Digital Architecture
Design Center

July 9, 2021

Future Society Created by Architecture -The Efforts of DADC

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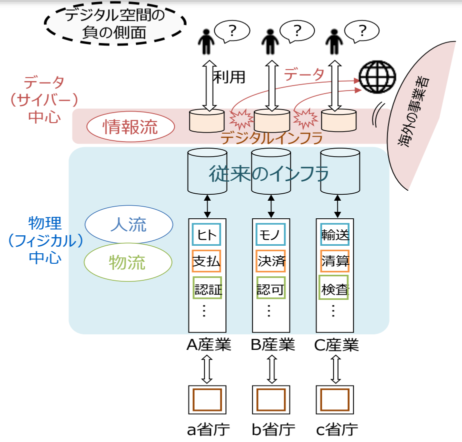
IPA Better Life with IT

Issues for the realization of Society 5.0

-Changing the Structure of Industry from a Vertical System to a Horizontal System-

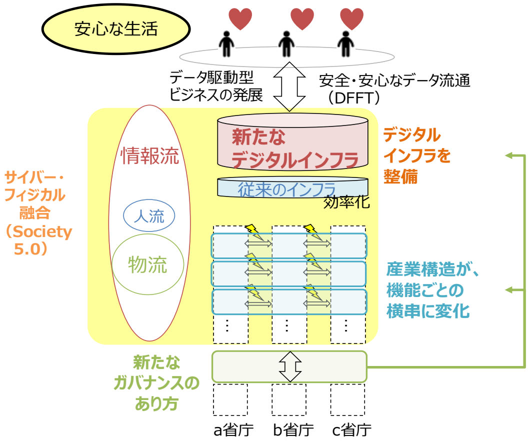
- ✓ **Society 5.0 is a human-centric society. It is important to enhance industrial competitiveness, ensure safety and security, and build a society in which people can live in prosperity by changing the structure from the conventional vertically divided regulatory/industry structure to a layered structure that horizontally develops digital infrastructure for each function across different areas, based on the emergence of new technologies.**
- ✓ **To realize such a structural shift, architecture as a society-wide blueprint is essential.**


デジタル空間の負の側面
?
?
?
利用
データ
データ
（サイバー）
中心
情報流
デジタルインフラ
海外の事業者
従来のインフラ
物理
（フィジカル）
中心
人流
物流
ヒト
支払
認証
モノ
決済
認可
輸送
清算
検査
A産業
B産業
C産業
a省庁
b省庁
c省庁

01 **Developing individual digital infrastructures based on the industrial structure of each occupation**

02 **Governance by regulations is also divided vertically for each ministry and based on physical elements not on data (cyber).**

03 **Under disorganized infrastructures, Japanese companies cannot run perform fully data-driven business. There is a possibility that data will not accumulate in Japan and may flow out abroad.**


安心な生活
データ駆動型
ビジネスの発展
安全・安心なデータ流通
（DFFT）
サイバー・
フィジカル
融合
（Society
5.0）
情報流
人流
物流
新たな
デジタルインフラ
従来のインフラ
効率化
デジタル
インフラを
整備
産業構造が、
機能ごとの
横串に変化
新たな
ガバナンスの
あり方
a省庁
b省庁
c省庁

01 **Designing an overall blueprint (architecture) for connecting systems with an eye to the future of the digital market.**

