

Day2 Leaders Dialogue: Collaborative System of PSSs as a Social Infrastructure

Japan's perspective: Trends and the Significance of Manufacturing in the Next Industrial Structure

2022.Oct.12

Robot Revolution and Industrial IoT Initiative
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- 1. What's happening in Japan**
- 2. Significance of “manufacturing technology” in next-generation industrial structure**

What's happening in Japan

- 1. Data Society Alliance (DSA) & DATA-EX**
- 2. Digital Architecture Design Center (DADC)**

Connected Industries

Manufacturing & Robotics



Robot Revolution & Industrial IoT Initiative

International Standardization

Industrial Security

Business Ecosystem

Architecture Design for Manufacturing

Data Ecosystem for Manufacturing

SME Supporters Networking

with other field



Automated Driving and Mobility Service



Plant / Infrastructure Safety Management



Biotechnologies and Materials



Smart Life



Digital Architecture Design Center



DATA-EX
Data Society Alliance

Architecture Design for Manufacturing
Digital Architecture Design Center

Data Ecosystem for Manufacturing

Connected Industries Open Framework
Industrial Value Chain Initiative

Society 5.0

Human-centered society proposed by Japan

1. Data Society Alliance (DSA)

With the support of the "Data Strategy" and the "Cabinet Office Strategic Innovation Promotion Program (SIP)" to be promoted by the Digital Agency, this council will promote **fairness across fields through industry-government-academia collaboration.**

We will promote **the following businesses with the aim of realizing a prosperous society** (called a "data society") **through free data circulation and utilization**, and contributing in cooperation not only with Japan but also with the world.

- **Provision of collaboration service (DATA-EX) that realizes the data society**
- **activities necessary for the sound growth of the data society**



DATA-EX is a general term (brand name) **for the efforts** made by DSA **to realize data linkage across fields**. DSA will provide "DATA-EX", a platform that aims at federation-type interdisciplinary data collaboration that harmonizes existing efforts related to data collaboration.

Efforts related to area data linkage platform

Based on the results of the survey, the Digital Agency defined **the open source software as "core components"** (hereinafter referred to as "recommended modules"), and provided technical information that contributes to the construction of the data linkage platform. It is our policy to reduce the burden on users and **promote the spread of data linkage platforms based on standardized specifications that enable interoperability**.



2. Digital Architecture Design Center

In order to drive Japan's economic growth and innovation at various industries, Digital Architecture Design Center (DADC)) was launched under the Information-technology Promotion Agency, Japan (IPA). Digital Architecture Design Center (DADC) **will orchestrate collaboration of multiple and diverse stakeholders through a wide range of activities to help improve Japan's architecting capability.**

To support Society5.0 — a super-smart society where big data, Internet of Things (IoT), artificial intelligence (AI), cloud and robots are fused into every industry and across all social segments for our quality of life and social well-being — Digital Architecture Design Center (DADC) will explore optimal architecting as follows.

- Design critical architecture designated by the Japanese Government
- Nurture architecting talents through a wide range of hands-on learning opportunities
- Conduct research and analysis for optimal architecture designing capabilities

Significance of “manufacturing technology” in next-generation industrial structure

Servitization in the future (hypothesis#1)

Society aaS

Society5.0, Planetary Boundary, SDGs, ...



New industrial structure

City aaS

Health aaS

Energy aaS

Food aaS

Mobility aaS

Agriculture aaS

...



Manufacturers to provide information and services

製造 aaS: Collaborative System of PSSs as a Social Infrastructure

Needs of modern society (Hypothesis#2)

Triple Bottom Line
Balance between economy,
society and environment



Planetary Boundary
Dealing with absolute
constraints

Diversification of issues

Matured society: Individual
QoL improvement
Emerging society: Economic
independence

Unstable International
Political Situation
Natural Disasters and
Pandemics



Major impact on globalized
economy



Problems are intertwined and **it is no longer possible to deal with them with conventional local responses.**

Example: Acatech circular economy roadmap
50 per cent reduction in natural resource consumption for 2050 compared with 2018,
... allowing economic growth to be absolutely decoupled from resource consumption.



Necessity of Structural Innovation Including Paradigm Shift
(Society 5.0, DX, Fourth Industrial Revolution)

Challenges in Innovation (Hypothesis#3)

Advances in science and technology bring about social change (**industrial revolution**) through technology.

