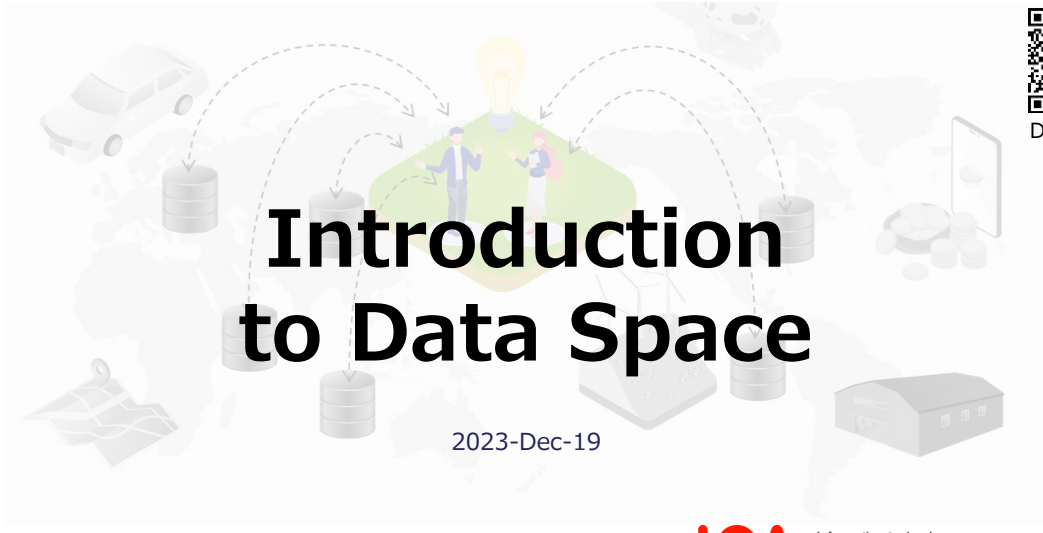

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Introduction to Data Space

2023-Dec-19

IPA Information-technology Promotion Agency, Japan

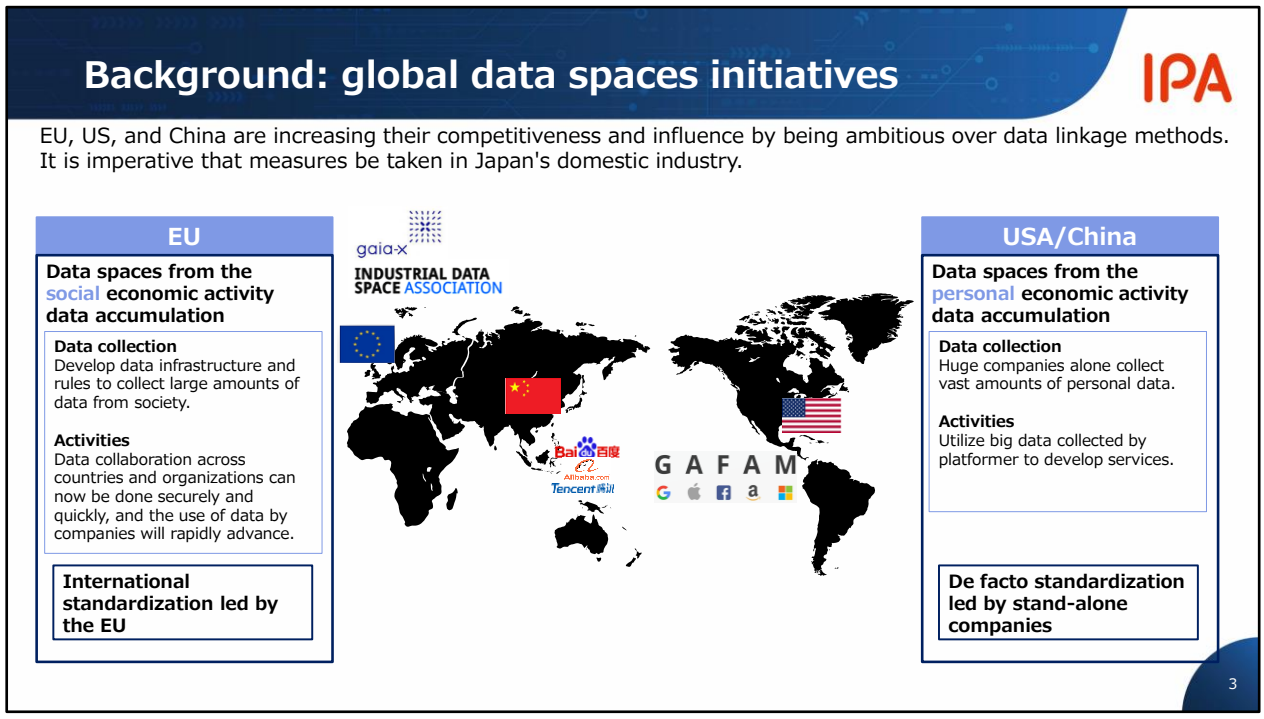
Digital Infrastructure Center (DISC)
Digital Engineering Department
Data Spaces Group

About this document

This document is for **beginners** who want **to learn about "Data Spaces"**.