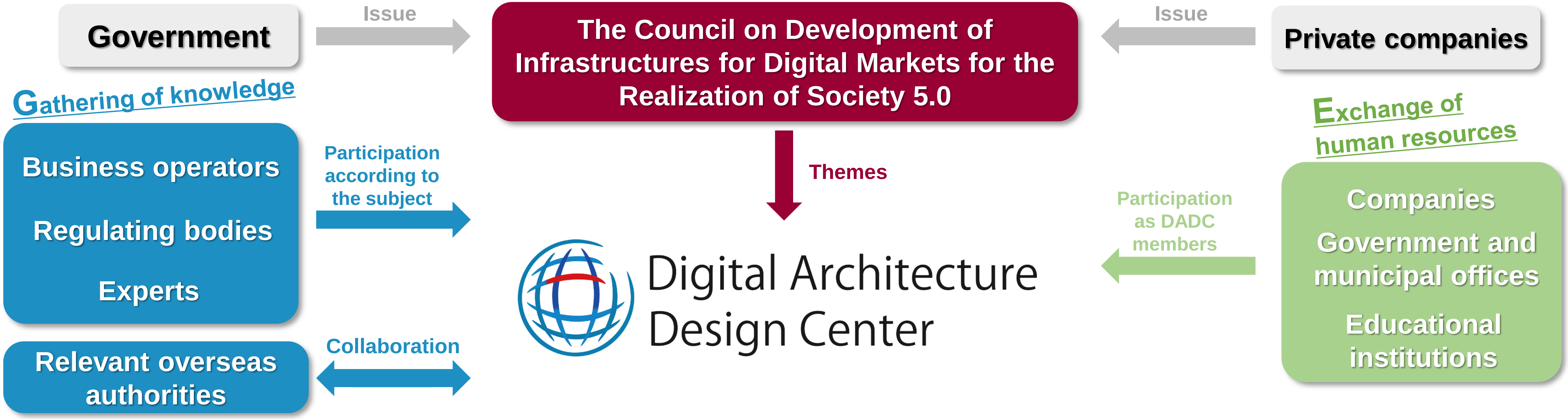
02 **Based on the architecture, develop a new digital infrastructure horizontally in consideration of total optimization. Japanese companies can be leaders.**

03 **As a result, industries of data-driven business will be developed in Japan, industrial competitiveness will be enhanced, and safe and secure distribution of data with consideration for personal data will be ensured.**

Source: 1st meeting of the Council on Development of Infrastructures for Digital Markets for the Realization of Society 5.0, October 16, 2020

Positioning of the DADC (Digital Architecture Design Center)

- ✓ While involving stakeholders from industry, academia, and the government flexibly and smoothly at the request of the government and private companies, the DADC designs architecture for realizing Society 5.0 in a neutral and transparent manner centering on the collaborative area based on global trends. Advanced knowledge is accumulated by the DADC and is also linked to human resource development.
- ✓ The relationship with the Digital Agency has also been clarified. The Priority Policy Program for the Realization of a Digital Society which was approved in the Cabinet meeting held on June 18 clearly stipulates that the Digital Agency and the DADC will work together to organize architecture design technologically for each area that is focused on, and accumulate the knowledge gained from their efforts.



Government

Issue

The Council on Development of Infrastructures for Digital Markets for the Realization of Society 5.0

Issue

Private companies

Gathering of knowledge

Business operators

Regulating bodies

Experts

Participation according to the subject

Themes

Digital Architecture Design Center

Exchange of human resources

Participation as DADC members

Companies

Government and municipal offices

Educational institutions

Relevant overseas authorities

Collaboration

The DADC was founded with the goal of becoming a transparent and neutral institute to which comprehensive knowledge from various collaborations between industry, academia, and the government is gathered.
It accumulates advanced knowledge and continuously contributes to society.

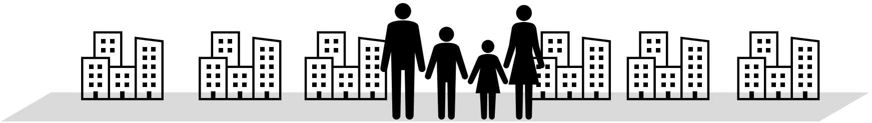
Founded on May 15, 2021, which was the implementation date of the Reform Act on Facilitation of Information Processing

Direction of efforts for developing the digital market infrastructure which stimulates conversion of the structure of industry (Revised edition)

