CIOF Practical Seminar 2020



CIOF as a Basic OS for Data Distribution Among Companies

October 1, 2020 Yasuyuki Nishioka President, Industrial Value Chain Initiative

IV Industrial Value Chain Initiative

CIOF Practical Seminar 2020 (Agenda)

Date and time: Thursday, October 1, 2020 13: 30-16: 00 Location: Webcast Lecturer: Yasuyuki Nishioka (President, IVI)

13: 30-14: 30 [Part 1] CIOF as a Basic OS for Data Distribution between Companies

Digital transformation (DX) has the potential to significantly change the business models of IT solution providers, including the way they deliver their software and solutions, and their relationships with their customers. This presentation will show the use cases for the manufacturing industry that will be realized by CIOF, and explain how the business models of solution companies participating in CIOF will change.

OTarget: For managers and marketing departments of IT companies

14: 40-16: 00 [Part 2] CIOF Architecture Overview and System Implementation Procedure

or those who develop IT systems and engineers, the important concepts and architectures will be explained in an easy-to-understand manner about the functions inside CIOF and the structure. It also introduces APIs and development environments for an actual system development, and explains the steps required for IT companies that develop or sell enterprise software to make them CIOF compliant.

OTarget: For developers of IT companies, and engineers in research institutes, etc.



- 1. Views on Data
- 2. Features and Purpose of CIOF
- 3. System Overview and Procedure of Usage
- 4. Stakeholders and Use Cases
- 5. IVI Activities and Next Steps



Data is the Oil of New Industries!







Step 1: Identify the Mining Sites







Step 2: Start Data Mining







Step 3: Data Refining and Chemical Conversion





Step 4: Connecting the Data







Step 5: Make Business Connections







Step 6: Build a Business Model





Step 7: Establish a Data Ecosystem





Basic Types of Data-Driven Business







Efficiency

- Labor saving / manpower saving
- Improving in labor productivity

Real-time

- What you need, when you need it
- Speed of change and toughness

Virtualization

- Simulation, Digital twin
- Knowledge reproduction by AI

• Telework

Light part

Connected car

Individual dignity and brand

- \rightarrow (Privacy)
- Trust information and order
- \rightarrow (Fake news)
- Concentration of wealth, widening disparity
- \rightarrow (Big data, Data sovereignty)
- Collapse of borders (barriers to entry)
- \rightarrow (Artificial intelligence)
- Economic society's runaway
- \rightarrow (Virtual currency)

Shadow part

Digitization

• The availability of technology to process information at a given time and place at high speed, in large volumes, and with accuracy, and to transmit the results instantaneously without degrading the result.

Digitization alone does not bring about DX (social transformation).

Data conversion

• The availability to encode, decode and communicate information based on rules in order to enhance interactions between things, humans, organizations, and between them.

Data conversion goes beyond DX to transform the economic structure.

- Data is free because there is no cost to duplicate.
- Even if the data is free, there is value in data (great value).
- Violation of the principle of management accounting (Principle of cost-revenue correspondence)



Past economic laws do not apply to data?

- Price = Cost + Profit to get (provide) information.
- The price of information is not tied to its value.
- To begin with, can we put a price on information?



Five Types and Three Levels of Data Value

Limited-value-for-sale type (concealed)

- The more people know about it, the less valuable it becomes.
- Examples) Bargain information at supermarkets, Surely winning prediction of horse tickets with high return.

Damage minimization type (shared)

- The more people know about it, the more value it has (less damage)
- Examples) Disaster warning, corona countermeasures

Incentive type (occupied)

- Fair competition through institutions and incentives for individuals
- Examples) Know-how / patents, customer information

Co-creation material type (shared)

- If there is a high degree of commonality, improving the efficiency of macroscopic information production.
- Examples) Map information, Open API

Voluntary security type (concealed)

- An innate right to distinguish one company from another
- Examples) Strategies / Tactics / Measures, Personal Data



- The value of data is valid for many people and situations.
- Typology of data value management
- Data as public and infrastructure

Genre type data

- The value of data is valid only for a specific environment and purpose
- Reproduction of value by designing the scope
- SNS, R & D, Knowledge creation

Context type data

- The value of the data is valid only between a party and the other party
- Data maximizes value on the spot, at the moment
- Supply chain / Engineering chain

Main target of CIOF



Since the PDCA cycle, instead of Plan (P), Do (D), and See (S) cycle, includes improvement within itself, the cycle has become a mechanism that constantly evolves by the factors

With pursuing quality, cost reduction, just-in-time, and environmental consideration, a well-balanced management index should be the basis of decision-making.

Value Chain thorough Cooperation of Smart Manufacturing Units



What happened and what we learned from the corona pandemic \mathbf{V}

The movement (supply) of goods between bases cannot be stopped, but the movement of people (actors) was restricted. The higher the degree of dependency on individual skills and illogicality in operations between departments and bases, the more confusing the business cooperation

Online (remote) meetings can transmit information, but not experience (tacit knowledge).



Overseas Trends







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- Data Trading
 - Data trading is the process of establishing and fulfilling data rights and obligations in advance for both data providers and data users when transmitting data between different terminals. A trading involves a series of actions, making a contract, transmission of actual data, fulfillment of rights and obligations and expiration of the contract. The target data here is called trading data.
- Trading Data
 - Trading data is individual data that is the target data of data trading. A hyper connection server, HCS, assigns a unique ID to it. The HCS ID and the trading data ID are globally unique. A hash is generated for trading data and by saving the hash instead of the trading data, it is possible to match the trading data. In addition, this hash is used for traceability of the trading data.