The Purpose is to understand**,**
- What are data spaces
- What is the organizational structure for data spaces promotion
- What use cases are expected in Japan

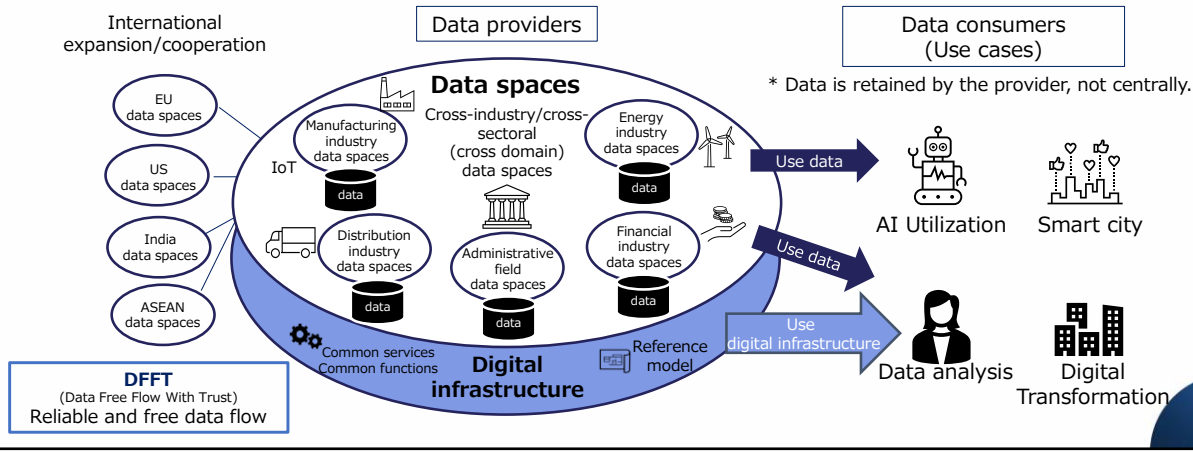
The intended target is those who want to learn about "data spaces" for the first time.
The purpose is to understand what are data spaces, the organizational structure for data spaces promotion, use case, etc.



The EU, US, and China are increasing their competitiveness and influence by being ambitious over data linkage methods.
It is imperative that measures be taken in Japan's domestic industry.
In the U.S. and China, services are being developed by utilizing big data collected by stand-alone companies. As a result, services are becoming de facto standards.
On the other hand, in the EU, in order to realize data collaboration across countries and organizations, data infrastructure and rules are being developed, vast amounts of social data are being collected, and international standardization is progressing under the EU initiative.

What are data spaces?

- Concept that focuses on indispensable data in the digital society.
- Standardized mechanism that ensures reliability and data sharing among different organizations, countries, and different industries ecosystems.
- Large amount of "diverse" and "reliable" data can be used with security.



What are data spaces?