How society should be in the future

Issues to be considered based on human nature

- **UX =** Society that **revolves around "things"**
- Society in which **humans and machines (AI and robots) coexist**
- Society in which **data/AI make judgments instead of humans**
- Society in which **harmony among people is regained**
- Society in which **information is shared equally**



"A human-centric society in which both economic development and solution of societal challenges are achieved: Realization of Society 5.0"

Human & Machine & Organization

Service delivery with optimum UI/UX

Approach from Artifacts ⟷ **Fusion** ⟷ **Approach from the Concept**

Design principles focusing on a human-centric/human society ⟷ **Governance that realizes cooperation** — Seek governance and rules

- **Governance that can apply vertical-horizontal cooperation to society**
  - How contracts and risks/responsibilities (distribution) in digital society should be
  - Mechanisms to ensure the comprehensive reliability of the entire system

How a dynamic social system that can flexibly respond to VUCA* and the speed of environmental change should be ⟷ **Horizontal coordination** — Standardization of functions (applications) and data

- **Modular structure that mutually connects services individuals have developed**
  - Establishment of a service infrastructure using algorithms suited for human behavior
  - Control of things/establishment of a control infrastructure
  - Establishment of a data-centric (market/society) trading infrastructure
  - Standardization of the common data model for society and establishment of a utilization infrastructure (base registry)

How the distribution of safe and secure data and the trust that supports CPS should be ⟷ **Coordination of vertical elements** — Development of a CPS implementation environment

- **A layered structure that connects both Cyber and Physical safely and efficiently while maintaining reliability**
  - Next-generation cloud infrastructure that also supports OT
  - Establishment of a versatile distributed processing model

*VUCA: Volatility, Uncertainty, Complexity, and Ambiguity

Direction of efforts for developing the digital market infrastructure which stimulates conversion of the structure of industry (Revised edition)

How society should be in the future

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- **UX =** Society that revolves around "things"
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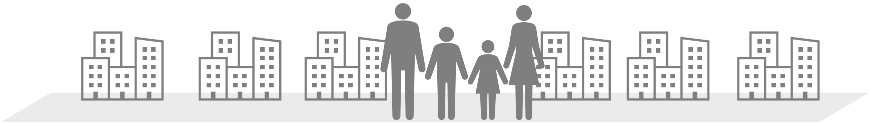


"A **human-centric** society in which both economic development and solution of societal challenges are achieved: Realization of Society 5.0"

Human & Machine & Organization

Service delivery with optimum UI/UX

Approach from Artifacts — **Fusion** — Approach from the Concept

Design principles focusing on a human-centric/human society

How a dynamic social system that can flexibly respond to VUCA* and the speed of environmental change should be

How the distribution of safe and secure data and the trust that supports CPS should be

Governance that realizes cooperation

Seek governance and rules

Governance that can apply vertical-horizontal cooperation to society

Smart Safety project

- How contracts and risks/responsibilities (distribution) in digital society should be
- Mechanisms to ensure the comprehensive reliability of the entire system

Horizontal coordination

Standardization of functions (applications) and data

Modular structure that mutually connects services individuals have developed

MaaS project

- Establishment of a service infrastructure using algorithms suited for human behavior
- Control of things/establishment of a control infrastructure
- Establishment of a data-centric (market/society) trading infrastructure
- Standardization of the common data model for society and establishment of a utilization infrastructure (base registry)

Coordination of vertical elements

Development of a CPS implementation environment

A layered structure that connects both Cyber and Physical safely and efficientl

Drone project

- Next-generation cloud infrastructure that also supports OT
- Establishment of a versatile distributed processing model

*VUCA: Volatility, Uncertainty, Complexity, and Ambiguity

Collaboration with private companies (Implementation of the Incubation Lab)

✓ The DADC responds to requests not only from the government but also from private companies and carries out architecture design to realize Society 5.0 (The Incubation Lab).