Advanced science and technology

IT, digitalization, IoT, and CPS/Digital Twin as possible solutions.

Confusion on how to use them
The innovation dilemma

The “**System of Systems**” transition to connect with data and information will begin

Unexpected emergence occurs

Necessity of Structural Innovation Including Paradigm Shift
(Society 5.0, DX, Fourth Industrial Revolution)



Response to diversification and acceleration of innovation



Need to deal with innovation dilemmas, unexpected emergence, etc.

Toward a solution, from the viewpoint of manufacturing (Hypothesis#4)

Hypothesis#2
We need **a system**

as **structural** innovation to
solve social issues

Hypothesis#3
We need **a system**

that can respond to the
diversification, acceleration,
and unexpected emergence
of innovation

Viewpoints

Manufacturing technology
related to all fields
(Hypothesis#1)

Corresponding to digitalization, **common systemization of manufacturing technology is needed**
Manufacturing technology created artifacts* and their social implementation information
(including tacit knowledge and data)

The above problem-solving system requires **a service platform (infrastructure)** that
conceptualizes, systemizes, models, standardizes, digitizes, and mutually utilizes this information.

***Artifacts:** things that do not exist in nature (machines, buildings, information systems, social systems, etc.)



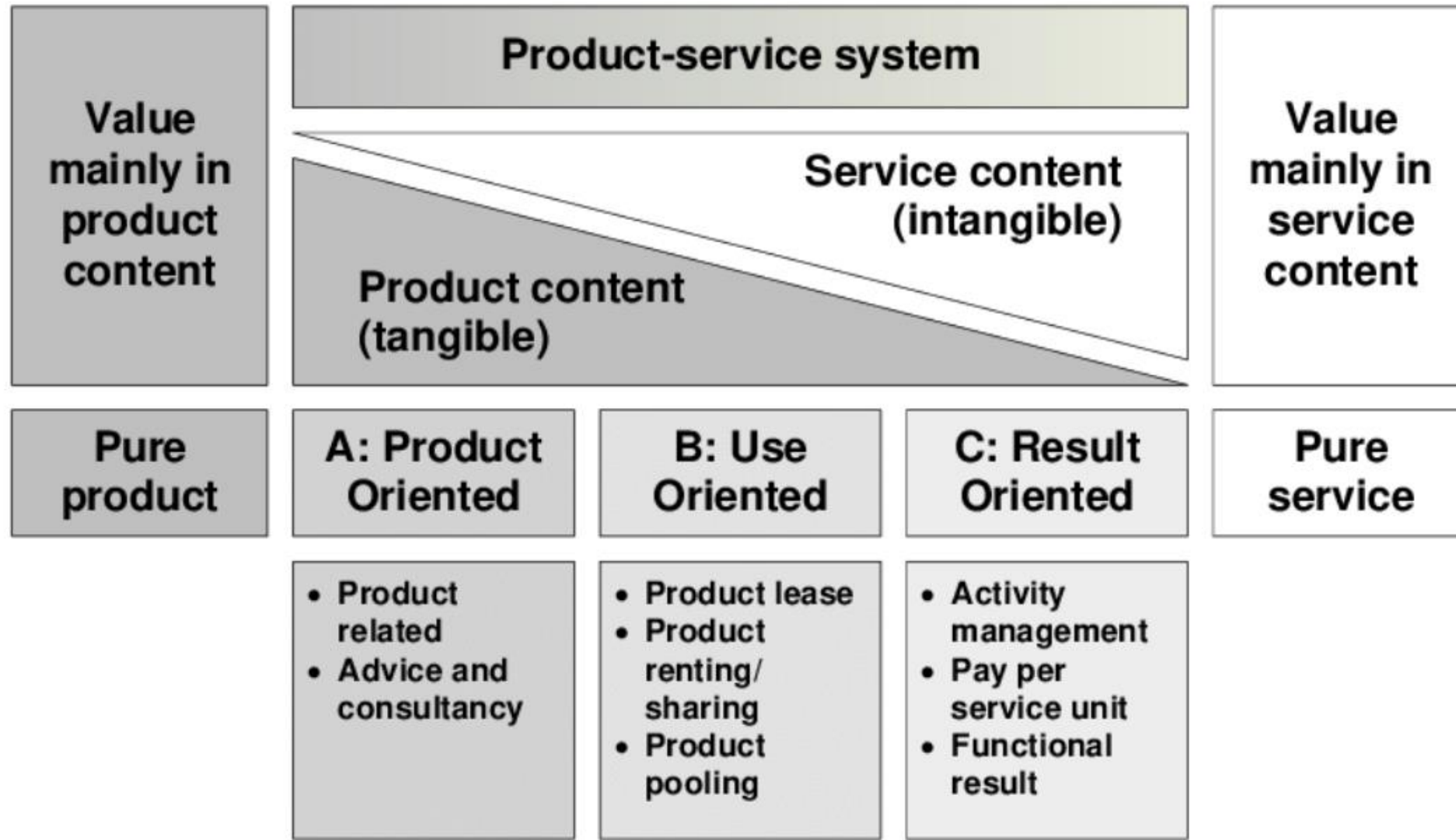
Society is a factory (hypothesis#5)