・Concept that focuses on data indispensable in the digital society.
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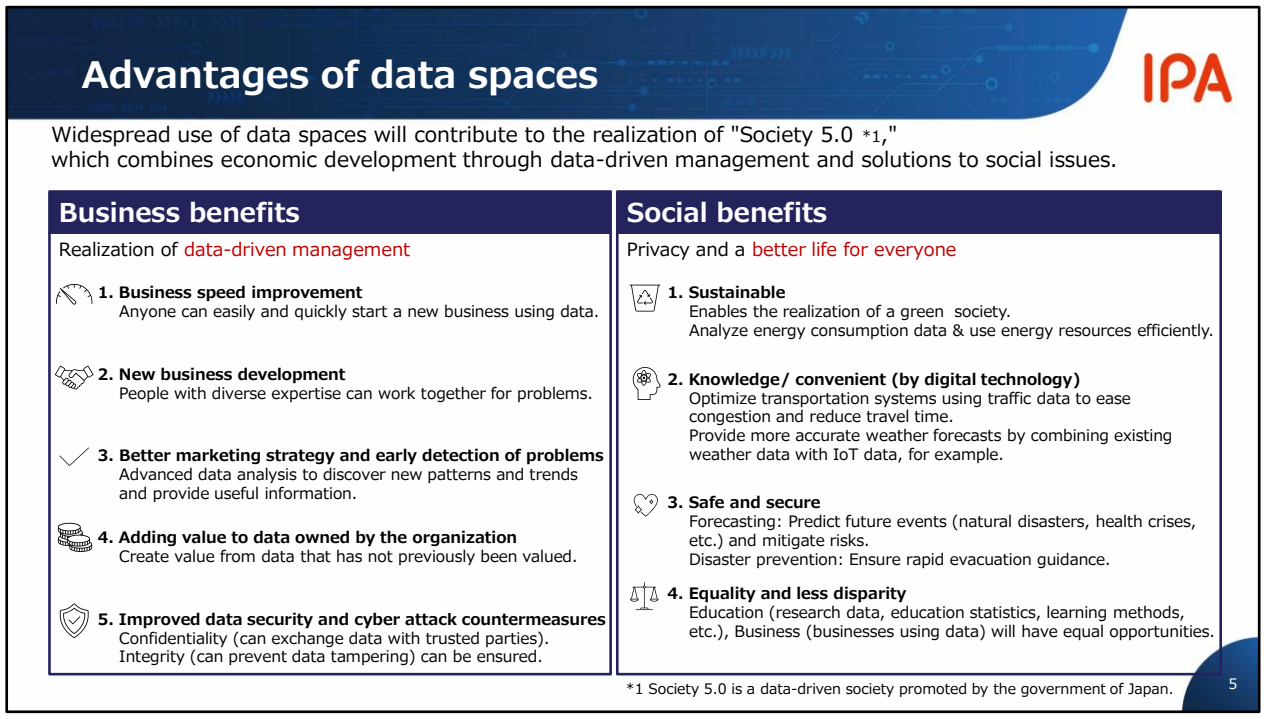


Supplement
Describe each benefit with the reasons why they are brought about.

【Business benefits】
①Business speed improvement
Anyone can easily and quickly start a new business using data.
Reason: Availability of common tools, services, data, etc.

②New business development
People with diverse expertise can work together to solve problems.
Reason: Enables collaboration and information sharing between different researchers, organizations, and industry sectors.

③Improvement of marketing strategy, early detection of problems
Discover new patterns and trends with advanced data analysis to provide useful information.
Reason: Can use data that transcends fields such as consumer information and distribution information.

④ Own organization data has business value

Create business value even from data that has not been found to have value until now.
Reason: Easilly provide data to different organizations.

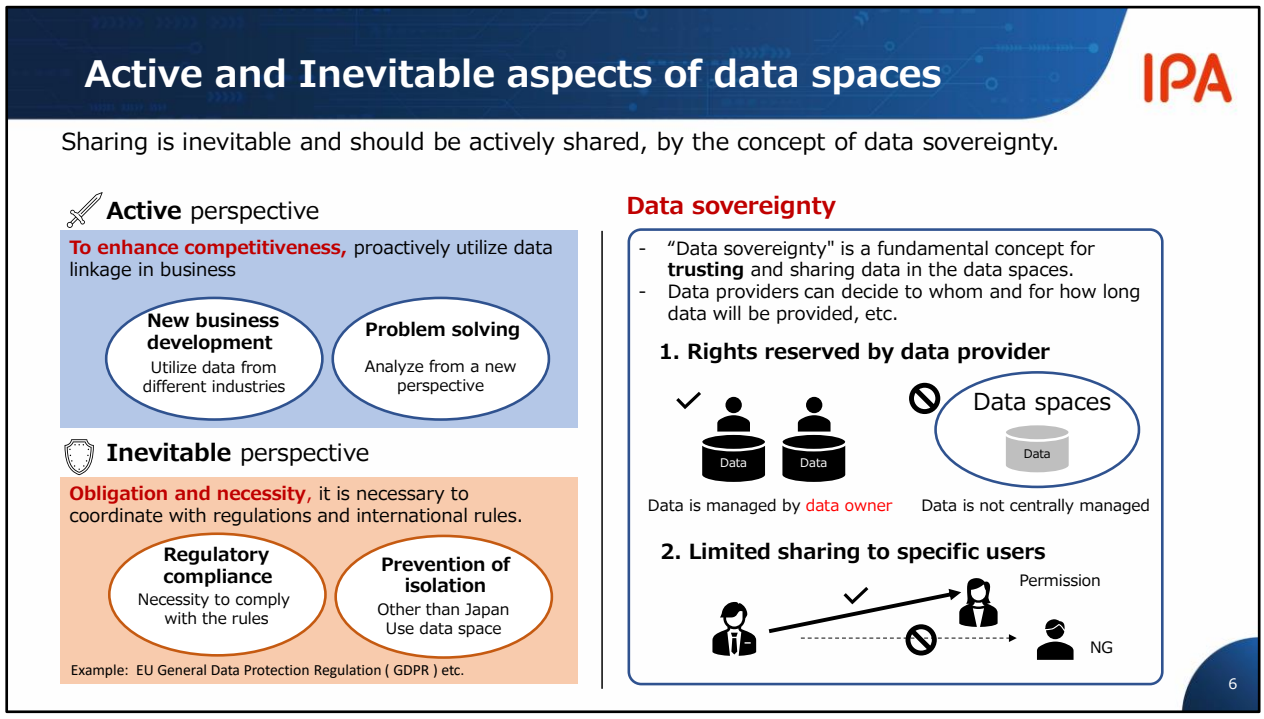
⑤Data security improvement and countermeasures against cyber attacks
・Confidentiality (can exchange data with trusted parties).
・Integrity (can prevent data tampering) can be ensured.
Reason: Has an organization, tools, and mechanisms in place to improve security.

