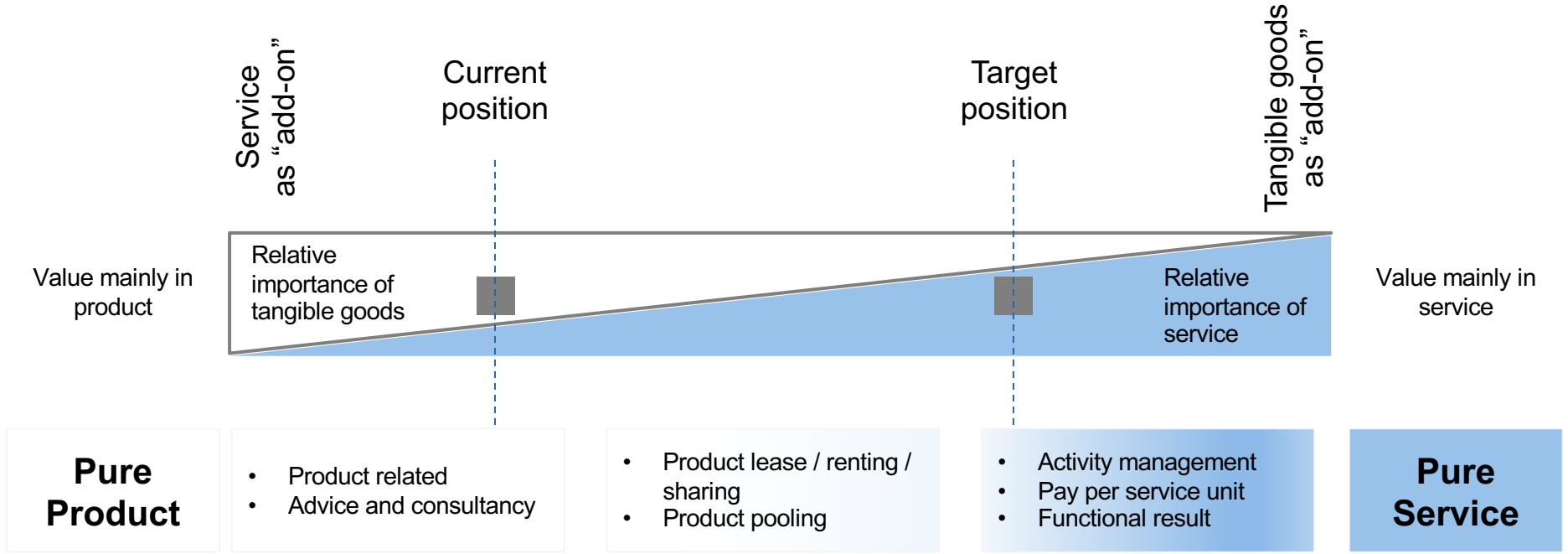

Customers
Products
Web
Social Media
Processes
Open Data
IoT

Considering the industry as a service provider?

Product or Service?

Source: Mobility Genossenschaft

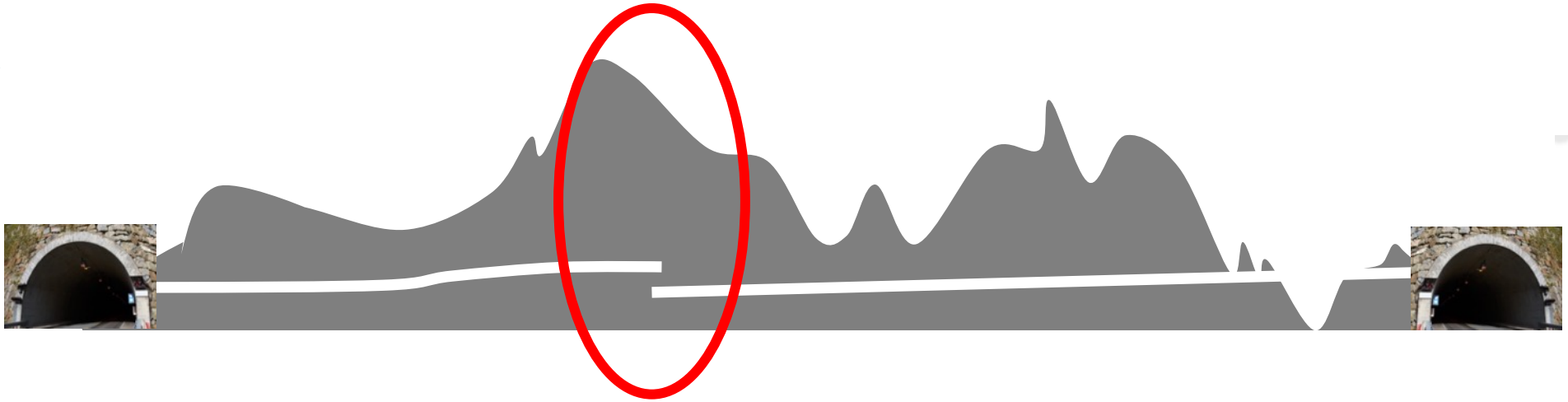
Managing the transition



Adapted from: Rogelio Oliva Robert Kallenberg, (2003),"Managing the transition from products to services", International Journal of Service Industry Management, Vol. 14 Iss 2 pp. 160 - 172.
and
Tukker A., eight types of product– service system: eight ways to sustainability? Business Strategy and the Environment, Bus. Strat. Env. 13, 246–260 (2004)