- ➢ As the first Incubation Lab, we conducted a feasibility study for six months on the subjects we adopted last October. Work on one of the subjects is in full swing and we have been implementing architecture design continuously.
- ➢ For the second Incubation Lab, we asked for subjects in May and adopted two. We then started a feasibility study in July.

1st Incubation Lab (Activities already finished) [October 2020 - March 2021]

Theme (1) Consideration of the architecture for realizing a governance model that ensures the safety and security for more pervasive use of service robots and a business eco system including related industries

Examination results It is important to make the collaborative area more concrete, and the DADC should officially examine the subject.

Theme (2) Consideration of architecture that enables the distribution and use of data among multiple areas after having ensured the reliability through the third-party data transaction function

Examination results Examination of the use cases should be important and given priority; therefore, the DADC should facilitate activities centering around business operators, and at the same time, participate in such activities as needed.

2nd Incubation Lab (Subjects determined) [From July 2021]

Theme (1) Intelligent building architecture as infrastructure for Society 5.0

[Details] Consideration a smart building architecture with a collaborative area of "building OS" (a data linkage platform that links building equipment and various services and accelerates application development), which aims to further evolve Smart Cities and create new added value.

Theme (2) Consideration of guidelines for digital identification corresponding to services

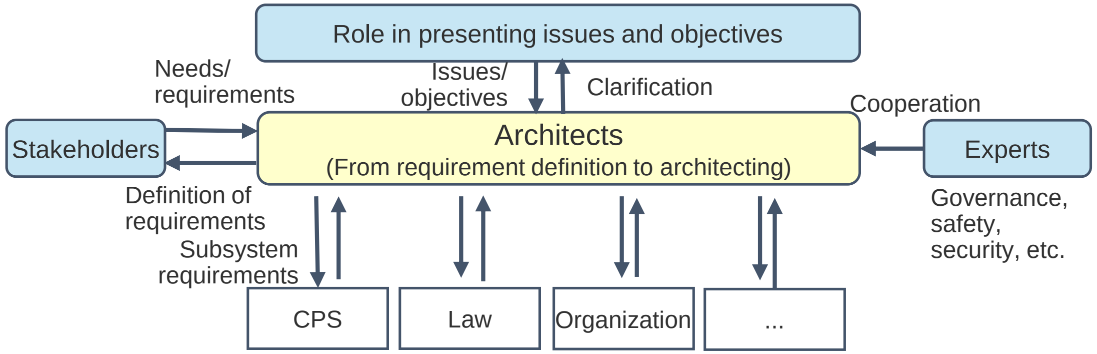
[Details] In consideration of the trends of overseas business and standardization, we concretely delineate a picture of the future of the society and industrial structure to be realized by the future digital identification (identification/personal authentication) and perform architecting toward the realization of the delineation. We will focus on examining the collaborative area for digital identification in which a variety of services and infrastructures can be complied with and organize our examination as guidelines.

Efforts for human resource development

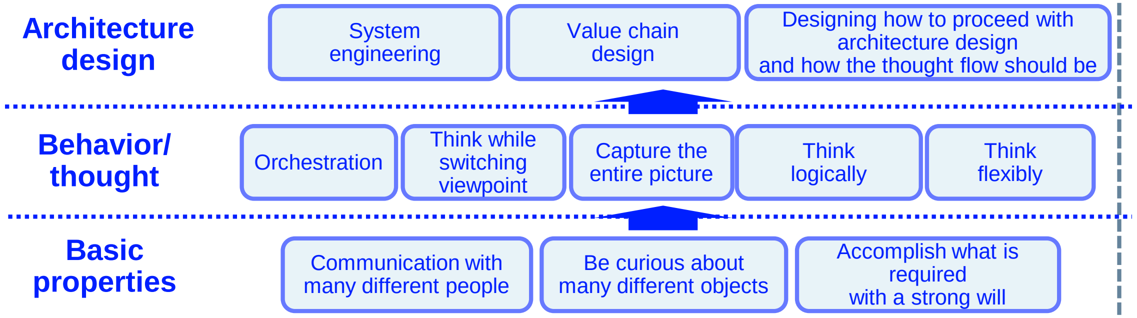
- ✓ To develop the **human resources (architects) who design architecture including industrial structure/governance changes** toward the realization of Society 5.0, the DADC **clarified roles** of the architects and **defined human resources** who could fulfill those roles last year.
- ✓ This fiscal year, to develop architects effectively, we will examine a **curriculum including places for acquiring knowledge and getting actual experience (OJT/PBL)** as well as a **system for human resources who are suitable to become architects to continuously participate in DADC activities and grow as architects**.