【Social benefits】
① Sustainable society
It becomes possible to realize an environment-friendly society.
Analyze energy consumption data and use energy resources efficiently.
Reason: It is possible to collect data for each resource across the board, such as oil, gas, and wind power.

②Knowledge society / convenient society (utilization of digital technology)
Optimizing transportation systems using traffic data to reduce congestion and shorten travel times.
More accurate weather forecasts, for example by combining existing weather data with IoT data.
Reason: It makes it possible to use large amounts of a wide variety of data.

③Safe and secure society
・Prediction…to predict future events (natural disasters, health crises, etc.) and reduce risks.
Reason: can analyze and utilize information from IoT, such as sensors and cameras.
・Disaster prevention…Realize rapid evacuation guidance.
Reason: To enable coordination of transportation, electricity, gas, water, and communication infrastructure, and evacuation information from local governments

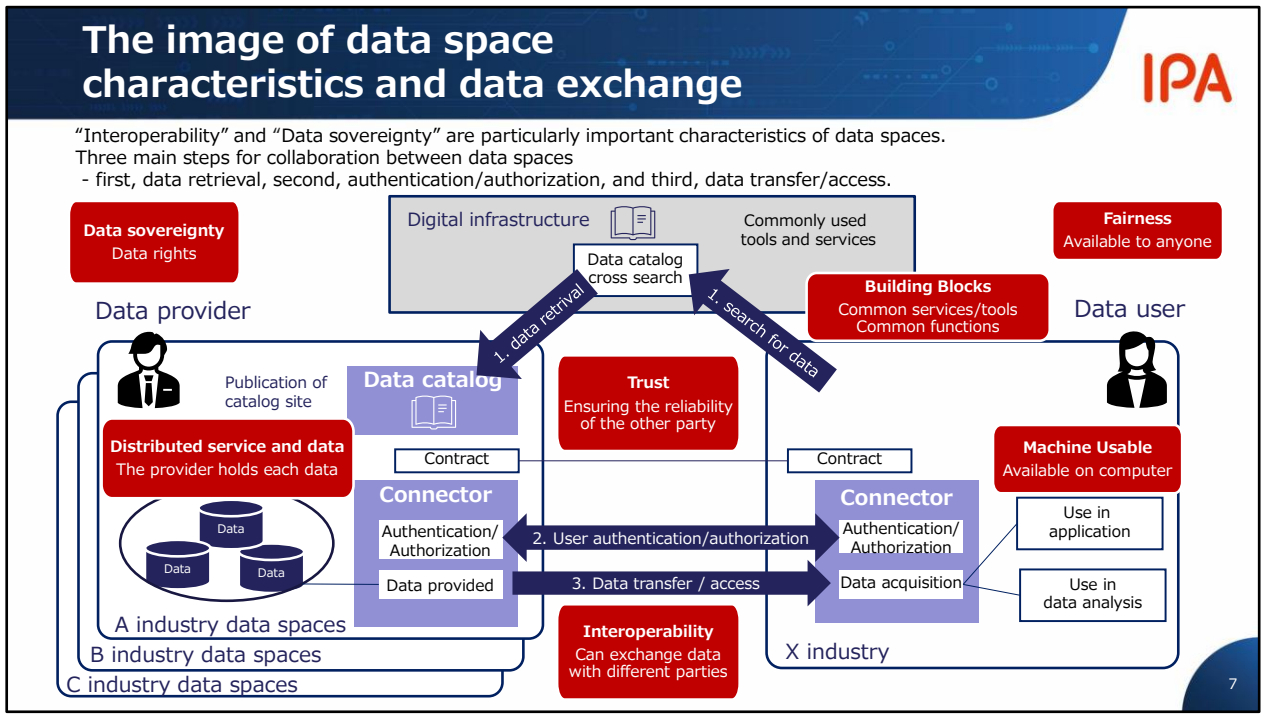
④A society with equality and less disparity
Education (research data, education statistics, learning methods, etc.), Business (businesses using data) will have equal opportunities.
Reason: The digital infrastructure makes it possible for anyone to utilize data.