Where Technology meets Business

Technology

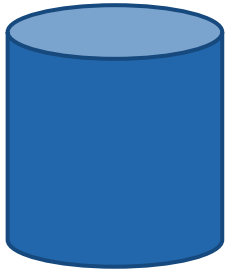


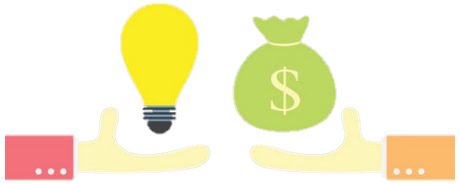
Customer

Push

Pull

Needs-Driven Approach



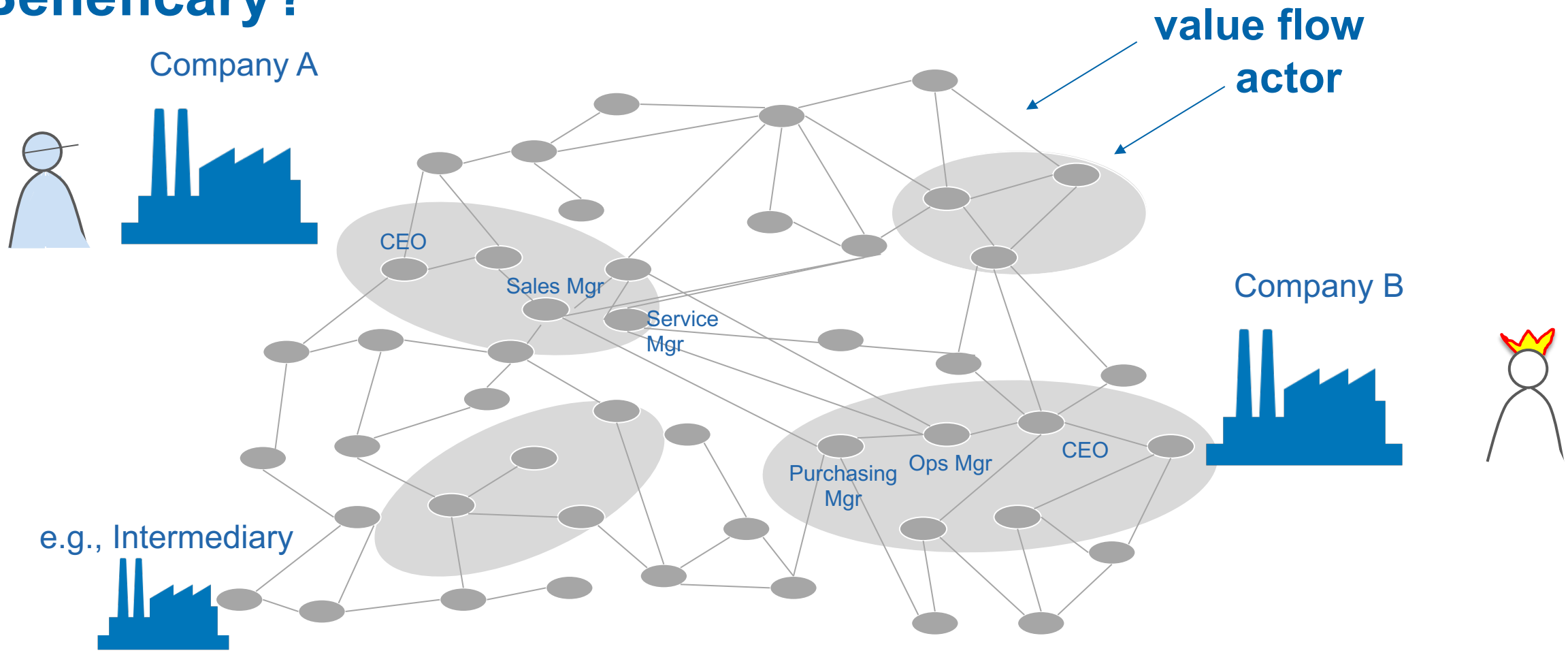


Data → Insight

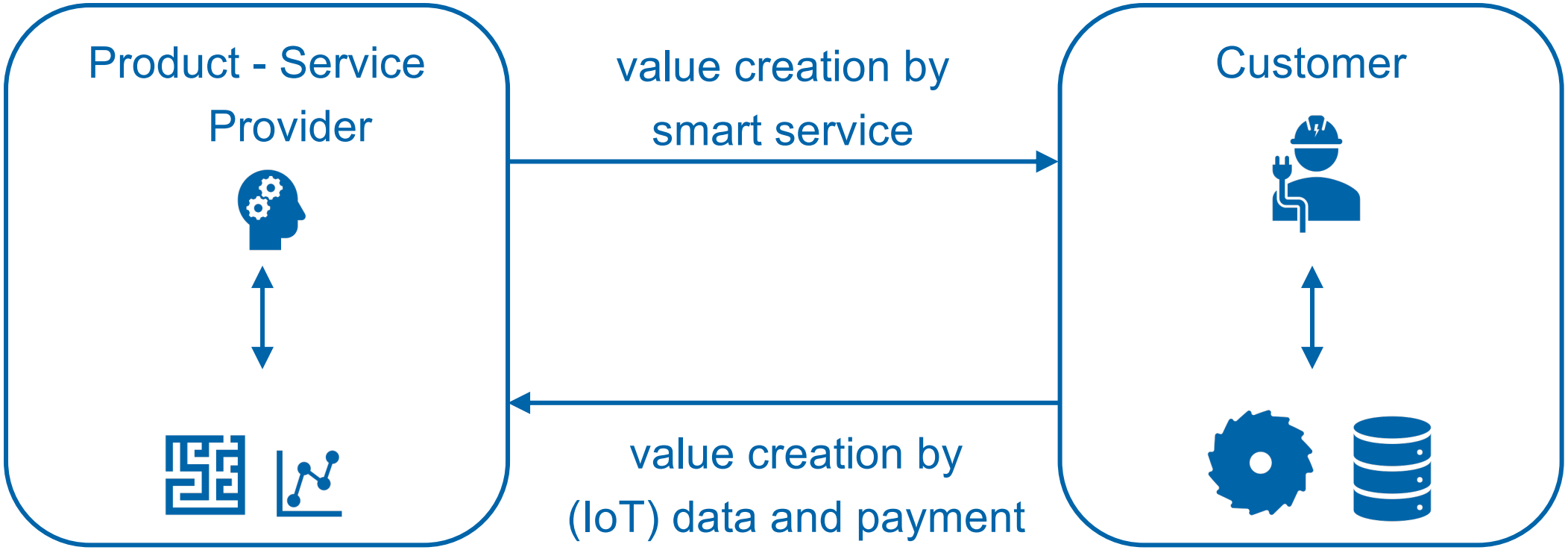
„... to provide benefits to others.“

Pull

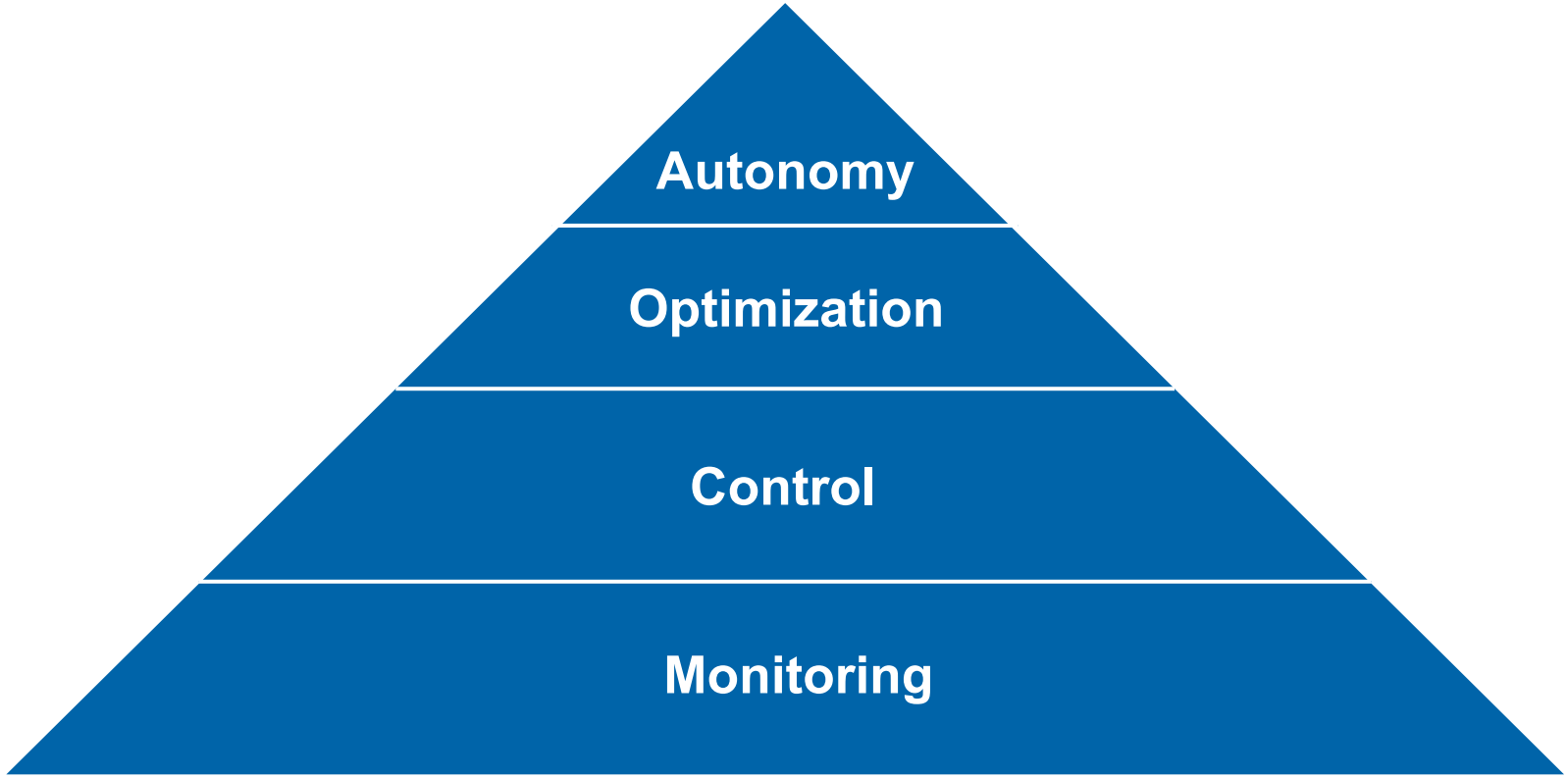
Understand: Who is the Customer, the Beneficary?



Value Creation with Smart, Connected Products



Hierarchy of Value Creation



Based on: Michael E. Porter and James E. Heppelmann: "How Smart, Connected Products Are Transforming Competition", November 2014, Harvard Business Review

From Input- to Output-Oriented Services

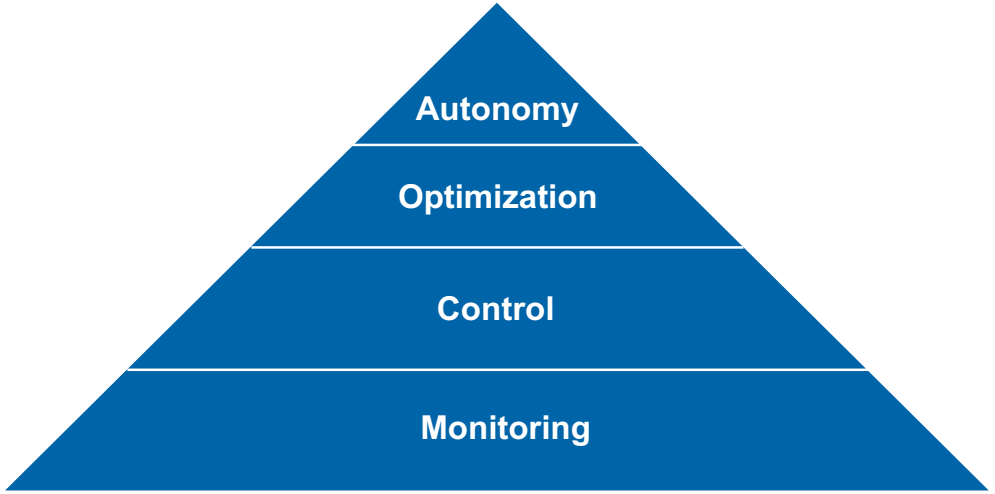
output

New Service-Models

input

Traditional Service-Models

Consulting, customization, condition monitoring, predictive maintenance, performance optimization



Bring into service, maintenance, repair, spare parts

simplified from: Kowalkowski, C., & Ulaga, W. (2017). Service strategy in action: A practical guide for growing your B2B service and solution business. Service Strategy Press.

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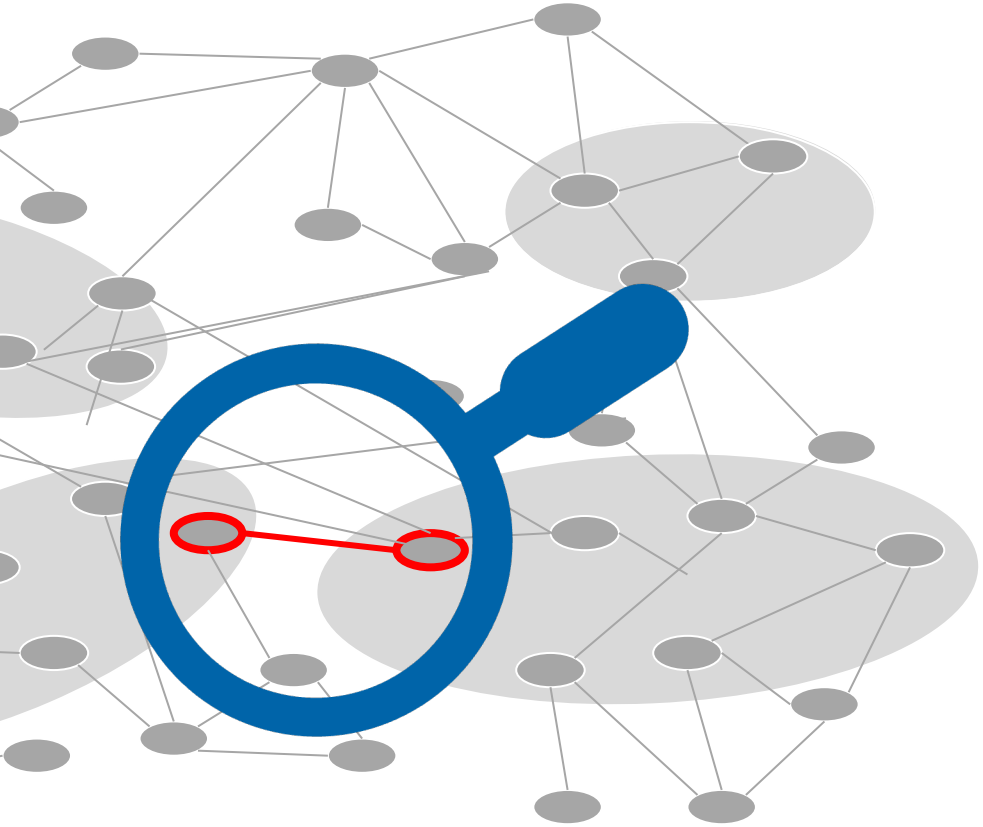
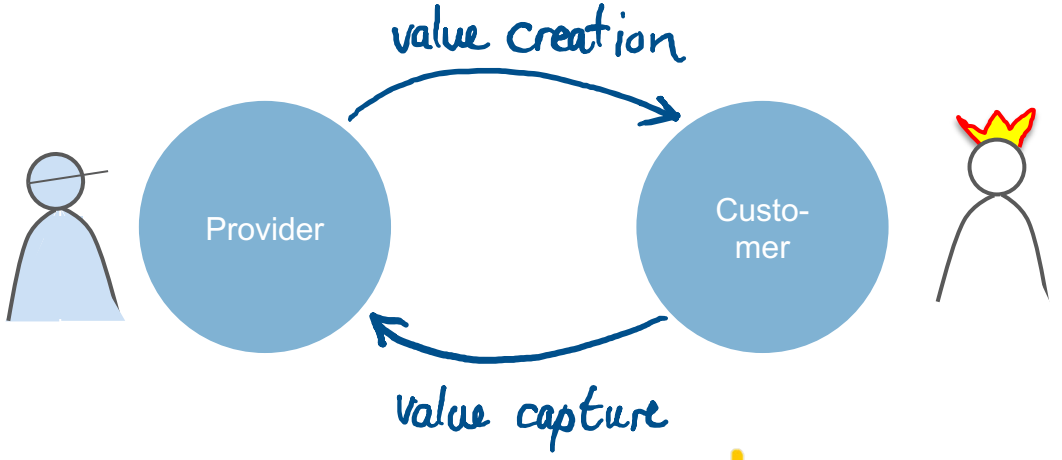
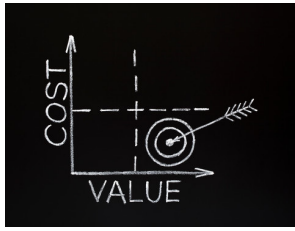
Quantitative Model for Value Creation and Capture in Service Interactions