Last year's efforts: Clarification of human resources to be developed

Outline/definition of architects' roles

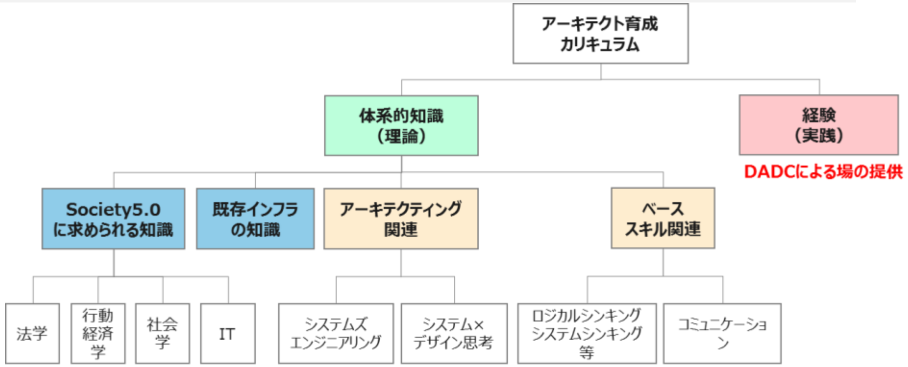

Role in presenting issues and objectives
Needs/
requirements
Issues/
objectives
Clarification
Cooperation
Stakeholders
Architects
(From requirement definition to architecting)
Experts
Definition of
requirements
Subsystem
requirements
Governance,
safety,
security, etc.
CPS
Law
Organization
...

Outline of the definition of human resources who are suitable to become architects

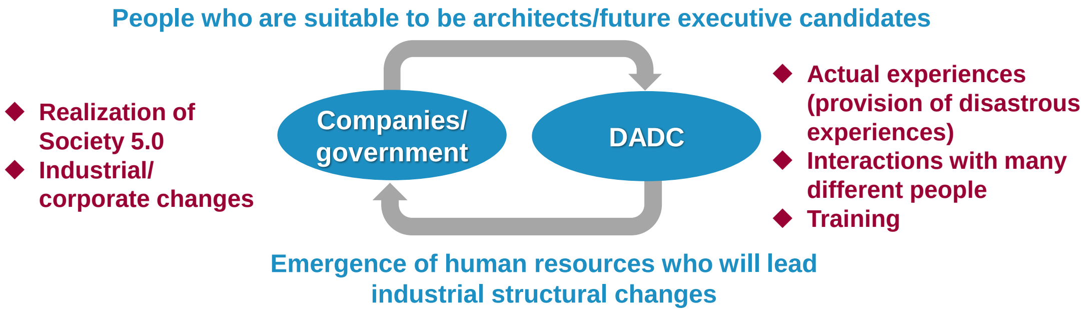

Architecture
design
System
engineering
Value chain
design
Designing how to proceed with
architecture design
and how the thought flow should be
Behavior/
thought
Orchestration
Think while
switching
viewpoint
Capture the
entire picture
Think
logically
Think
flexibly
Basic
properties
Communication with
many different people
Be curious about
many different objects
Accomplish what is
required
with a strong will

