Tentative translation

The Conference toward AI Network Society

The Committee on AI Economy

2022 Report

December 23, 2022

Contents

Introduction

A wealth of information from AI and IoT is being accumulated and utilized as societal implementation of such technologies progresses. The impact of data use is increasing over time. To enhance the effects of data utilization, the importance of data sharing and distribution is becoming increasingly recognized, but it is becoming clearer that there are barriers due to concern over personal data use and the need to secure sufficient data analysis personnel.

In an effort to maximize the value brought about by data, it is necessary to deal appropriately with privacy and security concerns. The promotion of Data Free Flow with Trust (DFFT) globally to maintain and build trust is under ongoing discussion. In the EU, the Proposal for Regulations Establishing Harmonized Rules for Artificial Intelligence was announced along with the Data Governance Act and the Data Act under the European Data Strategy. Specific regulations on data distribution are emerging as well.

Japan has begun moving toward the digitalization of the entire country. The Cabinet approved a comprehensive data strategy in June 2021 with the aim of becoming a world-class digital nation, and the Digital Agency was established in September of the same year. Global trends related to AI and data are rapidly changing around the world. The Committee on AI Economy of Japan (from hereon referred as the “Committee”) has been examining the impact and effects of the use of AI and data on society and the economy of Japan, based on the economic point of view through empirical analysis and hearings. During the last few years of the Covid-19 pandemic, remote work and online shopping were actively promoted. The importance of data has become more recognized due to the unprecedented speed of digitalization of all social activities. In such an environment, this Committee carried out the meaningful, leading-edge activities as it continued to discuss the effects of AI and data utilization and related issues. It is expected that it can also serve as a driving force for promoting more data utilization in the future.

We hope that the research and analysis in this report will provide hints and evidence regarding the effects of AI and data utilization, and that it will help to accelerate the existing forward momentum of AI and data utilization throughout society.

1. Background and History

1.1 History since Establishment of the Committee on AI Economy

In January 2019, the Committee on AI Economy (hereinafter referred to as “the Committee”) was established with the aim of considering what kind of social economy should be pursued and how the basic policy and medium-to-long period strategies should be through the promotion of the implementation of AI in society among the items to be considered in The Conference toward AI Network Society.

The Committee on AI Economy (hereinafter “the Committee”) published the Report in May 2019, focusing on the following 5 key points being outlined.

（1） Structure of industries related to the use of AI

（2） Ideal AI investment for sustainable economic growth and improvement of productivity

（3） How the industrial infrastructure that supports the AI economy (labor, R&D) should be

（4） Japanese enterprises’ global competitiveness over the utilization of AI

（5） Ideal basic policies and strategies on AI economy

The further discussion started in December, 2019, based on the 2019 report. The Special-Interest Group on Data was created under this committee with the aim to delve more deeply into the professional and technology side of the data economy policy. The discussion was focused in the following three items.

（1） The ideal way to utilize data required for the implementation of AI in society

（2） The data economy policy in the AI era

（3） Inclusive AI Economy Society

The Committee on AI Economy Report 2020 (“Report 2020”) was published in July 2020. Based on this report, the discussion was resumed starting again in December 2020 in order to deepen the analysis. In particular, the committee conducted a more detailed examination of data value measurement, and in light of the current situation of the Covid-19 pandemic, focused on the following two matters:

（1） Examination of the economic value of data

（2） Examination of the data utilization environment in anticipation of digital transformation in the post-Covid-19 era

Based on these analyses and discussions at the international AI Network Society Forum 2021, held by the Ministry of Internal Affairs and Communications (MIC) in March 2021, the Committee on AI Economy Report 2021 ("Report 2021") was published in August 2021. The main findings in Report 2021 are as follows.

- Digital transformation of the social and economic activities was accelerated during the global pandemic. As such, the importance of data utilization gained greater recognition. Digital transformation of the overall society will proceed with future technology advances, and AI technology and data utilization are expected

to be in greater demand.