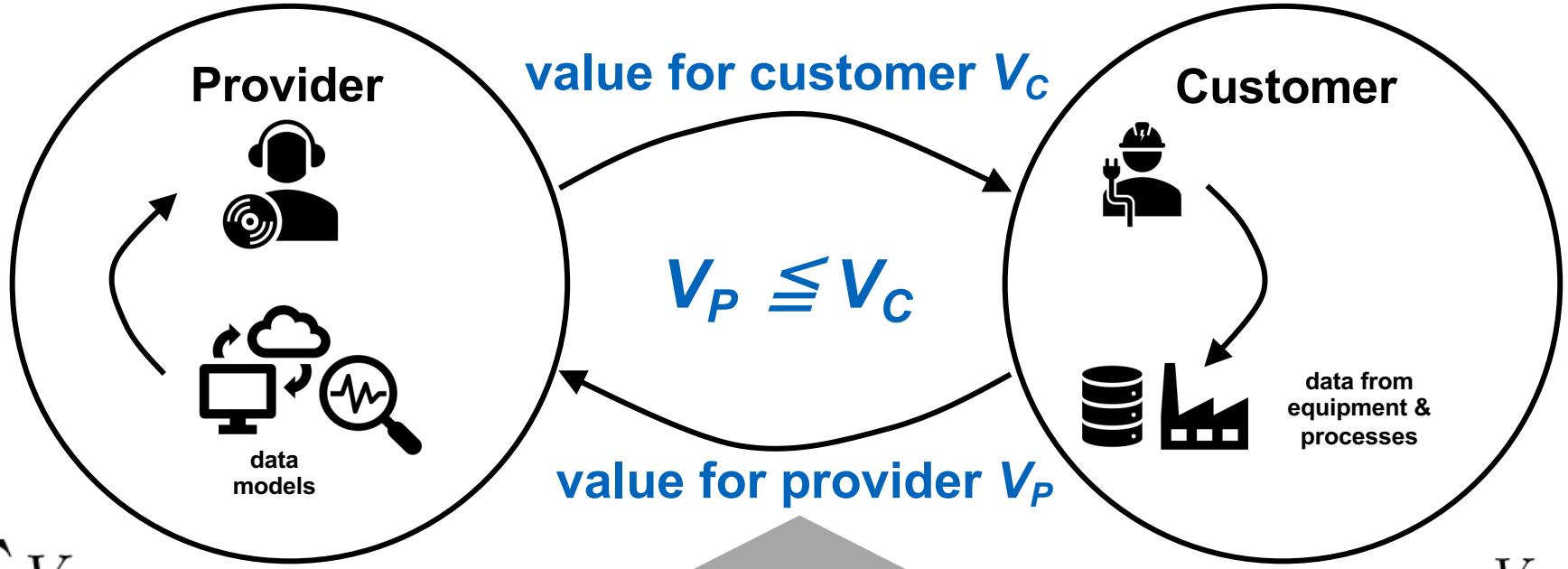




What do customers need?

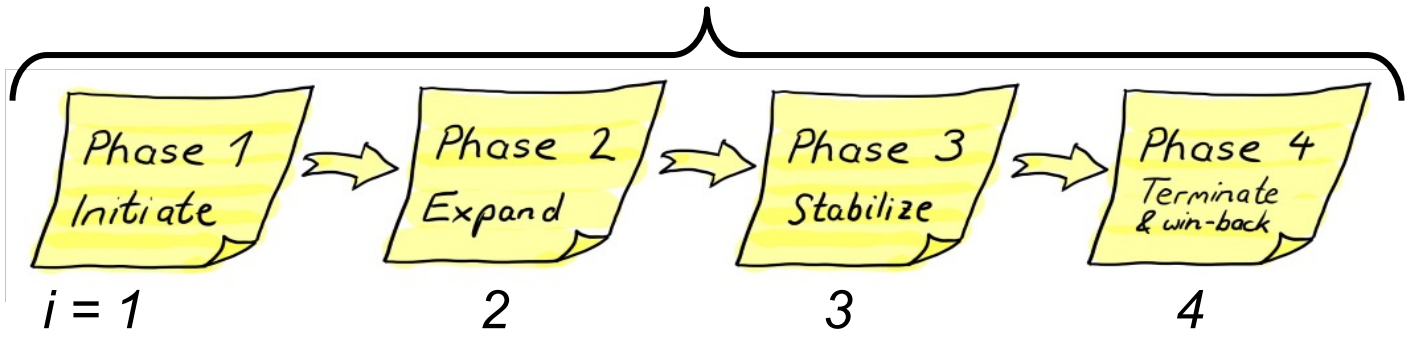
based on Osterwalder et al., 2014

Value Exchange Model



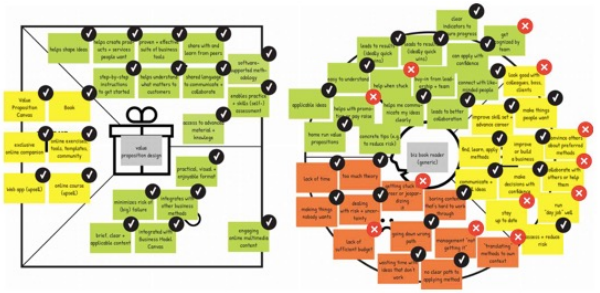
$$V_P = \sum_{i=1}^{4} V_{P,i}$$

$$V_C = \frac{1}{CLT} \sum_{i=1}^{4} V_{C,i}$$



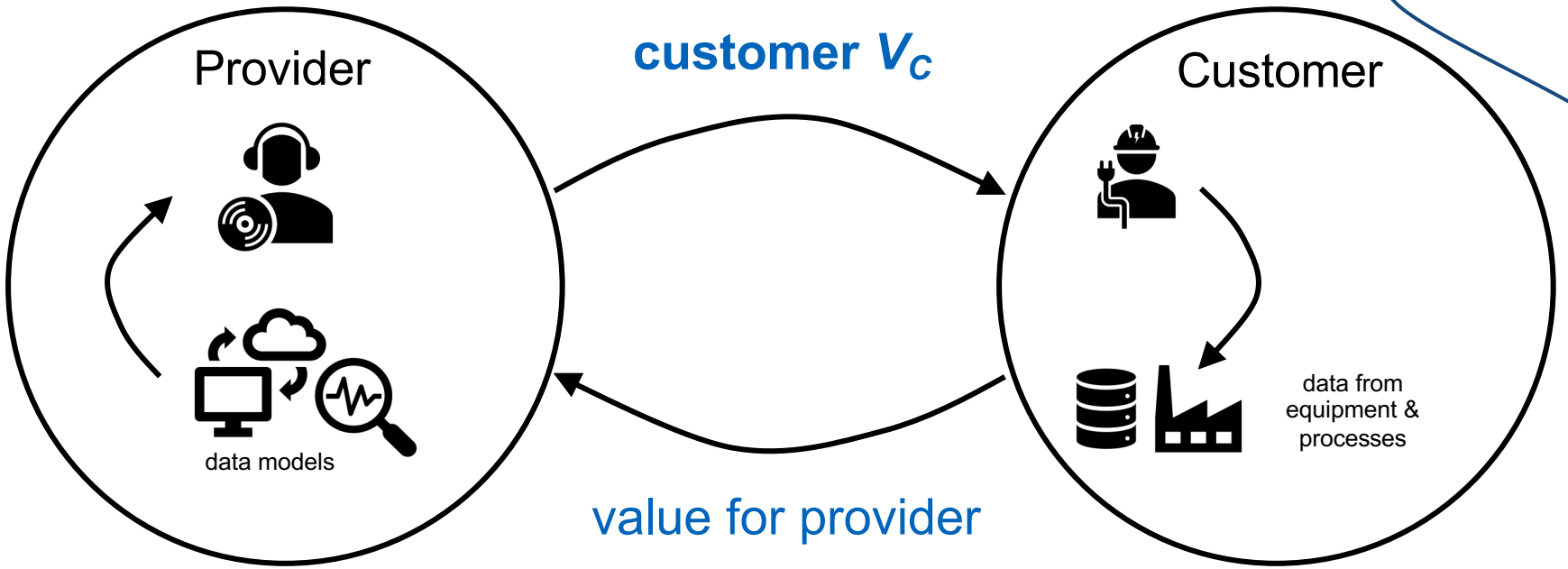
Value Creation Model – The Value of Solving Pains