Can the infrastructure for data distribution be common? \mathbf{IV}



◆Firewall of factory data

- Factory data can be selected so that it does not include on-site know-how, and can be reliably delivered only to partners specified in contracts in advance.
- Means for realizing servitization of manufacturing
 - By monitoring use of data passed to business partners, preventing unauthorized use, and sharing the value generated by the data, we enable a new service model.
- Value chain through connected industries
 - Strengthening data connections will reduce the cost and time required to build value chains with new business partners and increase the ability to respond to diversity.



How data monetization works





When using CIOF

produced with 3D printers





Features of CIOF







• Basic service

• Machine configuration settings, asset settings (implementation), user settings, authorization, ID issuance, etc.

Contract service

• Creating individual contracts and common contracts, communication with a partner, inquiry of contract information, management of history record, etc.

Transmission service

• Data transmission such as PUSH / PULL, Pub / Sub, and collect, history record, destination authentication, encryption, route setting, recovery, etc.

Dictionary service

• Registration of common dictionaries and external dictionaries, search function, recommendation function, public subscription, history (version) management, etc.



CIOF Service Menu (2/2)

- Conversion service
 - Transmission data conversion, record conversion, parameter conversion, API setting, rule setting, test environment, etc.
- Serarch service
 - Account search, profile search, business matching, transaction history inquiry, corporate group setting, etc.
- Certificate service
 - Inquiry of data transmission history, inquiry of data usage record, issuance of certificate, validity guarantee function, tampering history management, etc.
- Authentication service
 - Global ID function, software authentication, hardware authentication, certificate authority management, etc. (not to be implemented)



CIOF Hierarchy



Logical hierarchy	Description		
Connected World	This shows the entire server and physical world of the world. Various networks are self- propagatingly forming ecosystems without prior agreements here. This is a world consisting of such multiple ecosystems.		
COIF World	The entire range to which CIOF services are applicable. It can be defined as a connected world in which CIOF is involved. This corresponds to the range managed by the FCS.		
Domain	A unit in which various enterprises are united by one platform company or organization. This corresponds to the range managed by HCS. An enterprise always belongs to one domain.		
Enterprise	A unit that independently handles data trading and corresponds to a company or business unit. The scope of control by an enterprise may extend to multiple factories. Therefore, an enterprise can have multiple sites.		
Site	Site is a range in which machines cooperate with each other and is managed by one HCT. The movement of things and movement of data are managed in this unit. The inside of the site is protected from the outside by a firewall.		
Edge	The world inside the edge where real-time performance is required. There are edge devices that correspond to hardware, service implementations and data implementations that correspond to software, and are managed by unique IDs.		
Physical Asset	A collection of units that function individually as individual assets. Hardware and software are integrated and can be recognized as a visible object. It corresponds to the final connected object (thing) in IoT.		



CIOF Hierarchy

Logical hierarchy	CIOF Assets	Hierarchy of Authority	ID Hierarchy
Connected World			Standard Global Code
COIF World	Framework Control Server	Framework Administrator	Unique ID in CIOF World
Domain	Hyp <mark>er Connection</mark> Server	Domain Administrator	
Enterprise	Hyper Connection Manager	Enterprise Administrator	Unique ID in the domain
Site	Hyper Connection Terminal	Trading Administrator	
Edge	Edge Control Unit	Implementation Administrator	Unique ID in the domain
Physical Asset			Service-specific ID

Management Hierarchy





Framework Administrator A Framework Administrator manages the entire CIOF world, adds new domains, registers, and manages enterprises and sites. He also manages the legitimacy of trading history, issues certificates, and manages security.



Domain Administrator A Domain Administrator manages common dictionaries, accepts enterprise registrations, manages, and maintains HCS and charges and supports enterprises for each platform. He sets the authority such as IDs and passwords for enterprises.



Enterprise Administrator

An enterprise Administrator sets sites under control (HCTs) as an administrator of an enterprise, sets users who can log in HCM, and sets authority of trading administrators, implementation administrators, and dictionary administrators.



Trading Administrator

A trading Administrator has authority to create contracts for data trading. He manages data distribution of data belonging to target sites in all other sites including his own enterprise.



Implementation Administrator An implementation Administrator manages data implementation and service implementation at individual sites. He also manages addition and deletion of edge controllers in a site, data implementation and service implementation handled in a controller, and correspondences to internal IDs valid in each controller.



✓ Dictionary

It has individual implementations, individual dictionaries, and common dictionaries to express real site information of multiple sites with data.

✓Contract

A usage monitoring function to ensure the effectiveness of contracts required when multiple enterprises are involved in data transactions.

✓Authentication

Global management of sites and IDs of assets within sites which are involved in data and data trading to prevent tampering.



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Platformer

Platform company

Component company

Companies connected by data

-Common dictionary

Individual dictionary

Dictionary Type

Common dictionary

External dictionary

 \checkmark An individual dictionary is defined using the contents of data and services that are implemented independently in each terminal. Data is traded with the contents.

 \checkmark A common dictionary is used to associate data and service terms between different terminals. It is

registered by a platform company or a standards organization.









 \checkmark An external dictionary is created by a provider of an application or device, and the contents are imported and used in an individual dictionary by an enterprise who trades data.