There are reasons why data should be shared proactively in the data spaces (offensive perspective) and reasons why data must be shared (defensive perspective).

The offensive perspective is to proactively utilize data collaboration for business in order to enhance competitiveness.
This includes "developing new business" by utilizing data from different industries and "solving problems" by analyzing data from new perspectives.
The defensive perspective is the need to comply with regulations and international rules due to mandates and necessities.

In addition, in sharing data, "is it safe to share?". However, there is no need to worry because the data spaces are protected by data sovereignty.
Data sovereignty means that the data provider decides who to provide the data to and for how long.
①: Data is managed by the data provider, and data is not entrusted to some central location.
②: Data can only be released to specific users chosen by the data provider.

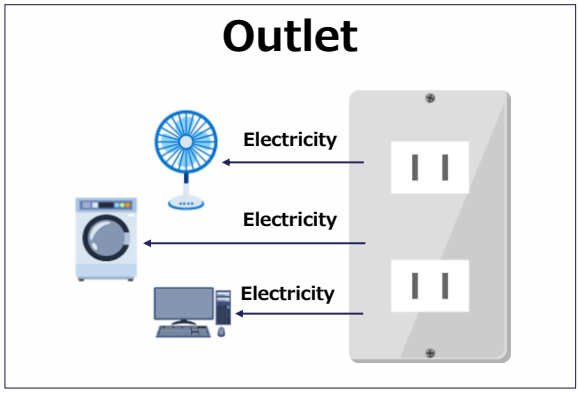


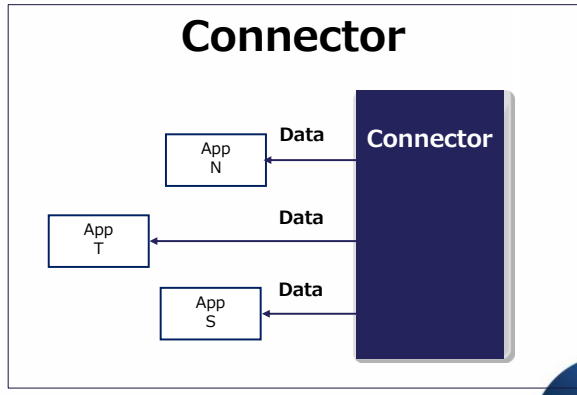
The features of the data spaces are in red.
A particularly important feature is "interoperability," which allows data to be exchanged with different parties.
Another important feature is "data sovereignty," which protects the data rights of the data provider.

Data spaces collaboration mainly involves 3 steps.
① Search for data
② Authentication / Authorization
③ Data transfer / Aaccess

"Connector" that realizes data exchange

- By using connector, **providers and users can connect each other and exchange the data.**
- Connector is like “Outlet”.
  "Appliances" can receive "electricity" by using the common “Outlet".
  "Apps" can access "data" by using a common “Connector".





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Under the digital infrastructure, the connector is the function of data exchange.

The connector connects providers and users and enables data exchange.

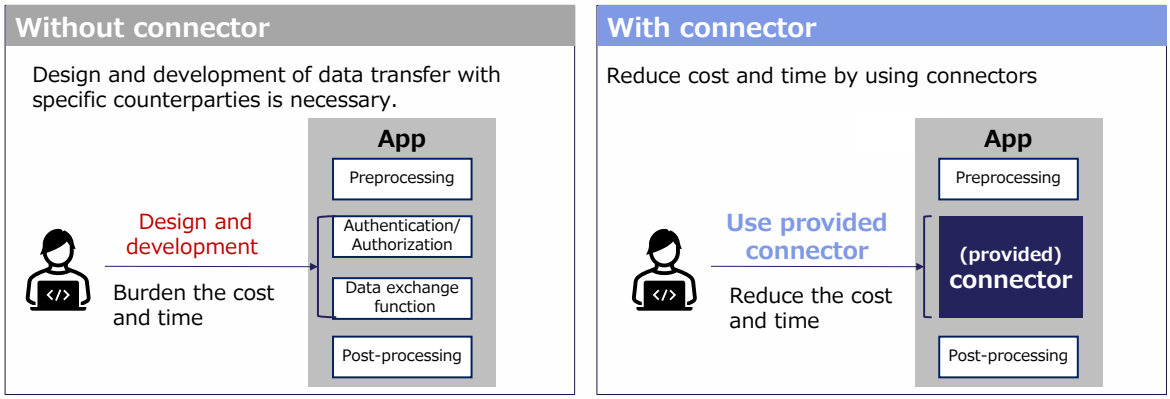
Connector is like a electrical outlet.