Note: the pain and its value can be economic or ecological



service value for customer V_C

$V_{C,i}$ = frequency x impact of pain



value for provider V_P

$$V_C = \sum V_{C,i}$$

based on: Meierhofer, J., Benedech, R., & Heitz, C. (2022, forthcoming). On the Value of Data: Multi-Objective Maximization of Value Creation in Data-Driven Industrial Services. *2022 9th Swiss Conference on Data Science (SDS), IEEE Xplore.*

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Results

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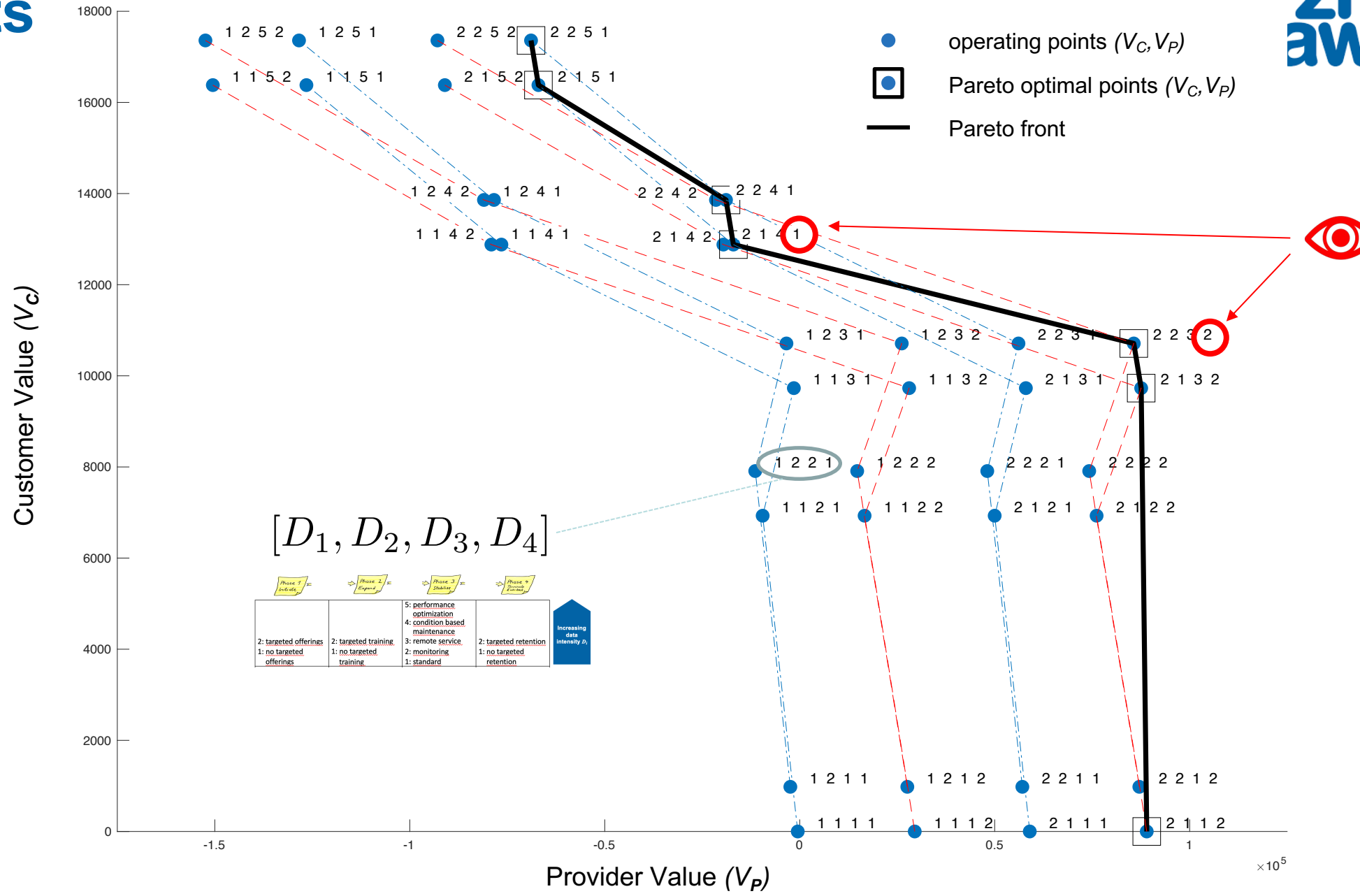

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On the Value of Data: Multi-Objective Maximization of Value Creation in Data-Driven Industrial Services

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***Abstract*—Data-driven value creation is a key topic in industrial services. However, designing such services in an optimal way represents a multidimensional and complex task. In this paper, we present a design methodology based on a simultaneous maximization of value creation for both the provider and the customer, allowing the identification of optimal service configurations. We**

advanced services [3], [4] that enable getting an output
the equipment that is better targeted at the
pains, and gains [5]. Additio
data for improvi
inno

Service Customization: Optimizing Value Creation and Capture by Designing the Customer Journey

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***Abstract*—Service customization is a central issue in socio-technical service ecosystems, enabled and fueled by new data-driven approaches, and with the goal of increasing value creation for the customer, and value capture for the provider. In this paper, we address the question of how to design service customization within the provider-customer interaction. We propose a novel quantitative approach for modeling the relation between cus-**

particular, there is an evolution of the customer to demand
and pay for customized services. Therefore, the transition from
goods to services and the addition of services to products is
considered essential [6]. The omni
communications
dev

Sustainable Value Optimization by Smart Services along the Customer Lifecycle

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juerg.meierhofer@zhaw.ch, melissa.stucki@zhaw.ch,

Abstract. This paper investigates the creation of economic and ecolog-
ical value in manufacturing ecosystems. The focus is put on the B2B
machines and a customer ap-

OPTIMIZING SERVICE VALUE CREATION WITH SMART, CONNECTED PRODUCTS

Jürg Meierhofer, Christoph Heitz, Frank Hannich

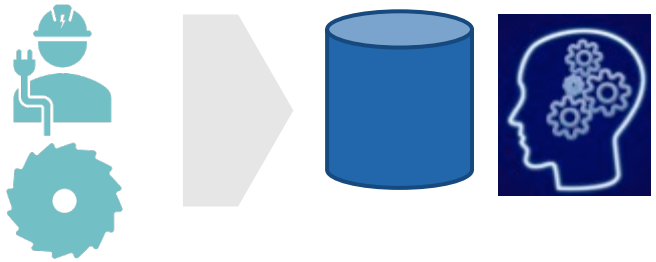
ABSTRACT

Purpose: This paper describes a novel quantitative model for the design of the service interactions in the life cycle of customers using smart connected products – typically in industrial environments, i.e., in Industry 4.0 context – with the goal of optimizing mutual service value creation for both the customer and the provider.

da

Value Creation Re-Visited

Physical Layer



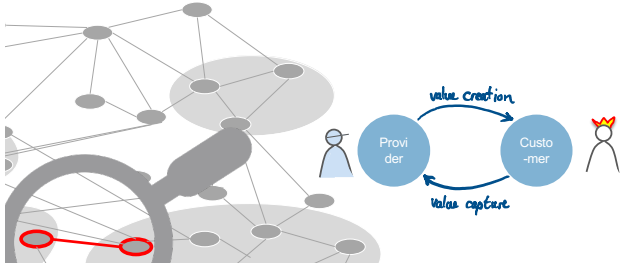
Factory
Ressources

Data
Algorithms

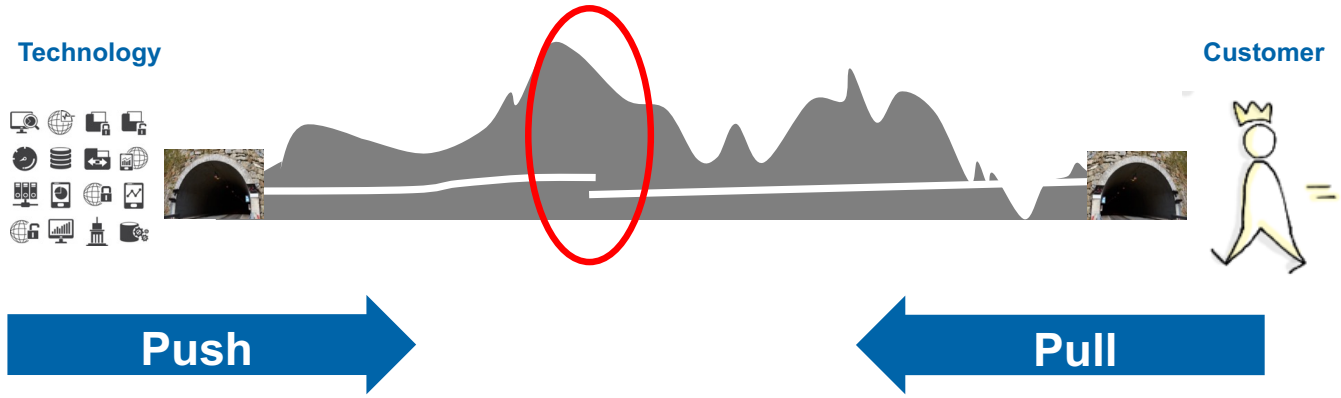
Requirements for service processes for value creation