- Data utilization had a positive significant relationship to added value in small and medium sized enterprises (SMEs), in the same way as large enterprises.
- In order for data utilization to create added value and improve productivity, it is crucial to build an enterprise organizational structure, educate and train professional personnel doing data analysis, develop strong alliances with external resources, accumulate practical know-how, and build the appropriate architecture of the environment. Then it is necessary to promote these efforts.
- Efforts that utilize only internal resources have their limits, and efforts that utilize external resources including data, such as the personal data trust banks that Japan pioneered, will be important.
- Going forward, it will be necessary to promote innovations by creating the competitive environment through open data sharing.
- The delay in the digitalization of fields and sectors not covered by the survey analysis in this report, such as the public sector (administration), medical care, and education, is an important factor behind Japan's low growth. It is crucial to consider and move forward with promoting their digital transformation.

The Committee resumed its deliberations in December 2021 based on the findings of Report 2021. It will continue measuring the value of data, with the purpose of undertaking detailed examination by field and analysis of the effect of AI use.

1.2 Scope of Research in the 2022 Report

The Committee resumed its deliberations in December 2021, and set the scope for following 3 items alongside compilation of the previous discussions.

（1） More inclusive range of fields and industries covered
It is important to take a detailed look at each business area so as to deepen the analysis of the economic value of data. In addition, the use of data in the public and quasi-public sectors, which has not been considered, is attracting a great deal of attention and will be considered.

（2） Improving the survey research and analysis
Further examination is called for, as the previous survey did not cover AI use to any great degree. A more detailed survey and analysis is also in order to identify bottlenecks and inhibiting factors in data utilization.

（3） Consideration for fixed-point observation
In making a comprehensive summary by the Committee, consideration is given to how the survey should be conducted in the future, taking the voices of the enterprises surveyed into account.

In addition, this report discusses the current status and challenges of data utilization and digitalization in various fields, based on the chairperson hearings and discussions at the AI Network Society Forum 2022, an international symposium held by MIC in March 2022. In addition to summarizing future prospects, we will present proposals for the future, such as solving social issues through the use of AI and data.

2. Study on the Economic Value of Data

According to the results of the study on the economic value of data organized in the 2020 and 2021 reports, the amount of data utilized has been shown to have a positive significant relationship to added value in the same way as with capital and labor. Based on the points covered in the 2021 Report, the Committee conducted a study on the economic value of data as per the scope of study shown in 1.2 above.

2.1 Survey for Estimating the Value of Data

2.1.1 Survey Overview (2021 Enterprise Survey)

The outline of the questionnaire survey is as follows.

In order to show the economic value of data, it is necessary to understand how data is actually collected, analyzed, and utilized. Therefore, following on from the survey of enterprises conducted in the prior period (from December 2020 to August 2021), the Committee conducted a survey for enterprises titled Survey on Data Utilization (beginning in December 2020; Report 2021 was published in August 2021). The current status of how the data is utilized in domestic enterprises was described based on those results.

The following shows the summary of the survey results.

<Study Regarding Data Utilization>

(A) Subjects of survey: The 15,001 enterprises in the 2020 Ministry of Economy, Trade and Industry (METI) Basic Survey of Japanese Business Structure and Activities, plus insurance and financial enterprises, which are two fields that were not included in the METI survey. Survey subjects in the Basic Survey of Japanese Business Structure and Activities were reclassified with the weighted total amount of added economic value to the given business area so as to reflect the weight of each industry in economic activity. This was done by classifying the 15,001 enterprises into a different but relevant framework by business area. Survey answers were randomly selected from the same business area to represent the given classification.[1] In addition, the survey targets of the financial and insurance industries, which are not covered by the Basic Survey of Business Activities, were extracted from the List of Licensed, Permitted, and Registered Business Operators of the Financial Services Agency.[2] [3]

(B) Survey Period - January 25, 2022 to February 28, 2022

(C) Survey contents: Volume and type of data used by the enterprises, analysis system (employee in charge, how the environment is built), AI utilization status[4]