Since electrical outlet is commonly provided for home appliances, there is no need to consider and develop individual plans for accepting electricity.

In the same way, since connector is commonly provided for data integration, there is no need to consider and develop plans for accepting data for each individual application.

Benefits of using connector

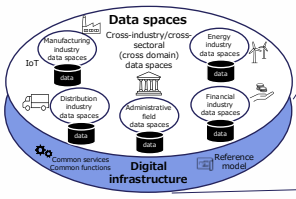
When developing data exchange applications, the provided connector can be used to **reduce the cost and time** required for design and development.



When developing data exchange applications, the provided connector can be used to **reduce the cost and time** required for individual design and development.

Digital infrastructure

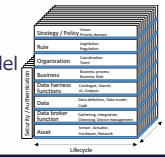
Digital Infrastructure provides common services, tools, functions, and reference models underlying the data space in addition to connectors.



- Common services and tools
- Common functions
- Reference models

SIP 分野間データ連携基盤
DATA-EX
デジタル庁 Digital Agency
Need to accelerate maintenance

GIF data model Guidebook
- Rule
- Standard
- Data model



Example of common services, tools and “Building blocks (common function)”

1. Data search	2. Authentication/ Authorization	3. Data exchange	4. Data utilization	5. Development environment	6. Guideline
Data catalog	ID service	Connector	AI/Analysis	OSS catalog	Knowledge
Data dictionary	Access control	Broker	Visualization	Test bed	Teaching materials
Base registry	Log management	Delivery	Knowledge Base	Test data	
Market place	Billing management	Data management			

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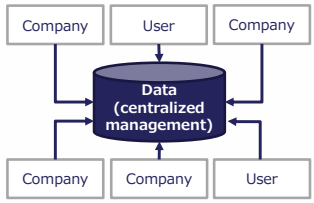
The digital infrastructure is the foundation of the data spaces.
Digital infrastructure includes common services, tools, common functions, and reference models.
It is provided by DATA-EX, the Digital Agency in Japan, and others, and is being developed in the future.

Differences from other data sharing structure

Comparing traditional data management and the structure of the data space is decentralized for reliability, interoperability, and data sovereignty *1.

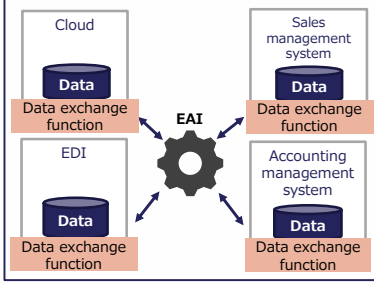
Platformer type

Structure type	Centralized
Characteristic	Platforms hold & handle data.
Sovereignty	N/A
Example	Google



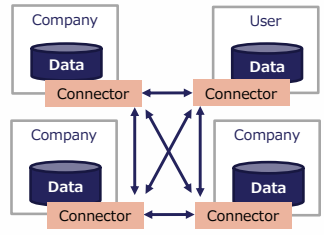
EAI (Enterprise Application Integration) *2

Structure type	Distributed
Characteristic	Mechanism for exchange data between systems within a company.
Sovereignty	N/A
Example	Data Spider



Data spaces

Structure type	Federated
Characteristic	Can ensure reliability and share data between different organizations and countries
Sovereignty	Yes
Example	Catena-X



*1: Whether or not the data provider can be involved in the handling of its own data.
*2: System that links multiple systems used for business within a company to efficiently integrate data and processes.