Society, cities, and all other industries receive "something" as an input, go through a certain process by people, equipment, and methods, and output "something" and "value."

This **structure** can be regarded as a structure **similar to manufacturing**. (Societies, cities, and all industries are analogous to factories.)

The concept of Manufacturing technology (production technology) and its business management and improvement **can be applied to all fields.**

Supplement: Example of product service system

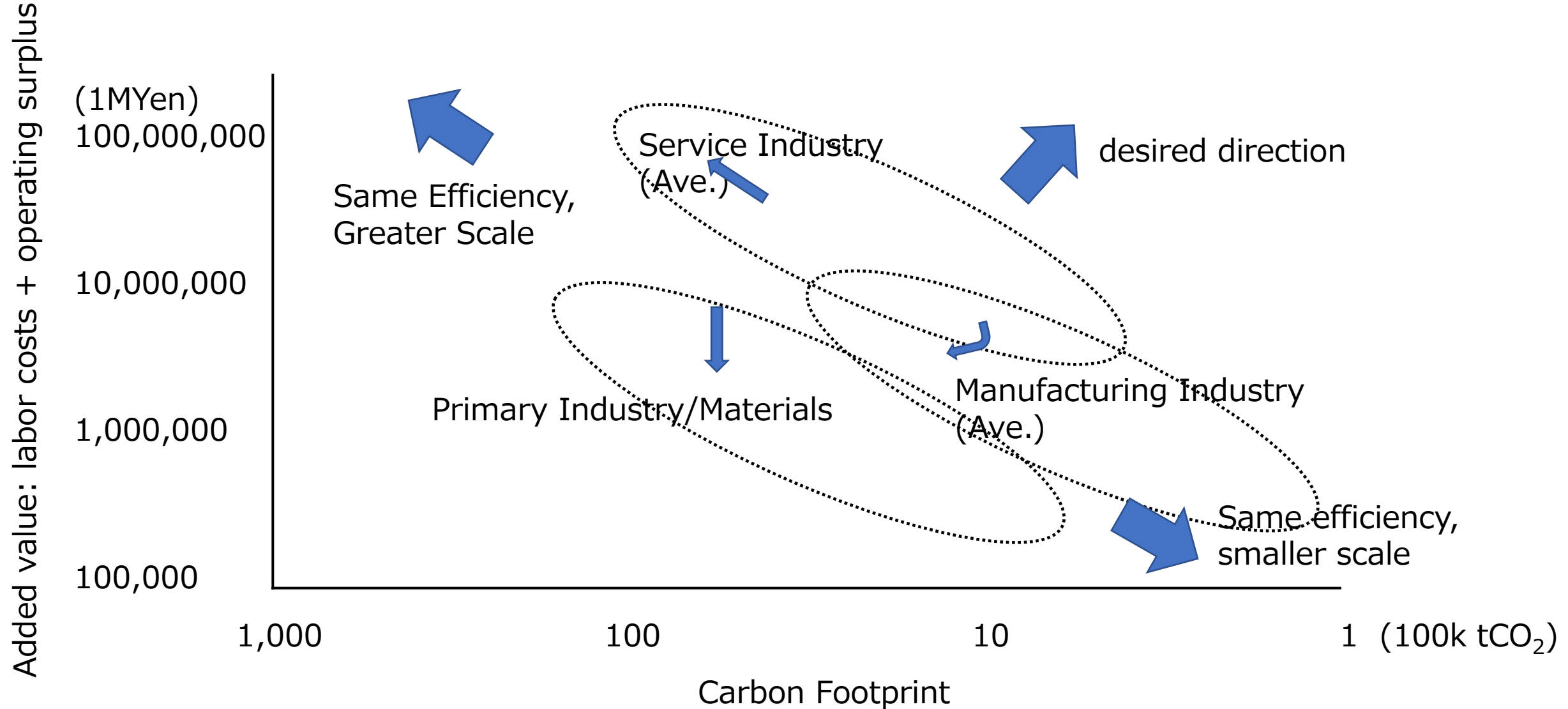


Types of Product-Service System (PSS) [35]