Data and analytics requirements for value creation

Service-, Process- and Business Models for Value Creation



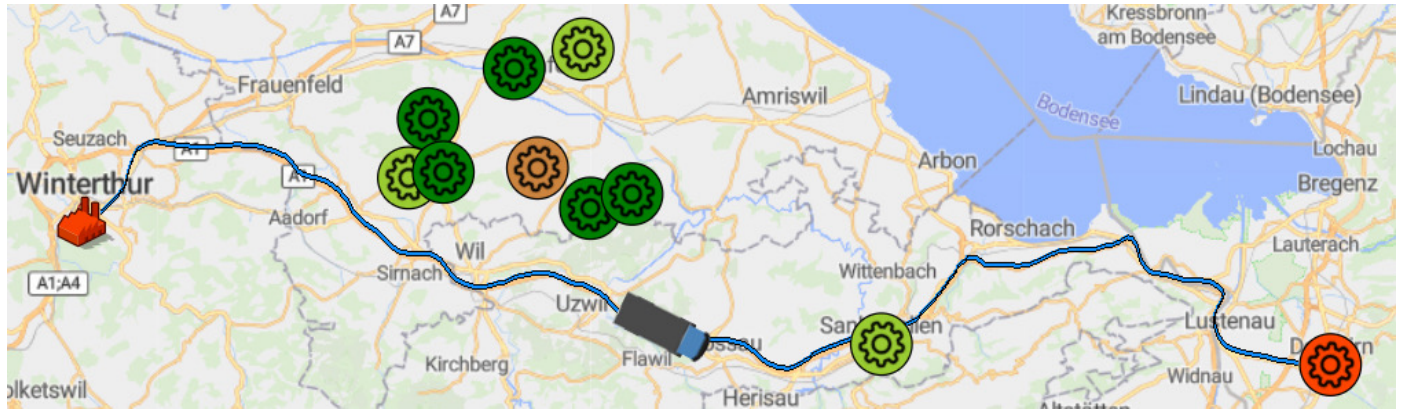
Services
Processes

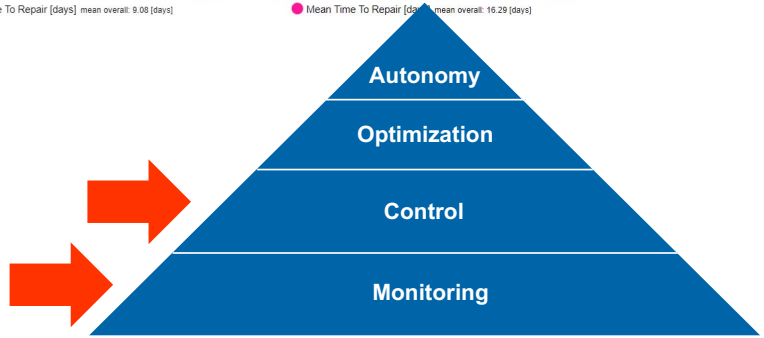


Methods

Ex. 1: Maintenance Supported by Data

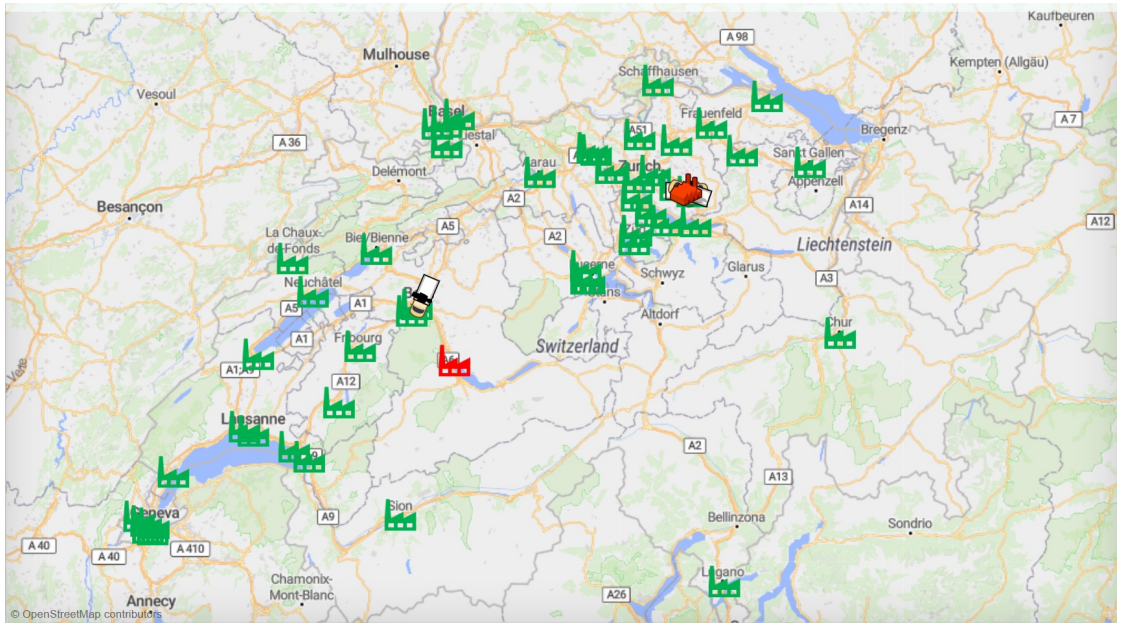
a service unit on the way to a faulty machine

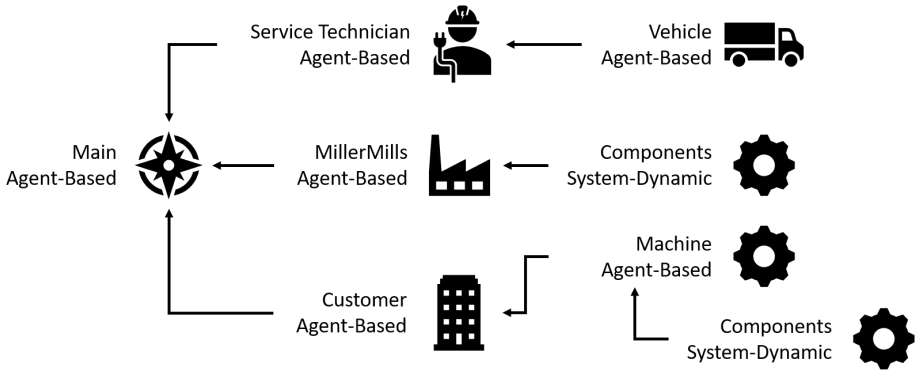


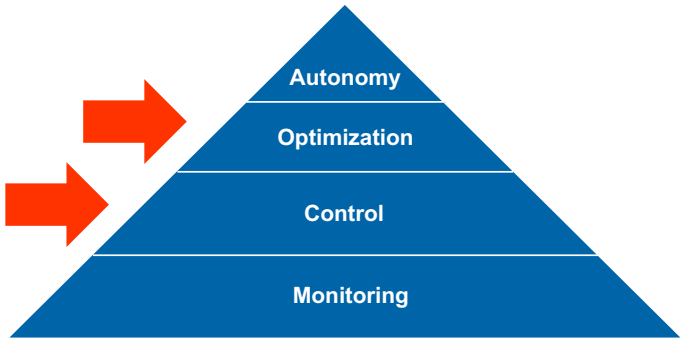


based on: Meierhofer, J., Benedech, R., Schweiger, L., Barbieri, C., & Rapaccini, M. (2022). Quantitative Modelling of the Value of Data for Manufacturing SMEs in Smart Service Provision. *ITM Web of Conferences, International Conference on Exploring Service Science (IESS 2.2)*, *41*, 04001. https://doi.org/10.1051/itmconf/20224104001

Ex. 2: Maintenance Capacity On Demand
Ex. 3: The Value of Remote Service

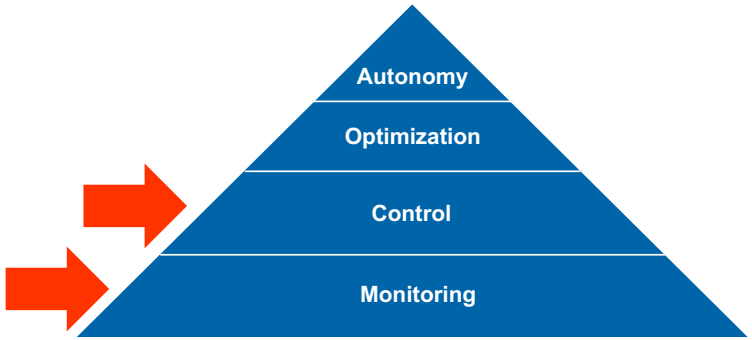




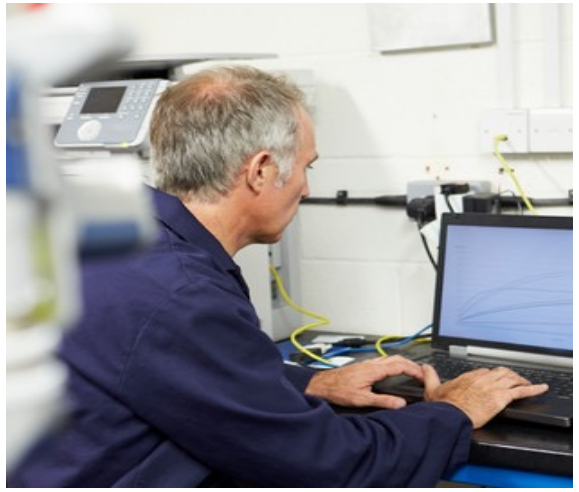


based on, e.g.: **Meierhofer, J., Züst, S., Lu, Jinzhi, Schweiger, Lukas, & Kiritsis, Dimitris. (2021). Enabling Decision Support Services in Industrial Ecosystems by Digital Twins. *Spring Servitization Conference - Driving Competition through Servitization, Aston University, Florence, May 2021*, 138–146.**

Ex. 4: Machine Handling Support for Operator



Ex. 5: Reactive and Predictive Alerts for Shop Floor Operator



„ My job is to make sure that our machines are always operational.“

John

John is 48 years old and wants to improve the service for his customers.

Jobs to be done:

- **Maintenance of the machines**
- **Replacement of defective components**
- **Understanding the machines**

Pains:

- **Unnecessary component replacements**
- **Have to take all possible spare parts with you**
- **Unplanned working time**

John's goals:

- **Identify if there are components more stable than others.**
- **Check to see if there is a failure on a machine within the next 24 hours.**
- **Know which parts need to be replaced within the next 24 hours, which machines.**

MillersMill - Dashboard

Select Machine ID

Maschinen-ID

1	14	27	40	53	65	77	89
2	15	28	41	54	66	78	90
3	16	29	42	55	67	79	91
4	17	30	43	56	68	80	92
5	18	31	44	57	69	81	93
6	19	32	45	58	70	82	94

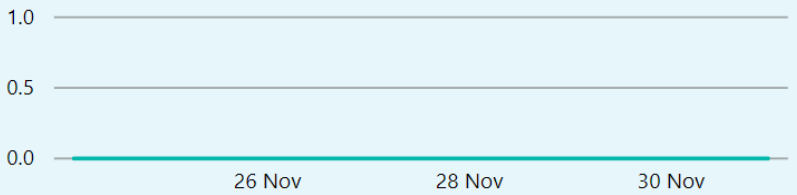
Filter für Datum:

Vorhergesagte Daten

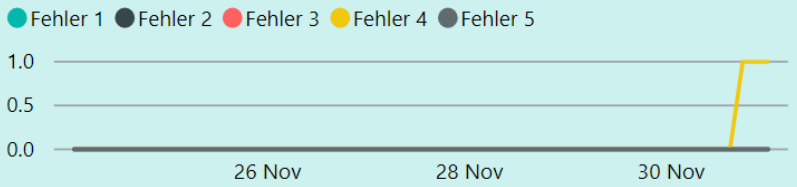
2015-09-29	2015-10-18	2015-11-06	2015-11-25	2015-12-14
2015-09-30	2015-10-19	2015-11-07	2015-11-26	2015-12-15
2015-10-01	2015-10-20	2015-11-08	2015-11-27	2015-12-16
2015-10-02	2015-10-21	2015-11-09	2015-11-28	2015-12-17
2015-10-03	2015-10-22	2015-11-10	2015-11-29	2015-12-18
2015-10-04	2015-10-23	2015-11-11	2015-11-30	2015-12-19

Ausfall- & Fehler-Verläufe über die letzten Tage:

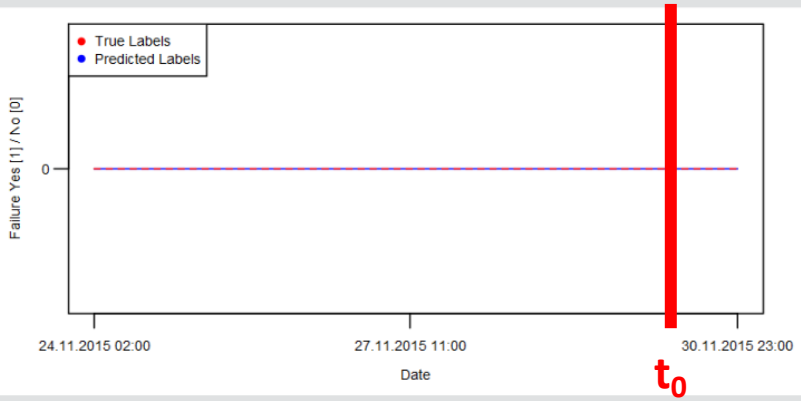
Eintreffen eines Ausfalls



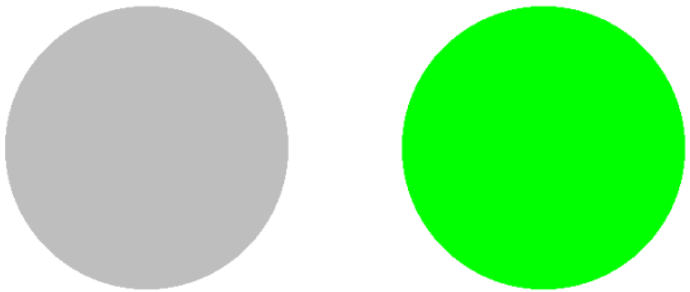
Eintreffen der Fehlertypen



Forecasted Break Downs



Forecast breakdown today [red=yes / green = no]

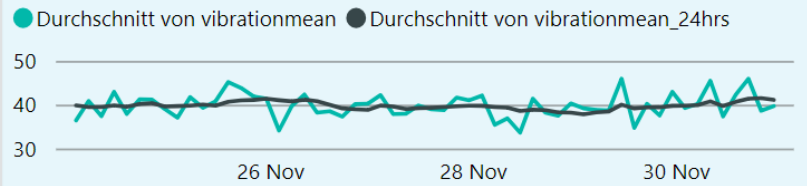


Infos der gewählten Maschine:

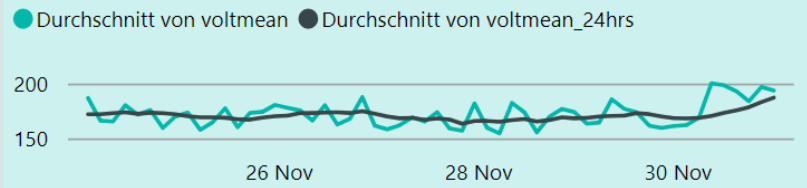
Maschinen-ID	Alter	Standort	Modell
55	17	Baar	model3

KPIs previous days

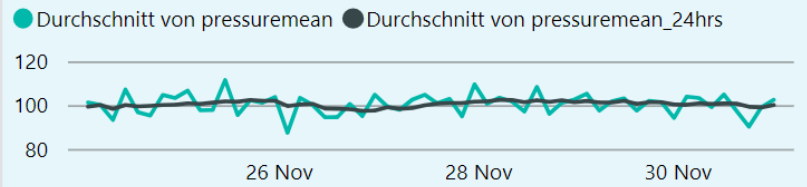
Verlauf Mittelwert Vibration



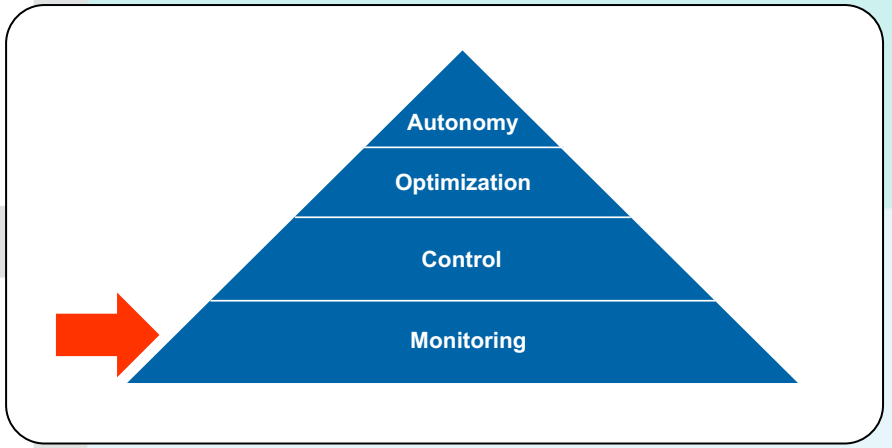
Verlauf Mittelwert elektrische Spannung



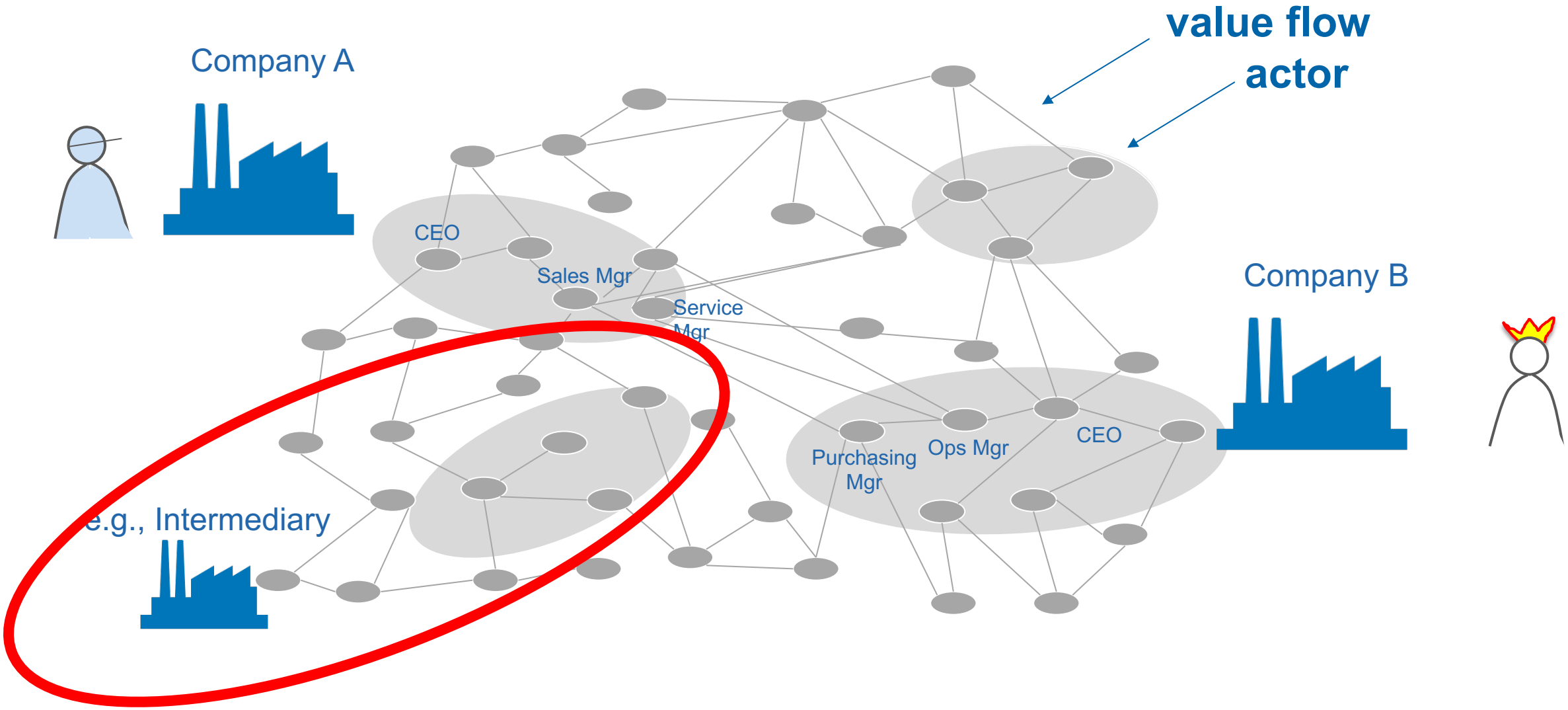
Verlauf Mittelwert Druck



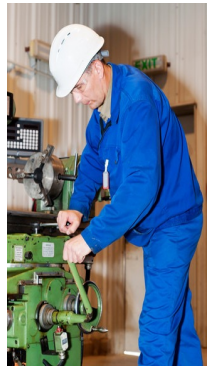
Verlauf Mittelwert Rotation

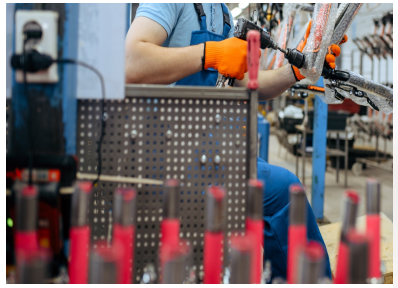


Ex. 6: Involve the Intermediary!!!