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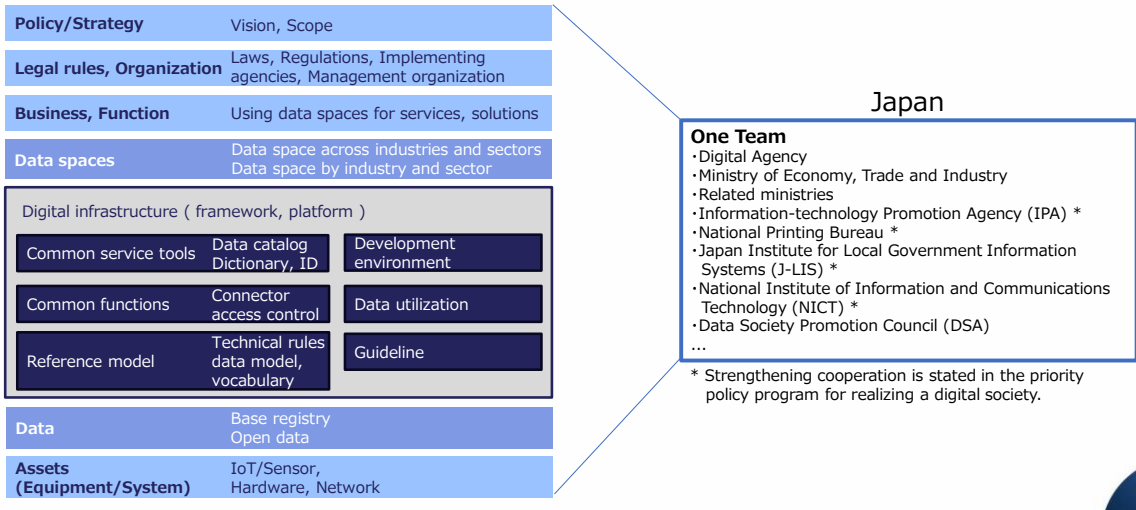
The difference between traditional data management and data spaces.
In a traditional platform-based data management system, such as Google, the data is managed centrally by the platform.
The data provider, a company or individual, has no control over how their data is used.
In other words, the data provider has no data sovereignty.
In addition, in traditional EAI, the data is distributed, but the data provider does not have data sovereignty, just as in a platformer.
Data spaces are distributed and the data providers has data sovereignty.

Role in acceralating data spaces in Japan

Government of Japan, DSA, and IPA plan to work together to promote data spaces.



Domestically in Japan, related ministries, DSA , and IPA will work as "One Team" to promote data spaces.

Area of the data space

Data spaces are used in a wide range of fields in society.

In each field, one or more projects are underway, and there are many data spaces with limited functions or regions.

In Japan, there are many initiatives similar to data spaces.

Japan Standard Industrial Classification : Major Classification	EU	Japan
A. Agriculture, forestry	EDS agriculture	Semi-public (agriculture)
B. Fishery	Fishing	-
C. Mining, Quarrying, Gravel extraction	-	-
D. Construction	EDS construction	Smart buildings, Underground objects Land Transport PF
E. Manufacturing	EDS Industry / Industrial, Mobility	Intercompany transactions, Batteries
F. Electricity, Gas, Heat supply, Water industry	EDS energy	Water supply
G. Information and communication	EDS media	-
H. Transportation industry, Postal industry	EDS railway, mobility, aviation, shipping	Autonomous mobile robot Mobility (service)
I. Wholesale trade, Retail trade	-	-
J. Financial industry, Insurance industry	EDS Finance	Finance
K. Real estate business, Goods rental business	-	Land Transport PF
L. Academic research, Professional / Technical services industry	EDS cultural heritage	-
M. Accommodation industry, food service industry	EDS tourism	-
N. Life -related service industry, Entertainment industry	EDS tourism	-
O. Education , Learning support industry	EDS skills	Public Service
P. Medical care, Welfare	EDS health	Public Service
Q. Complex service business	EDS smart community	Public Service
R. Service industry (n.e.c.)	-	-
S. Public service (excluding those classified elsewhere)	EDS administration, Administration (law, procurement, safety)	Public personal authentication Public service
T. Unclassifiable industries	EDS green deal	CFP carbon footprint

* EDS: European Data Spaces

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Data spaces are used in a wide range of fields in society.
In each field, one or more projects are underway, and there are many data spaces with limited functions or regions.
In Japan, there are many initiatives similar to data spaces, such as quasi-public projects, although they are not called data spaces.

Case study (1) - Osaka City "Super city concept"

IPA

Data spaces focus point

・Establishment of a digital infrastructure for industry-academia-government collaboration to eliminate the administrative digital divide within Osaka.
・The usage of the catalog enables the provision of services utilizing Osaka open data.

Background

There was a disparity in efforts to utilize data among municipalities in Osaka Prefecture due to financial, human resources, know-how, and other limitations. Aim for a society where all residents can access advanced digital services.

Effort

- Osaka Prefectural Government will take the lead in making ID sharing possible starting in FY2022.
- Establish a digital infrastructure and start providing services.
- Establish an environment to provide a variety of digital services to those who need them, when they need them.

Effect

- Development of Osaka digital infrastructure
  -> 43 municipalities in Osaka can share the usage of data and services that were previously disparate or fragmented.
- ID sharing
  -> Enables services to be linked and can provide personalized services.
- Increased digitization of business operations improves operational efficiency.