[Types of Product-Service System \(PSS\) \[35\]](#) | [Download Scientific Diagram \(researchgate.net\)](#)



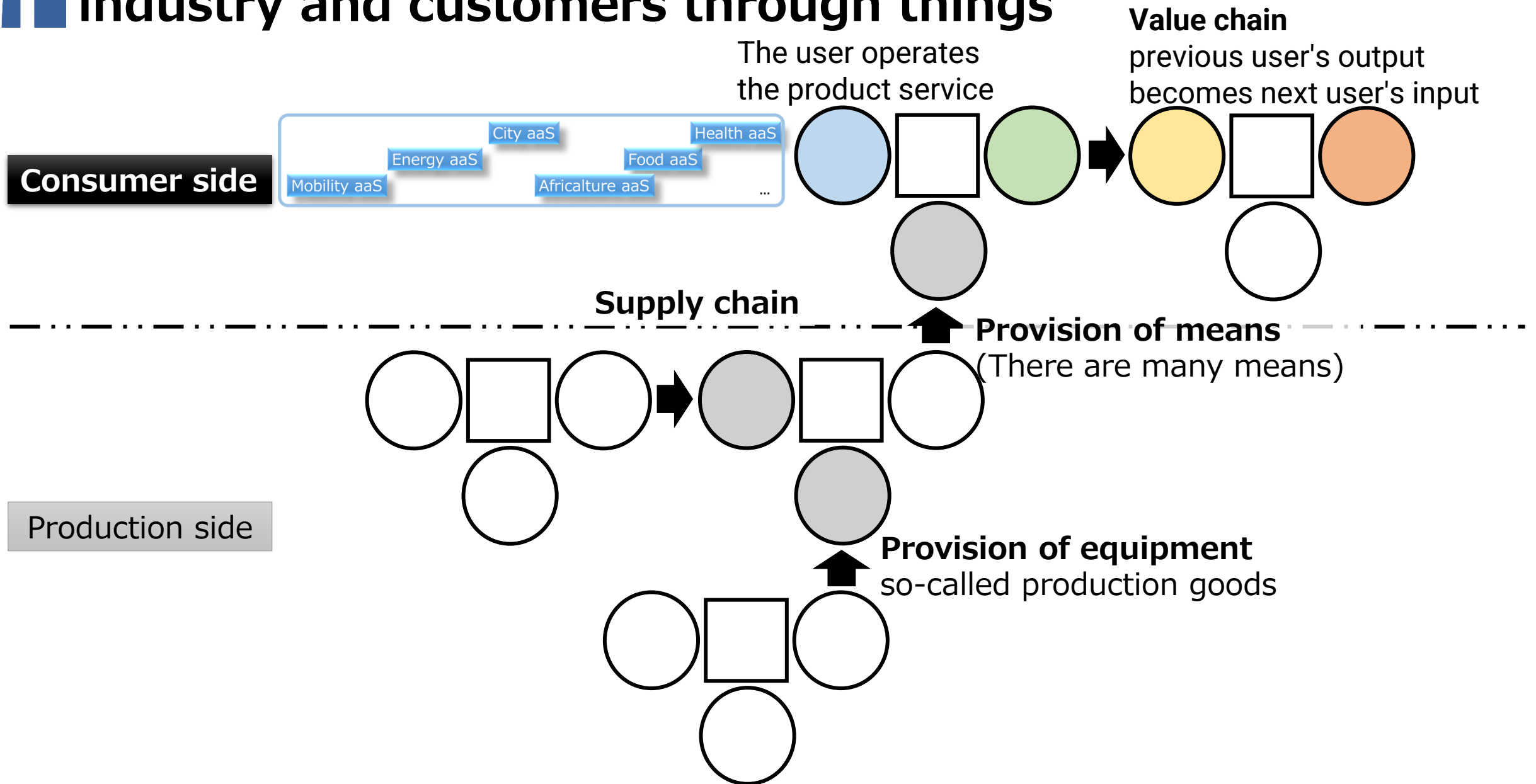
Supplement: Green Transformation (GX) and Servitization