(D) Survey method - Requested cooperation to respond to survey, asking to fill in the answers on the dedicated

[1] In order to understand the current situation of how the data utilization is performed in the small-to-medium sized enterprises (SMEs) and leading medium sized firms, we made a breakdown by business area depending on economic added value. Then, the representative samples of a given business area were randomly selected within the same business area regardless of the size of the enterprise. However, the number of enterprises was too small in the two areas of "electricity/gas" and "credit card/installment financing" in comparison with the economic added value. Therefore, it was not possible to allocate the subject enterprises according to their added value. For those two areas, we used all of the enterprises selected in the Basic Survey of Japanese Business Structure and Activities represent the area. Any remainder was allocated to other business areas according to the amount of added value.

[2] https://www.fsa.go.jp/en/regulated_institutions/index.html

[3] 133 Banks (5 Urban Banks, 13 Trust Banks, 62 Regional Banks, 37 Secondary Regional Banks); Other financial Institutions (16 Internet online banks); 75 Insurance Companies (42 Life Insurance Companies, 33 Loss and Damage Insurance Companies)

[4] Please refer to Attachment for the details of survey questions.

web form.

(E) Answers collected[5] - 3,329 sets (2,320 sets with all the` questions completed)

Figure 2-1 shows the number by industry of copies distributed and collected. The number of questionnaires distributed was large for the manufacturing, retail, wholesale, and information and communication industries, as was the number of survey responses. This should be given due consideration.

Figure 2-1 Number of Surveys Distributed and Answers Collected by Business Area (partial answer sets included)

[Total]

	Number distributed	Number collected	Rate of collection
Same subjects as in the Basic Survey of Japanese Business Structure and Activities	15,001	3,274	21.8%
Financial institutions & insurance enterprises (Category not covered previously in the Basic Survey of Japanese Business Structure and Activities)	208	55	26.4%
Total	15,209	3,329	21.9%

[Basic Survey of Japanese Business Structure and Activities – breakdown by business area]

Business area	Basic Survey of Japanese Business Structure and Activities				Survey of enterprises		
	Amount of added value		Number of enterprises				
	Added value (¥100 mil)	Percentage	Number of enterprises	Percentage	Number distributed	Number collected	Rate of collection
Mining, quarrying, gravel extraction	2,266	0.2%	32	0.1%	27	10	37.0%
Manufacturing	580,929	43.9%	12,712	43.4%	6,843	1,437	21.0%
Electricity, gas	57,752	4.4%	141	0.5%	141	43	30.5%
Information and communication	114,625	8.7%	2,460	8.4%	1,350	243	18.0%
Wholesale trade	164,066	12.4%	5,517	18.8%	1,933	408	21.1%
Retail trade	167,412	12.7%	3,444	11.8%	1,972	498	25.3%
Credit card, installment finance	9,795	0.7%	77	0.3%	77	22	28.6%
Goods rental	22,090	1.7%	302	1.0%	261	57	21.8%
Academic research, professional or technology services	23,722	1.8%	554	1.9%	279	61	21.9%
Food and drink services	21,429	1.6%	570	1.9%	252	48	19.0%
Daily life services, entertainment	14,858	1.1%	691	2.4%	176	29	16.5%
Personal teaching and learning	414	0.0%	14	0.0%	5	2	40.0%
Service industry (excluding services not elsewhere classified)	58,132	4.4%	1,431	4.9%	684	158	23.1%
Services not elsewhere classified	30,816	2.3%	467	1.6%	363	86	23.7%
Not elsewhere classified	54,110	4.1%	883	3.0%	638	172	27.0%
Total	1,322,415	100.0%	29,295	100.0%	15,001	3,274	21.8%

Figure 2-2 shows the number of answers collected by number of full-time employees. The number of responses from enterprises with less than 50 employees is small. This may be because the subjects of the survey were enterprises with 50 or more employees (total number of full-time and seconded employees) and 30 million yen or more in capital or investment. Except for enterprises with less than 50 employees, the recovery rate (number of responses collected / number of subjects surveyed) generally tends to be higher as the number of employees is smaller.