This year's plan: Creation of a system for human resource development

Consideration of a training curriculum for developing architects


アーキテクト育成
カリキュラム
体系的知識
（理論）
経験
（実践）
DADCによる場の提供
Society5.0
に求められる知識
既存インフラ
の知識
アーキテクティング
関連
ベース
スキル関連
法学
行動
経済
学
社会
学
IT
システムズ
エンジニアリング
システム×
デザイン思考
ロジカルシンキング
システムシンキング
等
コミュニケーショ
ン

Examination of a system that continuously develops architects

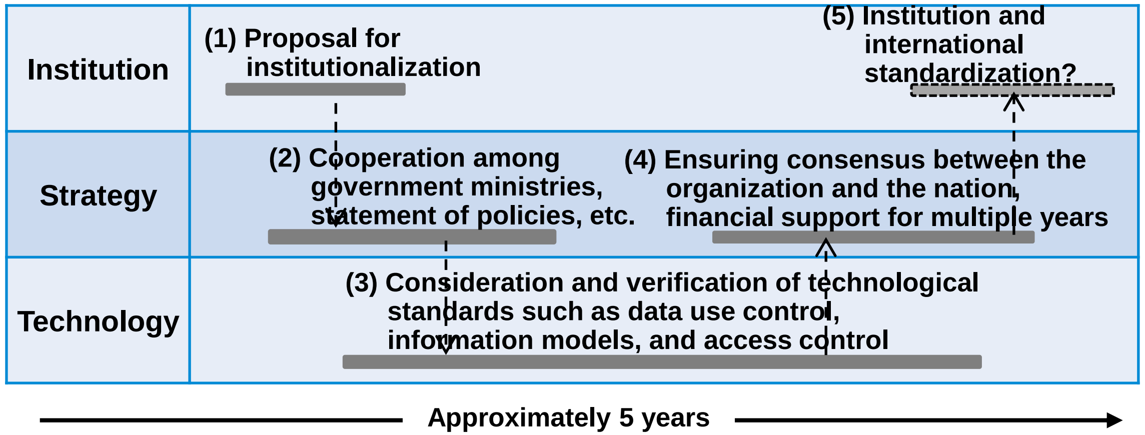

People who are suitable to be architects/future executive candidates
◆ Realization of
Society 5.0
◆ Industrial/
corporate changes
Companies/
government
DADC
◆ Actual experiences
(provision of disastrous
experiences)
◆ Interactions with many
different people
◆ Training
Emergence of human resources who will lead
industrial structural changes

International research related to social implementation of architecture

- ✓ The DADC has analyzed practices, such as GAIA-X, which are being promoted overseas. As a result, we have found out that the implementation of the new social infrastructure will take several years, including both the public and private sectors working together to promote institutional design and technological development, as well as issuing statements for broad collaboration with stakeholders in Japan and overseas. It is important that these activities are performed continuously for several years.
- ✓ We will continuously perform the investigations and analysis required to build an industry-academia-government eco system for designing and implementing the architecture that the DADC is promoting, and make necessary recommendations to the Japanese government and the industrial world.

Major achievements in 2020

- We have investigated practices such as the GAIA-X project in Europe, PI4.0 (Plattform Industrie 4.0) in Germany, and NIST (the National Institute of Standards and Technology) in the U.S. We have designed a new social infrastructure (for example, a data linkage platform) across multiple industries as an area for collaboration and analyzed the flow to social implementation.
- **What these practices have in common is** that they all have been not only focusing on the quality of the design itself but also **facilitating consensus-building efforts for wide use of the design results, from a strategic perspective, since the early stages**.



Institution

(1) Proposal for institutionalization

(5) Institution and international standardization?

Strategy

(2) Cooperation among government ministries, statement of policies, etc.