Relationship between Common Dictionary and Trading Data \mathbf{IV}





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Use Case (1)



results of processes
Use Case (2)





Use Case (3)





Use Case (4)





Equipment drawing Operation status

Connected Industries Open Framework (CIOF)

Category 1	
Intellectual property management of data including manufacturing know-how	There is a risk of technology leaks when information that is highly valuable as a trade secret, such as machining know-how and NC programs, is shared as data with external business partners. CIOF will monitor the CIOF monitors storage, modification, and deletion of data at the destination of data as intellectual property based on the trading contract, and inquires about the actual use of the data if necessary, thereby enabling the sharing of production process backed by a high level of trust with the business partner.
High value-added management through quality data management	Advanced quality control requires proper inspections at various points in the process. These inspection results will be converted into data and shared among multiple related sites though CIOF, which will be used to identify problems, thereby creating a system that allows both the field side and the management side to manage appropriate quality control in an integrated manner. In addition, blockchain technology will be used to guarantee validity of quality data and to add value to a manufacturing company with strength of high quality.
Category 3 Issue of strengthening competitiveness of connected small and medium-sized manufacturing enterprises	Small and medium-sized manufacturing companies, which are part of production process, are relatively small in size and often have on-site operations and management that are integrated. By using CIOF to manage data such as order details, inventory, and acceptance of shipped goods so that SMEs are not at a disadvantage when sharing such data with business partners, we can improve the management level and management capabilities of SMEs, and at the same time, improve the productivity of manufacturers who are the ordering companies.
Edge data collection and value sharing with AI	In order to turn the vast amount of data obtained from equipment into valuable data using AI, it needs to be associated with and trained on data from production control and quality control. While there is resistance to putting field data in the cloud, CIOF will collect primary data distributed and managed on the edge side according to AI learning models and share the results under contract.



Category 1

Intellectual property management of data including manufacturing know-how

Category 2

High value-added management through quality data management

Category 3

Issue of strengthening competitiveness of connected small and medium-sized manufacturing enterprises

Category 4

Edge data collection and value sharing with AI

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SCSK







Five Phases of Data Trading



Register a dictionary and structure of a business application corresponding to a target business.

Register devices or machines at a target site and set them in a dictionary to be used.

Make a contract regarding handling of data corresponding to a provision pattern.

Provide or use data actually according to the contract.

Inquire data provision and data usage history, and authenticate facts that have already been executed.



Platformer, Component company, Standards organization



System integrator, Expert in target business



Marketer, Business partner, Contractor



Procurement staff, Shipping staff, On-site business staff



Accounting staff, Quality staff, Management strategy office staff





Enterprise Profile Inquiry

	04-01
Search for registered	
	CIOF Home > Profile inquiry > Enterprise profile Login name: Log out
	G Enterprise profile
CIOF Home > Profile inquiry Login name: Log out	Enterprise Hosei university ID 1234567890
Profile inquiry	
Enterprise inc. Data inquiry Recruited trade ng.	Enterprise <u>service profile</u> <u>Data profile</u> <u>Contract template</u> enterprise are displayed.
ID Own	ID 1234567890
Name Search arget domain	Enterprise University of California Pronunciation University of California
Search result	English name Colifornia University URL http://hosei.ac.jp
ID Name Place Description (3) 1234567890 University of California California The west coast of the U.S., go (9)	Description Comprehe 04-02
2345678901 Tokyo University Tokyo In Tokyo, difficult to	Service profile
4567890123	
6789012345	
CIOF Home > Profile inquiry > Enterprise pro	by an
G Data profile	sh name Hosei University Plac Services that an enterprise
Enterprise Hosei University	displayed. Tokyo factory #1 ID has are displayed
Site name Tokyo factory #1 ID 4567890123	Name AI-based defect detection
Data Departing conditions Machine AAA ID UCHARHF5DFLU ID UCHARHF5DFLU	Description Detective products are inspected using Dictionary IVI common dictionary
Description Operating time, start, stop for the month Dictionary IVI common dictionary	東京 Process profile Name Description Creation Ionuity Modified Deleted
Data item profile 💵 🖌 🜖 Provide data to this site] 🛄 Use da	ta of this site] 2 Process 1-1 Explanation of process
Item # Name Description Data type Main	key Required
Record ID For data identification Character Image: Character 02 Sensor ID For data identification Character Image: Character	Error Description Process Contents of record
03 Measured value Measured value Number	Image: Normal end End of process 1 Process 1 Working time (s) Service 1 Explanation of service BBHG23 あああいしいううう
	Service 1 Explanation of service 2341112 あああいいいううう