Expected benefits

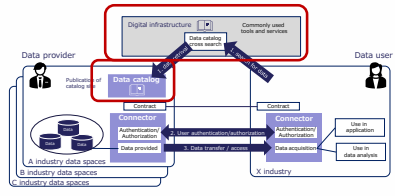
Business

1. Business speed improvement
2. **New business development**
3. Better marketing strategy, catch the detection earlier
4. **Adding value to data owned by the organization**
5. Improved data security and cyber attack countermeasures

Social

1. **Sustainable society**
2. **Knowledge society / convenient society (utilization of digital technology)**
3. **Safe and secure society**
4. **A society with equality and less disparity**

Focus points of this case



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Japanese domestic use case is a super city configuration in Osaka City.
The focus point of this case as a data spaces are as follows.
・The creation of a digital infrastructure for industry-academia-government collaboration that eliminates the administrative digital divide within Osaka City.
・The fact that the use of the catalog has made it possible to provide services utilizing Osaka City's open data.

Case study (2) - Sapporo City “Marketing optimization”

IPA

Data spaces focus point

- Establish of a digital infrastructure for public-private partnership.
- Possibility of creating new business by combining open data provided by private sectors with open data and provided by the Sapporo City.

Background

The public-private partnership digital infrastructure for coordinated use of public and private sectors data in the Sapporo area is being built and consider full-scale promotion of data utilization.

Effort

- Estate developers and restaurants combine external data such as "weather data" and "event data" from outside the Sapporo City to confirm the optimization of marketing and business operations.
- Conduct a demonstration experiment connecting CADDE connector to the Sapporo City's digital infrastructure.

Effect

- Realize the optimization of marketing and business operations.
- By using the connector when using external data, there is no need to develop separate interface functions for data exchange.

Expected benefits

Business

1. **Business speed improvement**
2. **New business development**
3. **Better marketing strategy, catch the detection earlier**
4. **Adding value to data owned by the organization**
5. Improved data security and cyber attack countermeasures

Social

1. Sustainable
2. **Knowledge/ convenient (utilization of digital technology)**
3. Safe and secure
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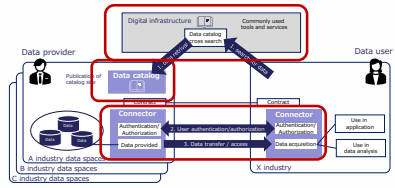
Focus points of this case



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This is the Sapporo City Marketing Optimization of a Japanese domestic case.

The focus point of this case as a data spaces are as follows.

・The city has established a digital infrastructure similar to that of Osaka City.

・The potential to create new business by combining open data provided by other companies with Sapporo's open data.

Idea of business Case "Enhanced Marketing"

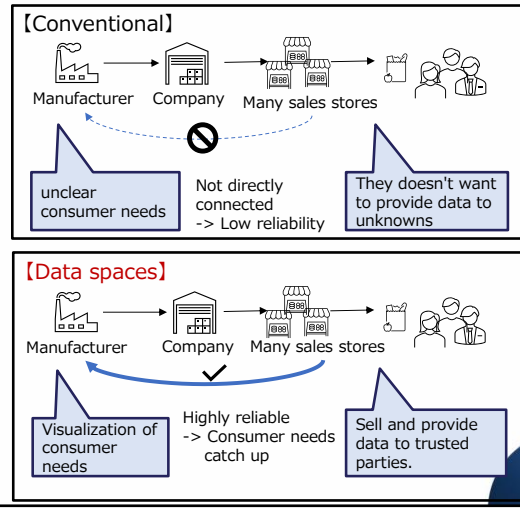
Understand consumer needs and improve marketing strategies.
Ensure credibility and the ability to provide and obtain data.

Effort
- improvement marketing strategy based on consumption information data that the manufacturer has not been able to catch before.
- Stores that previously refused to provide data on the grounds that the source of supply was unknown can now provide data because the reliability of the data is assured.

Effect
- Manufacturer: Can catch up with consumer needs.
  -> Leads to improve marketing strategy.
- Sales store: Data that had no value create business value.

Expected benefits

Business benefits	【Social benefits】
1. Business speed improvement	1. Sustainable
2. New business development	**2. Knowledge / convenient (by digital technology)**
3. Better marketing strategy, catch the detection earlier	3. Safe and secure
4. Adding value to data owned by the organization	4. Equality and less disparity
5. Improved data security and cyber attack countermeasures	



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This is not an actual case, but a expected case for the future use of the data spaces.
The first expected case is the enhancement of marketing.
Data from manufacturers and retailers will be linked to understand consumer needs and improve marketing strategy.
The data will be reliable, so that retailers will be able to provide the data and manufacturers will be able to obtain it.

Inquiries

To promote Data Space, please contact us.

Contact

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If you have any inquiries related to data spaces, please contact the IPA contact page.