Source: "Full Research" by Hiroyuki Yoshikawa

Examples of digitization of manufacturing technology

Today: The relationship between the manufacturing industry and customers through things



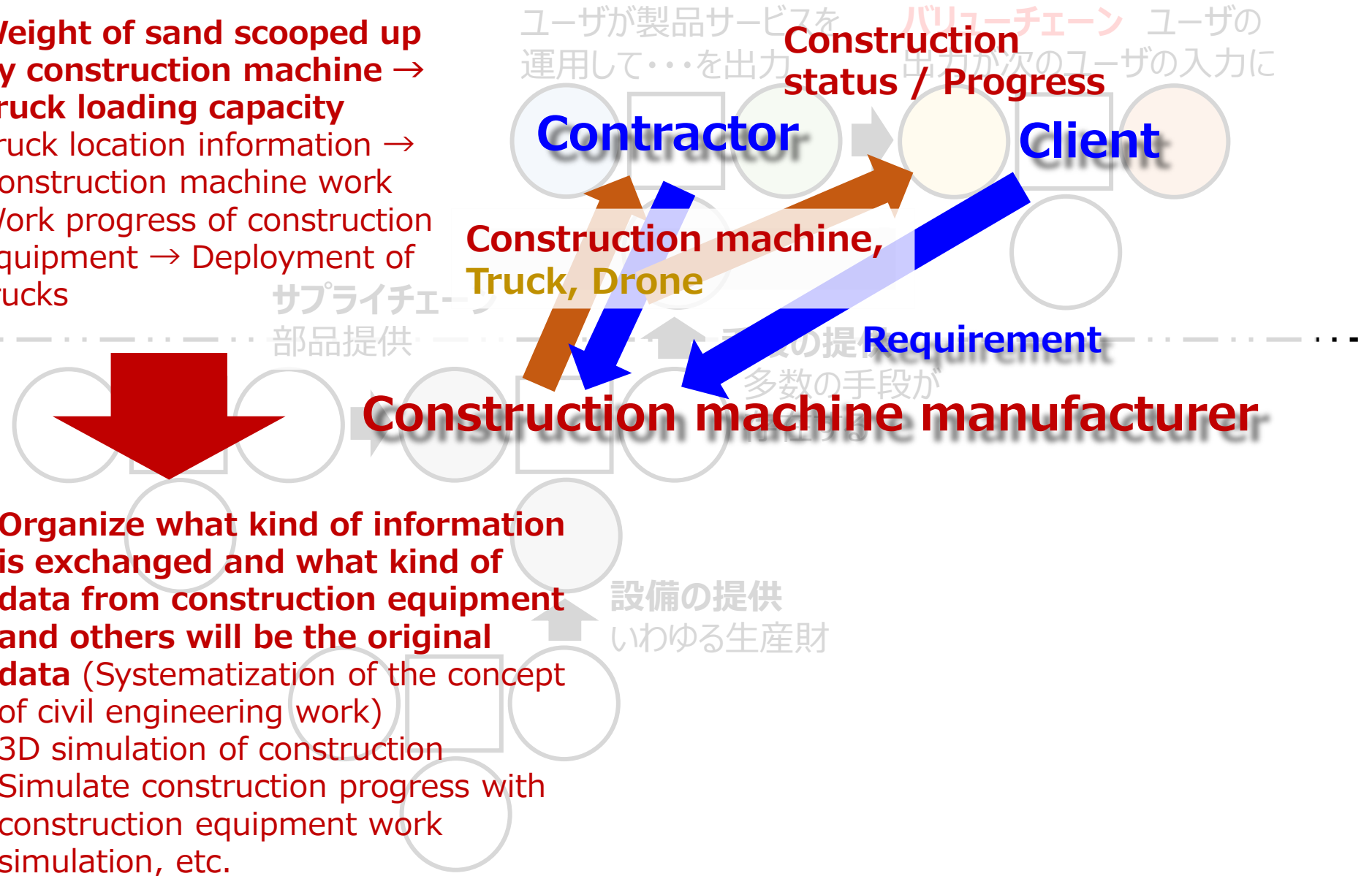
Example: Information on civil engineering and construction machinery