Trading Contract Management





Contents of a Trading Contract

05-04-03 Contract drafting flow		0	1		
		Con	tract		
CIOF home > Trading contract management > Trading contract rea	ading	Over	view		
🕒 🗹 Trading contract edit					
Contract First trading ID	A9LXA3RL6ELQ4				ormo
Description CIOF's memorable first trading Date	2020/9/3				enns
partner University of Southern California Detail Site	North bdg.			of the con	tract
Status during application Common dictionary	IVI Common dictionary: V12	▼ Contract	profile		
Provider Consumer Proposer Responder	Show all Hide all	Contract 📝		/	
		Contract item	Contents of contract		Modification
V Data profile		Basic contract	Basic design document123-456.pdf	/	
Data Machining temperature Data Sensor	r III 🖉 🛛	Individual contract	ABC Corporation Individual trading cont	ract.pdf	Correct
Description Temperature while machining Description All of s	sensor data	Confidential information	ation rules Provisions-20200202.pdf		Correct
Item # Name Compliant Implementation name Description	Data type Required	Contract C			
01 Record ID 01 ID Unique key	Character 🗹	Contract item	Contents of contract		Modification
02 Sensor ID For sensor ide	ntification Character	Purpose of use	The data subject to this transaction sha conducted by Paygate. It shall not be u	all be used for production control used for any other purpose.	
03 Measured value 03 Sensor value Measured value	Target	Consumer	The data subject to this transaction and the data subject to this transaction sha production control section of the releva be used by any other person.	the data obtained by processing II be used only by persons in the nt product division and shall not	Correct
▼ Service profile (Provide)	trading data	Individual 📝			
Service Verification of sensor value		Contract item	Contents of contract	and the second	Modification
Description Determine if the sensor value is normal		Period of use	(+ leeway)	roduct manufacturer	
Category Description Process	Comilao of	Storage location	Can be stored on a server owned by the	e production control department	Correct
Normal end Abnormalities in the test Test process	Service of	Secondary use	NG		Correct
Repeat per day Every 8:00 Callender	the provider	Third party offers	NG		Correct
		Delete obligation	Yes (must be reported at the time of de	letion)	
 Service profile (Consume) 		Period of use	10 years		Add
Service Temperature monitoring	Ľ				
Description Alarm when abnormal					
Category Description Drocks	optopto of record Descut	Message I'	m looking forward to working with y	/ou.	
Normal end End of process A Process A Or	perating time(s)				
Abnormal end Process A abnorma			Cancel	nd	
Service of	the i			_	
	· · ·				
	er				



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Trading Drafting Flow

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05-05-01 (Cont	1)Selection of data implementation	Contract proposal flow	Selection of ontract terms
CIOF home Trading Contract Management O Contract proposal flow Select Data implementation (Step 1) Name Description Contract proposal flow Name Description Contract mathematical during crack Machine operation NC machine operation information Crack Volume (tc) Factory #1 Operatory #1	1 2 3 4 5 Next 1 2 3 4 5 Next select Data im Template Name For parts manufacturers Multity data management roller Image: Provide Use Use For machine point Image: Image: Provide Use For machine	Itract proposal flow plementation (Step 4) Description Provision of progress data from component manufacturers to finished product manufacturers Provision of quality data from component manufacturers to product manufacturers Provision of circlifu-data from component manufacture 05-05-05-01 Contract proposal flow Contract proposal flow	
ClOF home > Trading Contract ClOF h	Contract proposal flow Management > Contract proposal flow flow 1 2 3 4 5 Next Back 05-05-03 Contract proposal flow CIOF home > Trading Contract Management > Contract Contract proposal flow 1 2	CloF home > Trading Contract Management > Contract (Contract proposal flow 1 2 3 Select Data implementation (Step 5) Provide Consumer Trading name First trading Description The sovereignty of this data is trading on the part of the Contract proposal to: Proposal flo Business Company A Description The company is someth Site Factory B Description The factory is another t	proposal flow
②Selection of service implementation	Select Data implementation (Step 3) Individually Group Public recountent Enterprise Description Site na University of California The west coast of USA, IT Block 1 Tokyo University University in Tokyo, difficult Buildir Company A Some explanation Factor	oup name Service profile (provide) oup name Contract profile me Desc Calif Message I'm looking forward to working with you. g 4 Tok w#4 Saita	
③Selection of business partner	Company A Some explanation Home Company A Some explanation Headq Company A Some explanation Tokyo sales	Iarters Hanc	5 Send confirmation of contents

Trading Application Flow

05-06-03	
	Contract response flow
CIOF home > Trading	ng Contract Management > Contract response flow
Contract response flow 12345 Reject Next Contract	response flow 1 2 3 4 5 Back Next
Confirmation of draft contents (Step 1) Answer time limit 2020/9/3 (Correction possible) Edit of mapping (Step	3) Answer time limit 2020/9/3 (Correction
Provider Consumer Show all Hide all Contract name First trading	ID A9LXA3RL6ELQ4 (3)Data
Contract First trading ID APLXA3RL6ELQ4 Description CIOF's memoral Description CIOF's memoral Date of proposal 2020/9/3 Business partner Business University of Southern California Detail Site North bdg.	ble first trading Date of proposal 2020/9/3 uthern California Detail Site North bdg.
Category Sender Contents Date Proposal side III Use Inquiry Hosei industry OK, if it is paid 2020/7/11 Use Use </td <td>Response III Provide</td>	Response III Provide
Application One ow 05-06-02 Data Machining tem Description Temperature of	perature Data Machining temperature lata while machining Description Temperature data while machining
► Data profile ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓	on Data type Main key Requied Item # Name Description Data type
Service prof OI Record ID Data ident Service prof O2 Service prof O3 Service prof O4 Service	ification Character 🗹 🗹 01 Record ID Data identification Character 🕞 05-06-04
Contract prod Contract response flow Contract response flow Contra	Contract response flow
Confirmation of draft contents (Step 2) Answer time lim	CIOF <u>home</u> > <u>Trading Contract Management</u> > Contract response flow
Contract First trading ID	G Contract response flow
Business University of Southern California Detail Site North bdg.	Edit of mapping (Step 4) Answer time limit 2020/9/3 (Correction possible)
	Contract name First trading ID A9LXA3RL6ELQ4
Name Description Controller Machining temperature Temperature data during machining CTR01 Image: CTR01	Description CIOF's memorable first trading Date of proposal 2020/9/3 Business partner University of Southern California Detail Site North bdg.
Machine operation NC machine operation information CTR01 Image: CTR01 Image: CTR01 Image: CTR01 Use Volume (today) Factory #1 Preliminary production result CTR08 Image: CTR02 Provide Use	Name Description Temperature monitoring service If there is an abnormality, the system will alert you.
	Services Accumulate logs.
2 Data implementation	(A) Service
selection	
	implementation selection