(4) Ensuring consensus between the organization and the nation, financial support for multiple years

Technology

(3) Consideration and verification of technological standards such as data control, information models, and access control

Approximately 5 years

Figure: Flow to social implementation in EU (Image)

Strategic activities	Examples of GAIA-X and PI4.0
(1)	• The European Commission released GDPR (personal data protection, enacted in 2016) and an EU-wide data strategy (company/industry data, released in 2017).
(2)	• PI4.0 was launched through collaboration between multiple government ministries and industries and disseminating "Vision 2030", which describes a future digital eco system (June 2019). • The German and French ministers declared the launch of the GAIA-X project in October 2019, and GAIA-X was launched officially by 22 German and French companies and organizations in September 2020.
(3)	• The IDSA (International Data Spaces Association) formulated authentication standards (data use control, information model, access control, etc.) to be applied technologically under GAIA-X in March 2020. • To carry out technological demonstrations and improvement of GAIA-X, more than 50 use cases were implemented in 9 areas. "GAIA-X Hub", to which the verification members belong, was organized and constantly releases information regarding its efforts and members on the GAIA-X website.
(4)	• In the declaration of 26 Cabinet-level representatives in EU for the creation of the EU cloud, they announced that 2 billion euros would be contributed between 2021 and 2027, and GAIA-X would be positioned as the leading project (October 2020). • BMWi (The Federal Ministry for Economic Affairs and Energy) in Germany announced that a fund of 186.8 million euros would be provided in total to companies (especially small and medium-sized companies) which use GAIA-X in a practical manner by 2024 (March 2021). • More than 500 organizations from around the world have participated in GAIA-X. To realize Vision 2030, Germany is also promoting bilateral partnerships with France, the Netherlands, the U.S., and Japan for PI4.0.
(5)	• With regard to GAIA-X, standards relating to institutions, industries, and technologies will be examined continuously with relevant organizations both inside and outside of the EU.

For future development

- ✓ One year has already passed since the DADC was founded. While embodying the whole picture of Society 5.0 in a layered structure, we have carried out activities such as three projects as use cases, human resource development, and international investigations in order to realize the Society 5.0 project.
- ✓ We still have a long way to go to reach the goal of the DADC. We need to further strengthen the driving force for the project, clarify and increase awareness of its positioning in society, and improve organizational resources.

- ● Toward the realization of Society 5.0, we want to accumulate advanced knowledge including design methods and frameworks related to architecture, develop human resources who will use this knowledge, and continuously contribute to society.
- ● We want everyone to take an active interest in architecture and the DADC's activities, and we also want you to participate in the DADC's activities in terms of business transformation and human resource development.

* Please visit the DADC website. -> https://www.ipa.go.jp/dadc

On the website we have also posted messages from our advisory board members for the first anniversary of the DADC.

Advisory board members

The advisory board has been set up as an advisory panel of experts who give advice on the concrete direction of architecture design implemented by the DADC from a professional perspective.

(Chairman)
Professor, Graduate School of System Design and Management, Keio University
Shirasaka Seiko

Professor, Graduate School of Law / Faculty of Law, Kyoto University
Inatani Tatsuhiko

PKSHA Technology Inc.
CEO
Uenoyama Katsuya

Professor, School of Engineering, The University of Tokyo
Umeda Yasushi

Woven Planet Holdings
Vice-President of Business Development and Strategy
Saijo Hiroshi

Kiduki Architect Inc.
CEO, and
Roland Berger Holding GmbH
Senior Advisor
Nagashima Satoshi

Smart City Institute Japan
Executive Director, and
Mitsubishi UFJ Research and Consulting Co., Ltd.
Senior Managing Executive Officer, Corporate Planning & Management Division
Nagumo Takehiko

Fujitsu Limited
Corporate Executive Officer, CIO, Deputy CDXO
Fukuda Yuzuru

OMRON Corporation
Representative Director, Senior Managing Director, CTO, and
Senior General Manager of Intellectual Property HQ
Miyata Kiichiro

Scrum Ventures
Founder and General Partner
Miyata Takuya

(Observer)
Japan Investment Corporation
Member of the Board, CSO
Fukumoto Takuya