Consumer side

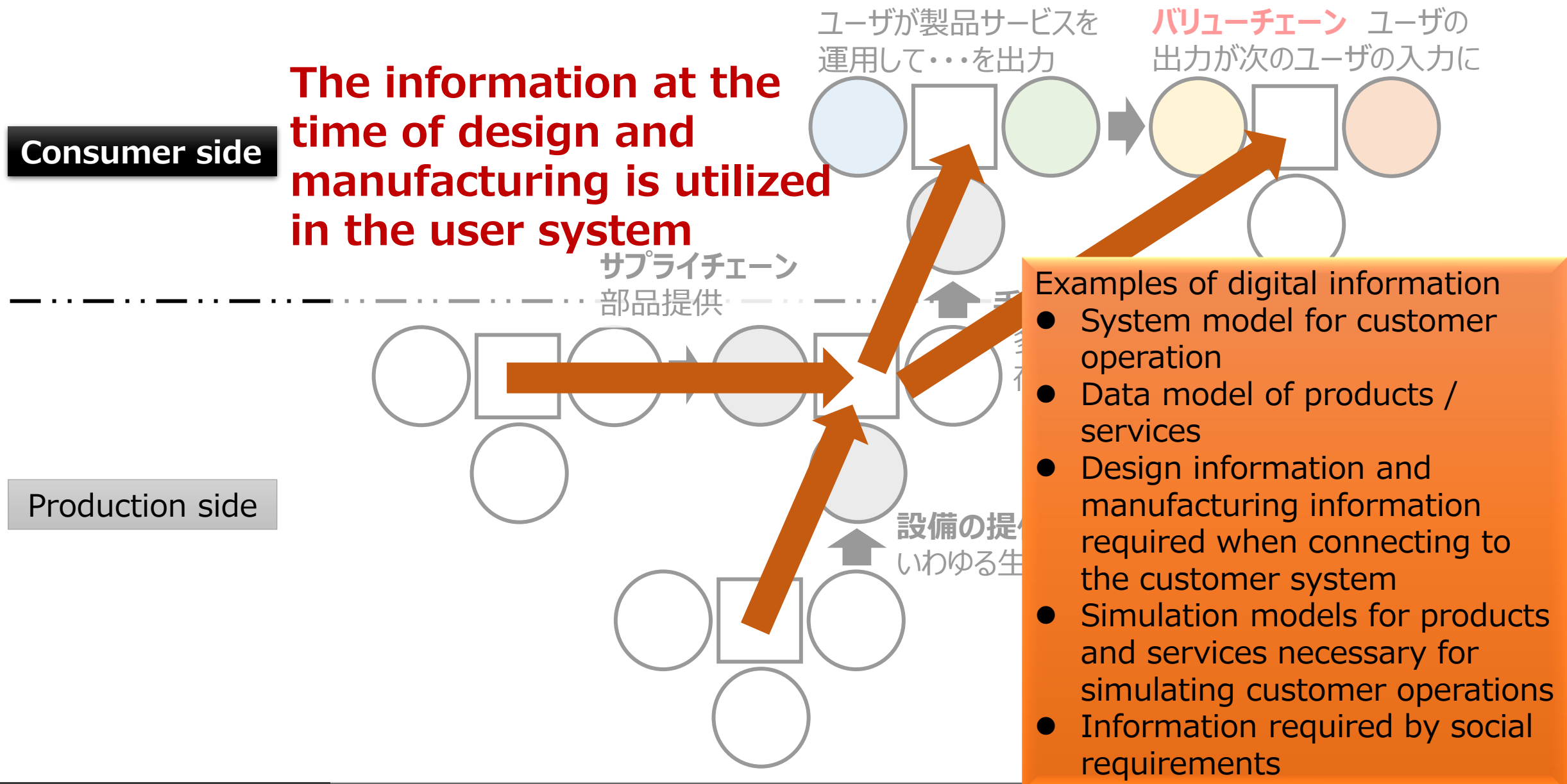
- **Weight of sand scooped up by construction machine → Truck loading capacity**
- **Truck location information → Construction machine work**
- **Work progress of construction equipment → Deployment of trucks**