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Service Usage Record (certificate)

Select a trading	Inquire data
contract	
CIOF bome > Trading record management	
G Trading record management	CIOF HCM > Contract proposal flow > List of contracts
List of trading List of data contracts	Trading data usage record Trading data ID GVHSNNQKUMG2 Data name Sensor data output information Description Time series of data obtained from se Provider Hosei university (Ichigaya number 1 Trading name First trading
In program Contract 001 Current sensor abnormal Ho	Data operation records Service operation records Contract name Trading contract001 Send current sensor values on demand for specified devices Business partner Hosei Steel Contract issue 2020/7/2 Category Date & time Even Contract ID JAD2G6
End trad End trad End trad Trading data Usage record	Generation 2020/6/12 14:55:13 Hose Send 2020/6/12 14:55:16 Receive 2020/6/12 14:56:22 Hose For monitoring the operating status of equipment in Line 2 Save 2020/6/12 14:56:25 Hose Data ID
Data name Sensor data output information Description Time series of data obtained from sensors Provider Hosei university (Ichigaya number 1 factory) Trading name First trading	Trading data
Number_Service implement. Service implement. Messages 2 Sensor analysis Results Normal	Date of use 2020/7/2 10:12:34 is abnormal. 2020/7/3 14:10:23 Data usage record
execution record	Issue certificate Number Service Impl. Event Impl. Actual results Messages Date of use 2 Sensor anly. Analysis result Normal 2020/7/2 2020/7/2 10:12:34 2 Sensor anly. Analysis result Abnormal The value in part 2 is abnormal. 2020/7/3 14:10:23

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How to start data trading





Who will benefit from this mechanism?

- 1. End users: Organizations that use data to solve their own management issues (user companies that want to use internal data to strengthen governance, user companies that want to connect with business partners through data to expand their business)
- 2. Device manufacturers: Enterprises that provide products that connect to the outside world with data, such as devices and equipment (manufacturers that provide IoT devices and equipment, and companies that provide network equipment and communication infrastructure).
- 3. Software vendors: Enterprises that provide customers with software that uses external data (business application development vendors, application SaaS providers).
- 4. System integrators: Enterprises that build business systems using devices and software (SI companies that provide integration services, line builders that build production lines that meet required specifications).
- 5. Data analyzers: Enterprises that provide services to companies using business data (enterprises that manage facilities on behalf of companies, such as facility diagnosis and predictive maintenance, or consulting firms that provide diagnosis and guidance using business data).
- 6. Data providers: Enterprises that provide data obtained from their own or other companies for a fee.(Providers engaged in data distribution services, Enterprises that manage credit and quality control with data on behalf of their clients)



Stakeholders of CIOF



End User (small to medium enterprise)



assumptic

scenario

Direct connection between site and office to share the latest problems

Company A, which specializes in processing parts to customer specifications with short delivery times, has been fulfilling urgent orders on a daily basis by going to the site and working together with the site. The new factory, which was completed last year, is located 50 meters away from the office. The company is using CIOF to add new inquiries to the latest operation schedule created by the new factory in an Excel-like format, and is setting reliable delivery dates by referring to drawings and specifications. (S1-1)

Improving profit margin by visualizing actual costs

Company B, which has a mix of one-time individual orders and orders with relatively high repeat orders, has not been able to fully grasp the manufacturing costs and has not been able to link the increase in sales to profits. Until now, the company had not been able to grasp the manufacturing costs sufficiently, and the increase in sales had not been linked to profits. With CIOF, the company was able to collect actual work results, which it had not been able to do in the past, and set prices that took into account depreciation of equipment and workers' rates, which greatly improved the profit margin. (S1-2)

Advanced quality assurance through data-based management

Company C, which specializes in the processing of precision parts for aerospace and medical equipment, records quality data for each lot, process, and facility according to its own standards, in addition to the quality control standards required by the manufacturer, and manages the data as third-party certification data at CIOF. When a quality problem occurred at the manufacturer, the company was able to use these data to prove that there was no quality problem with the parts it provided. (S1-3)



End User (large company)

Real remote operation of overseas sites

Company A, a major manufacturer of electronic devices, transferred part of its production capacity from its factory in China to an expanded factory in Hanoi, Vietnam. At this time, in order to have a part of the functions of the domestic mother factory, CIOF made it possible to grasp the data at the time of the start-up of the local production line online in Japan, so that the moderate production line could be handled locally. (S2-1)



Inventory of data assets and effective utilization across departments

Company B, a manufacturer of office precision equipment, obtained a foothold for overseas expansion by integrating Company S, a medium-sized European manufacturer, through M&A. In order to integrate the operations of a local factory with low productivity, CIOF conducted an inventory of the current data assets to identify problems and achieved management integration without significantly changing the current production process. (S2-2)

Understanding the ROI situation of IT investment in factories

Company C, a general manufacturer of industrial machinery, has a wide range of business divisions, and each division has been promoting its own IT system. The company's management policy emphasizes independence and diversity, so it does not integrate its IT systems. However, CIOF has enabled the company to grasp the return on investment of IT through common guidelines and KPIs, and to reduce costs significantly by consolidating functions that can be shared. (S2-3)