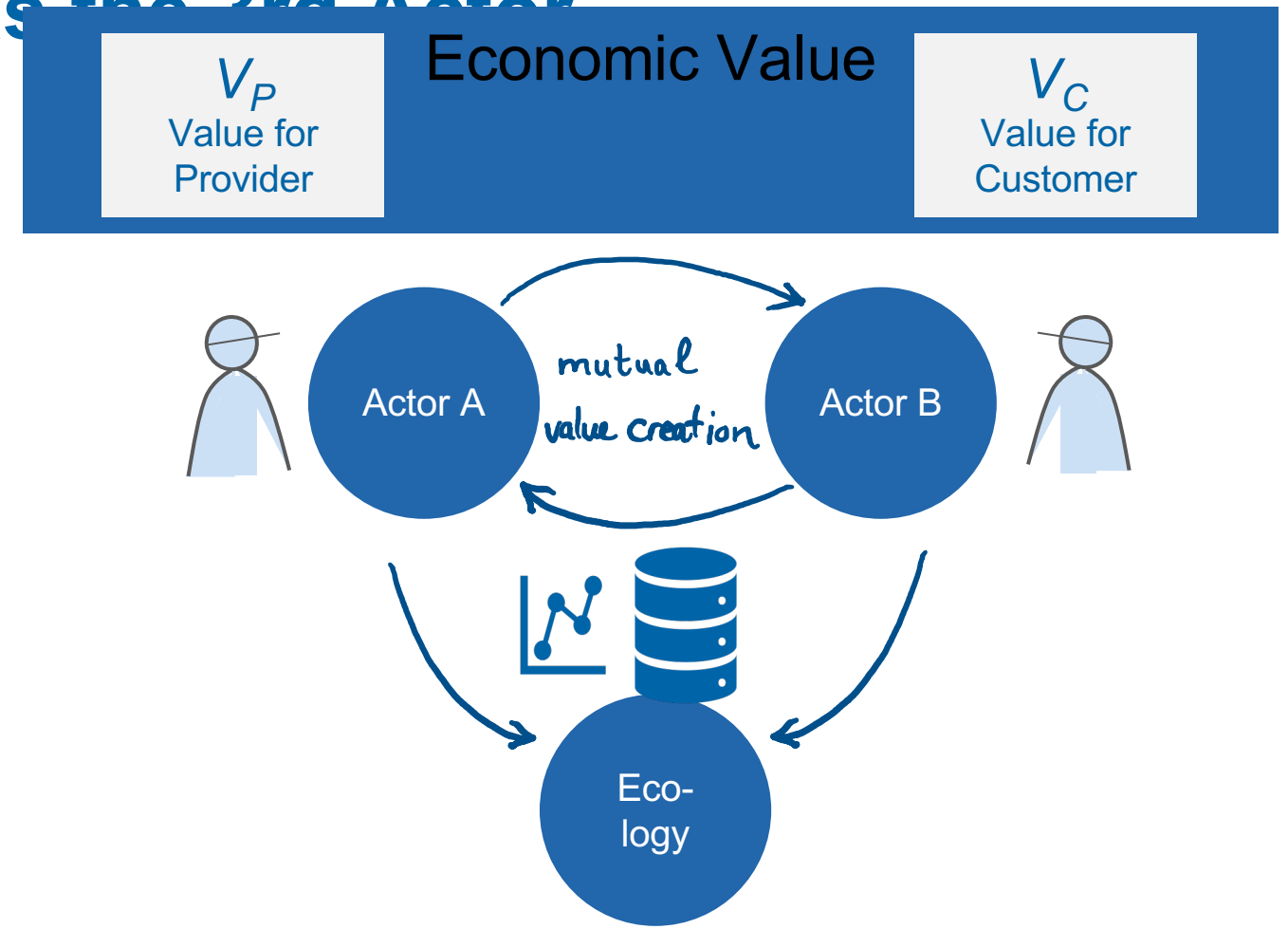


Motivation: How to Assess Economic and Ecological Value Quantitatively?





Ecology as the 3rd Actor



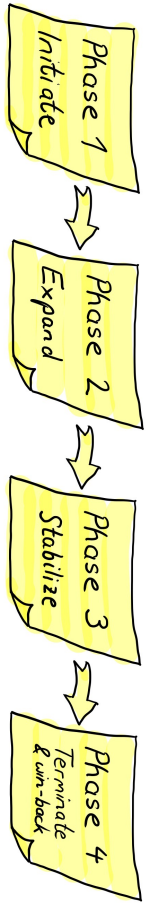
- Customer loyalty (-> CLTV)
- Customer insights
- Stable cash flows
- Higher margins
- …

- Customized value
- Better output performance
- Lower risks
- …

- reduced emission
- reduced material consumption
- more output per material

Bartels, R., & Jenkins, R. L. (1977). Macromarketing. *Journal of Marketing*, *41*(4), 17–20. https://doi.org/10.1177/002224297704100401

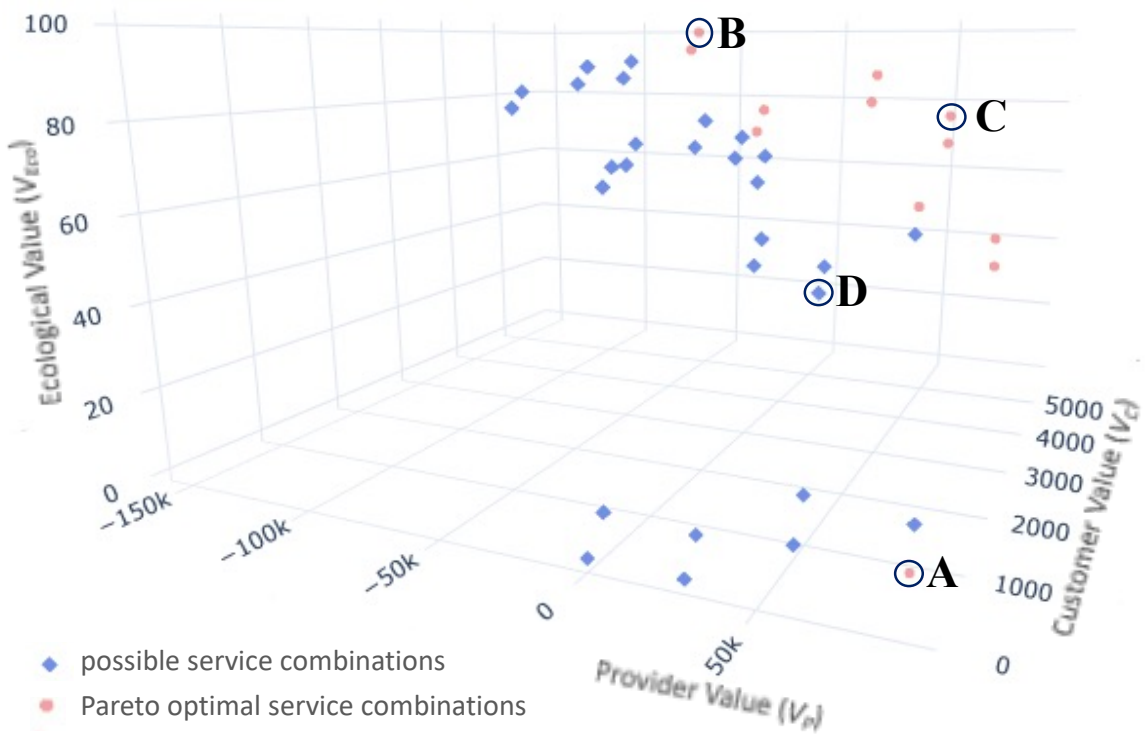
Economic and Ecological Benefits per Lifecycle Phase