Production side

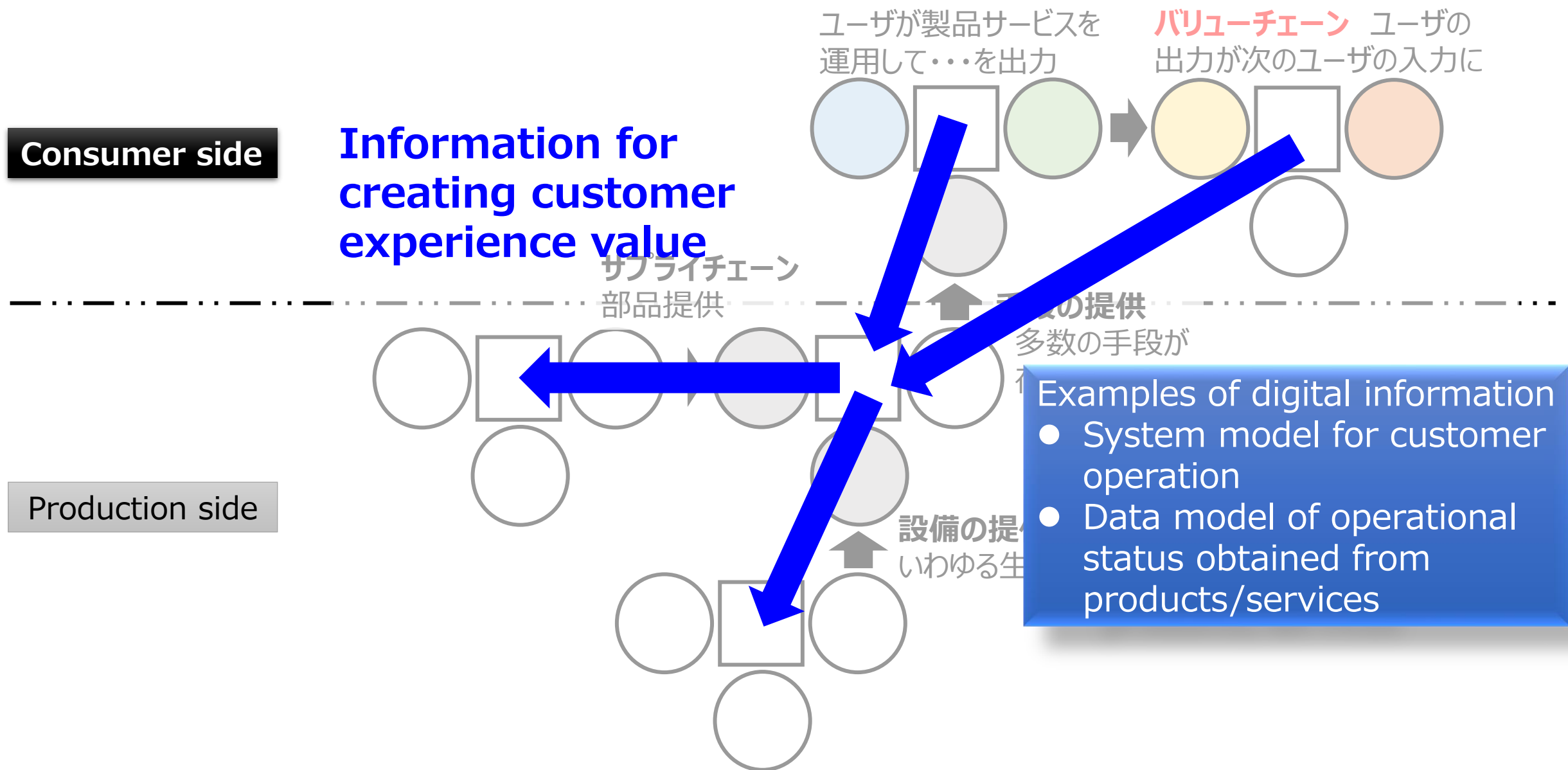
- **Organize what kind of information is exchanged and what kind of data from construction equipment and others will be the original data** (Systematization of the concept of civil engineering work)
- **3D simulation of construction**
- **Simulate construction progress with construction equipment work simulation, etc.**



Information provided by the manufacturer (1)



Information provided by the manufacturer (2)





Summary

The manufacturing industry provides products to all industrial fields = involved in manufacturing technology

In response to digitization, it became possible to systematize manufacturing technology in common, and it is necessary to do it