End User (common)

Seamless collaboration with business partners at field level

Company A, which delivers an average of 2,000 units per item per day and 70 items daily to a major automobile manufacturer, required Company S, which outsources part of its production process, to inspect all items at the time of shipment. In exchange for sharing the in-process inspection data through CIOF, the company switched to spot checks at the time of shipment, but quality errors were reduced and the kanban cycle was shortened to 48 hours. (S3-1)



Correspondence to servitization and knowledge consolidation of manufacturing

Company B, which manufactures and sells welfare-related equipment, has a short product life cycle, releasing a new product every year on average, but it also has a 10-year supply obligation for maintenance parts for products sold in the past. CIOF keeps the data not as inventory but as data on production methods, and a start-up company specializing in manufacturing services takes care of the whole process. (S3-2)

Improving skills of on-site workers, skill transfer and BCP support

Company C, where the number of on-site workers is aging, although the company has established ISO and internal standards, it has not been able to update them in response to new customer demands and daily kaizen, resulting in a gap with the actual situation. After first grasping how to proceed with the work of veteran technicians by CIOF, the ideal form that can be realized is set and it is used as a checklist for skill transfer and BCP is set. (S3-3)



Edge Platformer

Essential sales promotion tools for overseas expansion (China, EU)

Company A, a manufacturer of manufacturing equipment with an overseas sales ratio of over 50%, has sales offices around the world and is growing with the new wave of digitalization. As the need for integration with higher-level ERP systems has increased, open CIOF-compliant equipment that connects with local ERP vendors has become a requirement for procurement, contributing greatly to the development of new overseas markets. (S4-1)



Win-win business development through partnerships

Company B, a manufacturer of FA devices, provides software for design and installation of FA equipment and production lines, and offers its partners a system integration environment using its products. Until now, the company has mainly focused on connections between devices, but CIOF has expanded its sales channels by making it possible to link with external software beyond the edge. (S4-2)

Strengthening sales network and building value for integrators

Company C, a major domestic manufacturer of factory automation equipment, has organized system integrator (SI) companies that handle its equipment to share technical and market information and improve customer value to end users. Since CIOF provides information on actual device usage of end users, it is used for sales promotion and strategic planning. (S4-3)



IT Platformers and SaaS Providers

Deployment of conventional applications with a billing system based on the number of times the application is used

Company A developed and sold an application for equipment operation management, but the application could only be used in the factory where the operation data was available, and although there was a cloud version of the application, sales were sluggish because the data could not be sent outside the company due to strong customer demand. With CIOF, even for on-premise software, the minimum amount of data required can be acquired and billed on the cloud side. (S5-1)



Collect data externally that provided application needs

Company B, which provides equipment diagnosis and failure prediction systems as a SaaS service in the cloud, could improve its accuracy by collecting more operation and failure data from more types of equipment, but it was unable to proceed beyond the demonstration experiment. CIOF has enabled us to obtain data from new case study companies and put the business on track. (S5-2)

Expanding the platform's functionality with a variety of applications

Company C, which provides software on the cloud as a total solution with applications that are well established in their respective fields, has developed its own mechanism for data integration and is requesting each application to respond. CIOF has made the connection even easier and cheaper, and has brought together an unprecedented number of small-scale, excellent applications with enhanced functions. (S5-3)



System Integrator (line builder)

Reduction of integration costs

Company A, which derives 70% of its sales from the construction of production lines for a major manufacturing company, Company S, collects data from the various machine tools and equipment that make up its customers' production lines, and provides a system for visualizing the entire factory. With CIOF, the company has been able to significantly reduce individual integration costs and invest resources in building a higher value-added system. (S6-1)



Connecting with new vendors and suppliers

Company B, a line builder specializing in automation of production lines for medical machines, has business with more than 100 equipment vendors, equipment manufacturers, and software vendors in Japan and overseas. The pace of technological progress is rapid due to the advancement of digitalization, but by referring to CIOF profiles, the company is always able to collaborate with partners that have the best technology. (S6-2)

Connecting with customers and feedback

Company C, which provides turnkey automated production lines with short delivery times, mainly for small and medium-sized manufacturers, was unable to secure enough staff to provide after-sales support after the system was installed. With CIOF, the operation history of the production system is monitored and accumulated at the factory side, and effective support using such data has become possible. (S6-3)





Reduction data collection costs and separation of operations

Company A, a start-up company that provides outsourced quality inspection services using AI, used to go to the designated production line for each of its customers, install the equipment, verify the data, and even negotiate the contract details individually. With CIOF, the company no longer needs to deal with the man-hours required to set up the system for each individual customer, and scalability has been greatly improved. (S7-1)



Acquisition of trial data for new development and functional verification

Company B received a request for a new data utilization from Company X, a major manufacturing company that was already using CIOF to manage a variety of data, and started to test a hypothesis based on a novel idea. Through a contract limited to verification purposes, appropriate data was selected from the CIOF profile, and a new feasible data utilization was proposed. (S7-2)

Expansion of data dictionaries and ensuring interoperability

Company C, which provides information on equipment failure prediction based on a broader range of factual data, wanted to collect failure data from as many companies as possible so that the format of the dictionary would be easily accepted by the companies providing the failure data. By adopting the most frequently used dictionaries registered in the CIOF in order, the company was able to collect more data than ever before. (S7-3)