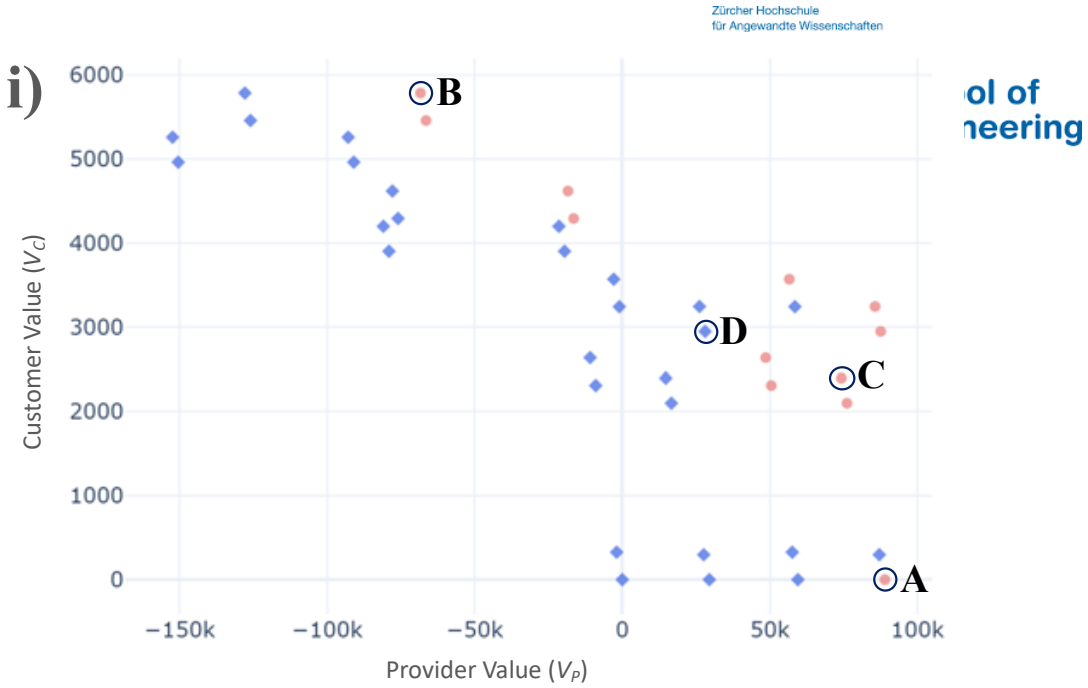


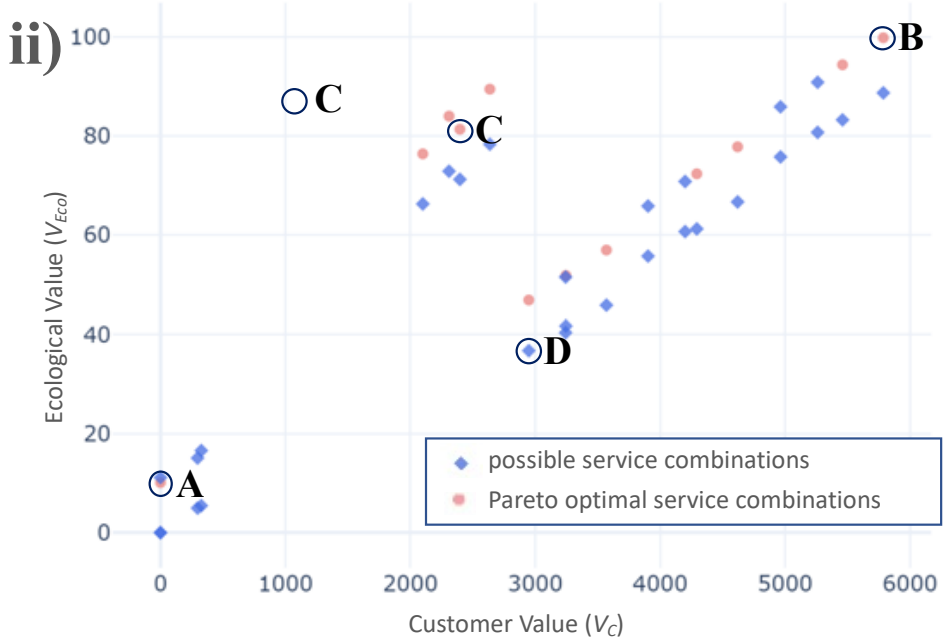
Phase	Economic benefits	Ecological benefits
Initiate	Make targeted offers with prior knowledge (from data) about customer needs and thus increase sales opportunities and lower acquisition costs.	Avoid unnecessary travel and other logistics costs through more targeted customer acquisition.
Expand	Higher performance through targeted training for customers based on data, steeper learning curve.	Less material loss and scrap parts thanks to steeper learning curve.
Stabilize	Improvement of product performance for customers through smart services (e.g. condition-based or predictive maintenance, remote maintenance, remote monitoring)	Less material loss and scrap parts thanks to optimized maintenance. Less travel to customers and less logistics.
Terminate	Upgrading / lifetime extension / customer loyalty based on information (data) about user behavior.	increasing the lifespan of the material, 3 R-strategies (reduce, reuse, recycle)

based on: Meierhofer, J., & Stucki, M. (2022). Mit Smart Services zu mehr Nachhaltigkeit. *KunststoffXtra*, *2022*(11–12), 54–56. https://doi.org/10.21256/zhaw-26269

Combined Optimization







based on: Meierhofer, J., & Stucki, M. (2022). Sustainable Value Optimization by Smart Services along the Customer Lifecycle. *5th Smart Services Summit - Smart Services Creating Sustainability*. 5th Smart Services Summit, Zürich.

Sustainable Value Optimization by Smart Services along the Customer Lifecycle

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Abstract. This paper investigates the creation of economic and ecological value in manufacturing ecosystems. The focus is put on the B2B relationship during a lifecycle between a provider of production machines and a customer applying this machine in its own production processes. Smart services for manufacturing environments have been proven to create economic value for the actors in an ecosystem and there are several quantitative approaches to assess this value. Additionally, smart services have the potential to create ecological value by manifold levers such as, for example, higher equipment efficiency, extended lifetime, or more efficient maintenance processes. This paper extends the existing quantitative models for economic value creation by incorporating a quantitative model for ecological benefits and costs.

Keywords: smart services, customer lifecycle, value creation, sustainability

1 Introduction

For manufacturers, the service business has t
revenue and higher customer loyalty b
by more stable cash flows (Ebeli
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International

HEFTTHEMA VERANTWORTUNG ÜBERNEHMEN – SERVICES NACHHALTIG ENTWICKELN

Ökologischer & wirtschaftlicher Nutzen mit industriellen Smart Services

Smart Services verhelfen industriellen Unternehmen zu mehr wirtschaftlichem Wert für Ihre Kunden, Partner und sich selbst. Darüber hinaus können diese Services aber auch ökologischen Nutzen schaffen, z.B. durch optimierten Betrieb oder effizientere Wartung von Produkten. Eine Voraussetzung dafür ist jedoch, dass bei der Gestaltung der industriellen Services die ökonomischen und ökologischen Ziele gemeinsam und systematisch verfolgt werden.

Wie Smart Services den Unternehmen zu mehr Nachhaltigkeit verhelfen können

Smart Services schaffen nachweislich einen wirtschaftlichen Wert für die Anbieter und K

höhere Kundenbindung. Die vertieften Einsichten in die Kundenbedürfnisse erlauben zudem eine effektivere Innovation. Die Kunden erhalten einen zusätzlichen Nutzen durch verbesserten Output

Energie zu einem Kostenfaktor, den sie aus Eigeninteresse minimieren möchten. Service- und Logistikkosten sowie Ineffizienzen (wie z.B. Störungen) von duziert, während erhöht und die agen verlängert gelten daher als eigneten Ansät-

DIGITALISIERUNG + swiss plastics /expo

KUNSTSTOFFXTRA

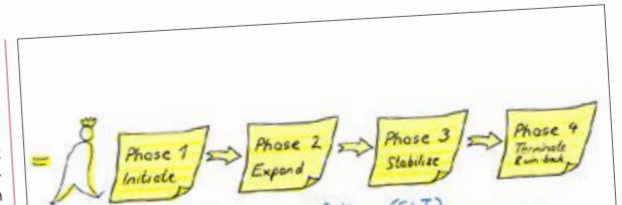
Ökonomische und ökologische Wertschöpfung

Mit Smart Services zu mehr Nachhaltigkeit

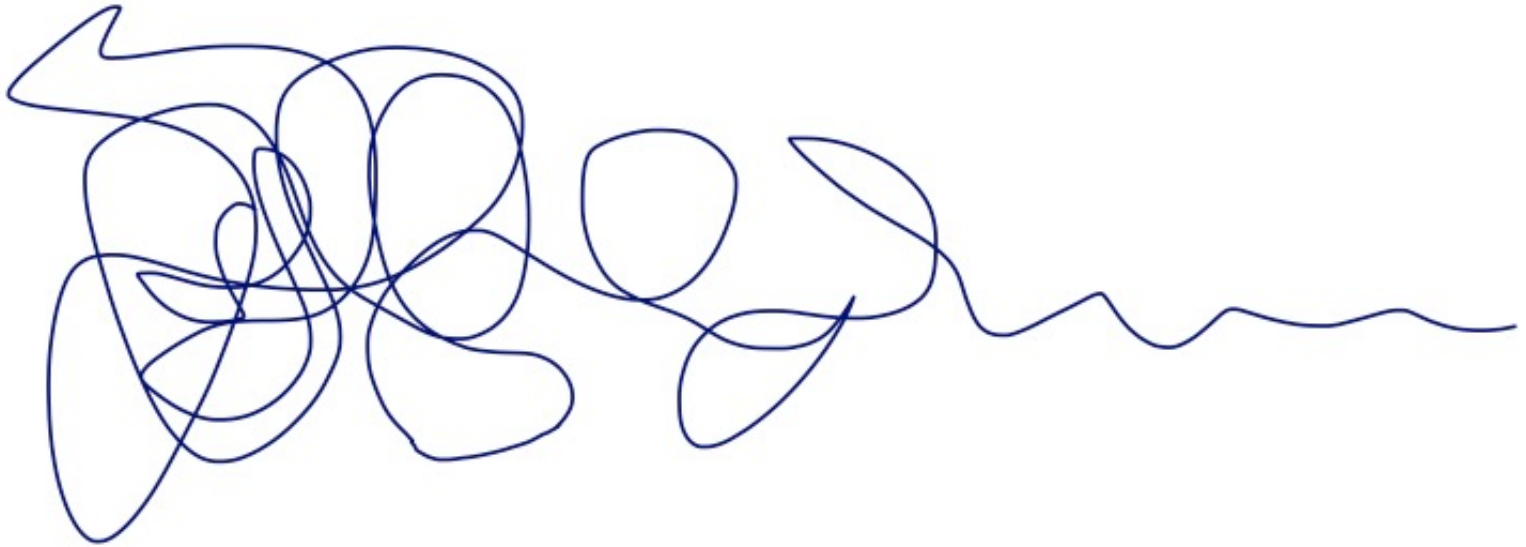
Mit datengetriebenen Services können industrielle Unternehmen messbaren Nutzen für ihre Kunden, Partner und sich selber schaffen. Gleichzeitig haben diese Services aber auch das Potenzial für ökologischen Nutzen, z.B. durch optimierte Prozesse in Betrieb oder Logistik. Damit dies ermöglich wird, müssen ökonomische und ökologische Ziele beim Design der Services gezielt und kombiniert erfasst werden.

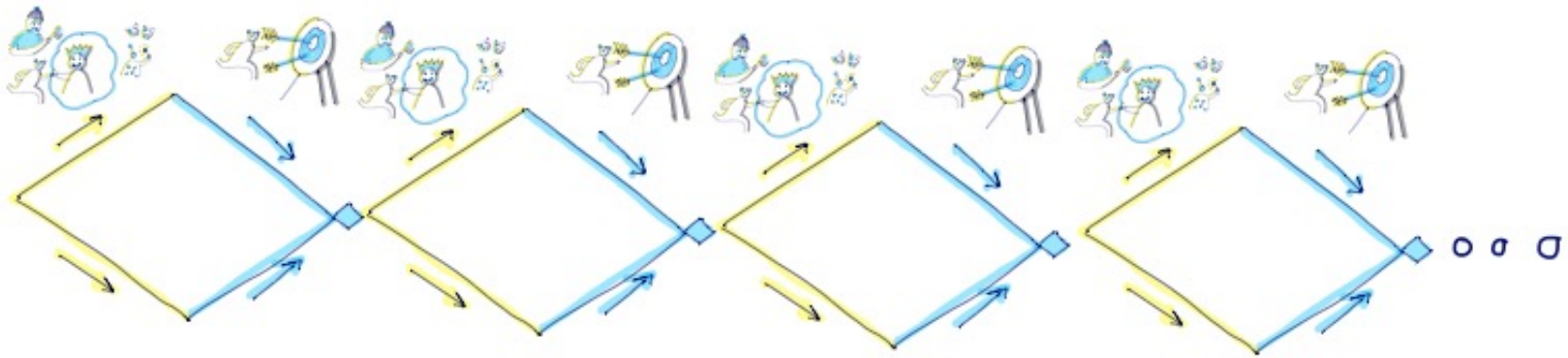
Jürg Meierhofer[1]
Melissa Stucki[2]

Intelligente Dienstleistungen (Smart Services) für Produktionsumgebungen schaffen nachweislich einen wirtschaftlichen Wert für die Akteure in einem industriellen Busi-



Iterative Approaches





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For **further information on smart service engineering (see alse below „Featured“)**