Providing services through superior and diverse data sources

Company A, which develops a business of purchasing equipment operation data and inventory data from factories and selling them for a fee to the target factory's business partners and financial institutions, uses CIOF to map customer requests to specific and actually collectable data provided by the target company, compiles the data, and reports it to the customer on demand. (S8-1)



Guarantee of source of data used for service

Company B, a start-up company that develops AI business based on big data, decided to improve the learning accuracy of the AI and ensure the quality of the data by developing a profile of the sources of the collected data. With the CIOF, all the training data of the AI is managed by IDs, and the provider, the actual machine ID, and the location of the device can be identified. (S8-2)

Gradual scaling up of data distribution business

Company C, a start-up company, has developed a business model in which it receives know-how of data processing technology in the form of a profile from the data provider and receives a margin when the data user uses it as a new form of data distribution. CIOF provides high security and traceability. (S8-3)



- 1. Views on Data
- 2. Features and Purpose of CIOF
- 3. System Overview and Procedure of Usage
- 4. Stakeholders and Use Cases
- 5. IVI Activities and Next Steps







🛲 MITSUBISHI HITACHI POWER SYSTEMS

IVI member	NEDO – CIOF Project Member companies	Currently in the second phase of development (project completed in March 2022)
	IVI Regular member / Support member / Implementation member	Component application is required (reception starts from October 9th)
	IVI regular member (Companies with factories or business facilities)	Demonstration experiments at IVI Business Scenario 2020 (completed in March 2021)
Non-member	IT company (Component development company or integrator)	API information and technical information are public, samples and SDK are not public.
	Companies with factories or business facilities and their business partners	Use of IVI components is possible for both members and non-members



2020 Business Scenario WG (Current Status)

WG	Working Group Name	Facilitator Company
6A01	Automated inspection platform: A paradise of use	CKD Corporation
6A02	Edge and remote on-site support	Mitsubishi Electric Corporation
6A03	Improvement of die-cast cylinder block material quality	Mitsubishi Electric Corporation
6A04	Realization of low-cost information acquisition for product management	Leimac Ltd.
6B01	Predictive maintenance of consumable parts in production machines	KURITA SANGYOH CO., LTD.
6C01	Automation of parts storage logistics through remote control of transport equipment	MAZDA Motor Corporation
6C02	Improvement in productivity of production line with AI, Part 4	MAZDA Motor Corporation
6C03	Visualization of human and product performance $-III$ (Pursuit of next-generation IE)	MAZDA Motor Corporation
6C04	Remote-control of manufacturing processes (visual inspection)	NIKON CORPORATION
6C05	Visualization process capability to improve business efficiency	Kobe Steel, Ltd.
6E01	Innovation in "transportation of goods" that does not create value- Analysis-	SERENDIP HOLDINGS Co., Ltd.
6E02	How to make connections that works for mass customization	IHI Corporation
6E03	IVI-type manufacturing evolution with edge AI and data distribution	TOSHIBA CORPORATION

A: Quality assurance and design, B: Equipment and maintenance, C: Kaizen and total optimization, D: Integration of filed and management, E: Linkage between companies



Business Scenario WG / Call for Solutions





Future Deployment



- Service design
- Infrastructure construction

NEDO

project

- ◆2021
 - Demonstration experiment
 - Marketing

◆2022

- Service in
- International expansion



Hannover Messe 2021

De facto / de jure standard
Development of domain standard dictionary
Fair trade rules for data
Overseas expansion, global distribution
Security and trust support
Strengthen infrastructure, establish reliability
SME support (cost and human resources)



IVI Platform Component Application

https://pfcp.iv-i.org/wp/

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IV December 2020 概	要 プラットフォーム コンボーネント 参加				
Overview Overview					
AL ROLATON	世史 Platform· zozo 一 Component zozo 一 の 一 こ の 一 こ つ ン ポーネント 参加				
Three features of the IVI platform components					
	-Manufacturing takes center stage-	-Open Ecosystem-	-Data management as intellectual property-		
IVI Platform Componen	ものづくりを実践する企業にとっての 価値を最大化することを第一の目的と します。	構成するコンポーネントについて、オ ープンな仕様にもとづくエコシステム とします。	企業データの所有者は企業自身とし、 ボトムアップなしくみづくりを可能と します。		
	ものづくり企業のものづくり企業によりものづくり企業のためのプラットフォームとして、コストを抑え、効果を最大化することで、結果としてIT企業にとっても大きなメリットがあるしくみとします。	個別の機能を提供するコンポーネント として、顧客の要望によって、その都 度異なるプラットフォーム上で稼働で きる環境を作ります。これにより、プ ラットフォームの側は、より多くのす ぐれたコンポーネントを集めるために さらにつなげる機能が向上していくこ とを狙っています。	プラットフォームで扱うデータは、一 義的にはものづくり企業のものです。 IVIプラットフォームでは、原則と して製造業のエッジ側で得られたデー タに関する権利は、その製造業が保持 するものとし、ものづくりの技術やノ ウハウの健全な取引を支援します。		

(C) 2020. Industrial Value Chain Initiative 70

IVI Platform Component Application





Committees / WGs

- General Planning Committee / Standard Business WG
 - IVRA promotion and awareness and international expansion
 - Smart thinking standardization
 - CIOF component authentication
- Business Cooperation Committee /
 - Platform WG
 - IVI modeler and smart thinking development
 - Common dictionary / template development
 - CIOF business model construction support






- Monthly web meeting (from 15:30 on 3rd Thursdays)
- Conducted as a joint WG within this year (Prf. Nishioka participates)
- New member subscriptions starts from the symposium in October
- The first session will include guidance, on Thursday, October 15th.
- SWG activities starts from December, to set the goals
- The final goals are to make reports in March
 - \rightarrow To be announced at Hannover Messe

You can register on the IVI member page. After October 10th, please contact the IVI secretariat

Member page → Group → Standard Business 2020 / Platform Joint WG

----- How to participate

	Value Initia	strial Chain tive	0-
メンバー	ホーム 業務シナリオ 🗸	グループ	ディスカッシ
	グループ		
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検索		Q	
活動中	ワーキンググループ	プラットフォー	ームオーブ
略称	グループ名		

	October 15th (Thu.)	IVRA-Next / CIOF Commentary & Discussion	
ション	November 19th (Thu.)	CIOF Implementation / IVI Modeler	
		commentary & discussion	
	December 17th (Thu.)	Business Scenario WG 2020 Analysis	
	January 21st(Thu.)	Activities divided into individual WGs	
-1-,->	February 18th (Thu.)	Activities divided into individual WGs	
	March 18 th (Thu.)	Report Summary	1
		V	

Notice from IVI

IVI Open Symp ~ The manufacturing re	OSII evolu	um 2020 -Autumn- ition is underway despite the	12:15	Genera	al moderator: Hideaki Nishimura	
effects of the coronavirus ~			12:30) (Oper	ning Remarks] Watanabe, IVI Director of Sec.	
Organized by: Industrial Va	lue C	Chain Initiative (IVI)		ruji	watanabe, fvi Director of Sec	
Date and time: October 08, 2020 12: 30-18: 40			12:40	[Invited Lecture] "Management 'At Your Side' with f		
Place: Part 1 : Web distribution, delivered by Youtube Live			-	Tosh	oshikazu Koike, Emeritus Chairn	
Part 2 :Web conferencing, mutual exchange by MS Teams			【IVI Opinion】 "Digitalization, Dataization and the fu Yasuyuki Nishioka, IVI president (I			
Participation fee: Free 15:00 Break Time			[Introduction of excellent cases of I			
			14:00	16:30	Break Time	
	15:1 <mark>0</mark>	[Lecture] "Overcome new normal manufacturing with Smart Thinking" Hideaki Nishimura, IVI Chief Organizer (Brother Industries, Ltd	52 92 5092 m	16:40	[Highlight of Advanced Stu Introduction of group activity Subcommittee	
	15:30	[Report to current progress of Business Scenario WG, 2020] Hiroyuki Mizuno, Chairman, IVI Business Cooperation Committee (CKD) Presenters of Scenario WGs **See "Reports of Business Scenario WG, 2020" for presenters.		10.40	Koji Tomita Chairman, IVI Toshiaki Hirata Project Ma Subcommittee (Computron)	
We look forward to your participations to the symposium.			5	17:00	[IVI Panel discussion] "Wisdom, Knowledge and In epidemic" Osamu Horimizu, IVI Fello	

[Part 1] Opening , IVI Chief Organizer (Brother Industries, Ltd.) retariat ta" nan, Brother Industries, Ltd. uture of Value Economy" Professor, Hosei University) Business Scenario WG, 2019) udy Group] y: Al and Deep Learning Applied Research General Planning Committee (Yaskawa Electric) anager, IVI AI and Deep Leaning Applied Research nsight of manufacturing to survive the Coronavirus ow (Hitachi, Ltd.) Yukihide Seki, IVI Fellow (NEC) 74

Satoshi Noguchi,

Mitsubishi Electric



Session 1:Everyone is happy with a little more effort. Move forward with wisdom and ingenuity.

WG number	Title of Business Scenario WG	Presenter
6E02	How to connect for mass customization	Hiroshi Yamamoto, IHI
6C05	Improving operational efficiency by visualizing process capability	Ryosuke Fujita, Kobe Steel, Ltd.
6B01	Predictive maintenance of consumable parts in production equipment	Atsushi Moroshita, Kurita Industry
6A04	Realization of low-cost information acquisition for product management	Hiroshi Toozuka, Leimac
Session 2: I	mplementation heaven / Analysis paradise, Two to	ps of IoT
6C02	Improvement in productivity of production line by AI, Forth report	Hidenori Ichimoto, Mazda
6A01	Inspection automation platform, utilization heaven	Hiroshi Honda, CKD

Die-cast cylinder block material quality improvement

There will be an online social gathering from 17:40. Please participate in the venue for direct questions to the presenters of WGs and the venue for discussions (in charge of Prof. Nishioka) of the CIOF to deepen your understanding.

Session 3: Transport that cannot be self-restrained should be three steps, such as visualization, independence and automation.

6C01	Parts storage logistics automation by remote control of transport equipment	Taishi Okuya, Mazda
6E01	Innovation and analysis of "Transport of goods" which does not create value	n Keisuke Oshima, Serendip HLDGs
6C03	Visualization of achievements of people and things, part 3 (Next generation IE pursuit)	Arata Yoshioka, Mazda
Session	4: To go to the scene in distance, that is connecting fo	ormation.
6C04	Remote manufacturing process (Visual inspection)	Taiki Seto, NIKON
6E03	IVI type manufacturing evolution with edge AI and data distribution	Yasuo Matsuoka, Toshiba
6A02	Edge and remote on-site support	Yasuhiro Yoshimoto, Mitsubishi Electric



6A03

Industrial Value Chain Initiative