[5] "Collected answers or returned answers" means any written responses on the answer sheet on the dedicated web form created for use in this specific survey. It includes any partial answer sets.

Figure 2-2 Number Distributed and Answers Collected in the Basic Survey of Japanese Business Structure and Activities Shown by Number of Full-Time Employees (partial answer sets included)

Number of full-time employees	Number distributed	Number collected	Rate of collection
1 - 49	70	15	21.4%
50 - 99	4,548	1,209	26.6%
100 - 199	4,326	1,016	23.5%
200 - 299	1,893	382	20.2%
300 - 499	1,606	274	17.1%
500 - 999	1,265	202	16.0%
1,000 - 1,999	674	108	16.0%
2,000 - 9,999	525	56	10.7%
10,000 - 199,999	94	12	12.8%
Total	15,001	3,274	21.8%

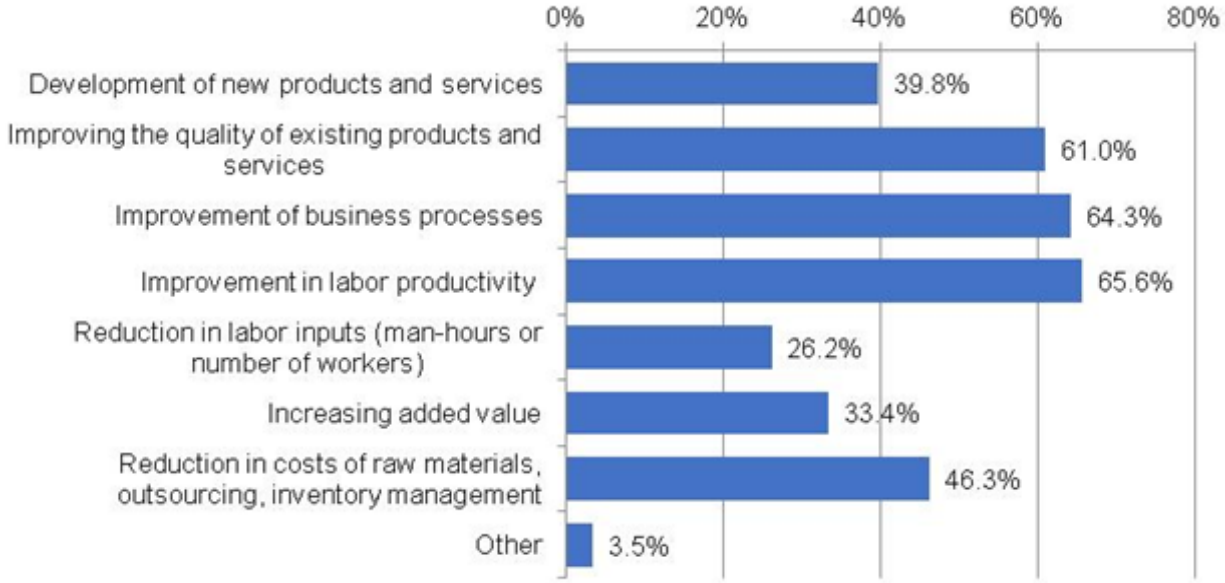
2.1.2 Main Survey Items and Results of Questionnaire

The survey covered a wide range of questions including purpose of data utilization, area of data utilization, data analysis method, frequency of data analysis, period of data to be used, type of data, volume of data, data analysis system/personnel needed, effect of data utilization and status of AI utilization. The major outcomes are described in this section.[6]

(A) Objectives of Data Utilization

As shown in **Figure 2-3**, the top three responses to the question, "For what purpose are enterprises working to utilize data?" were "Improvement in labor productivity," "Improvement of business processes," and "Improving the quality of existing products and services." All three exceeded 60%.This trend was the same when viewed by company size (large enterprises / SMEs) and by industry (manufacturing / non-manufacturing).

Figure 2-3 Objectives of Data Utilization

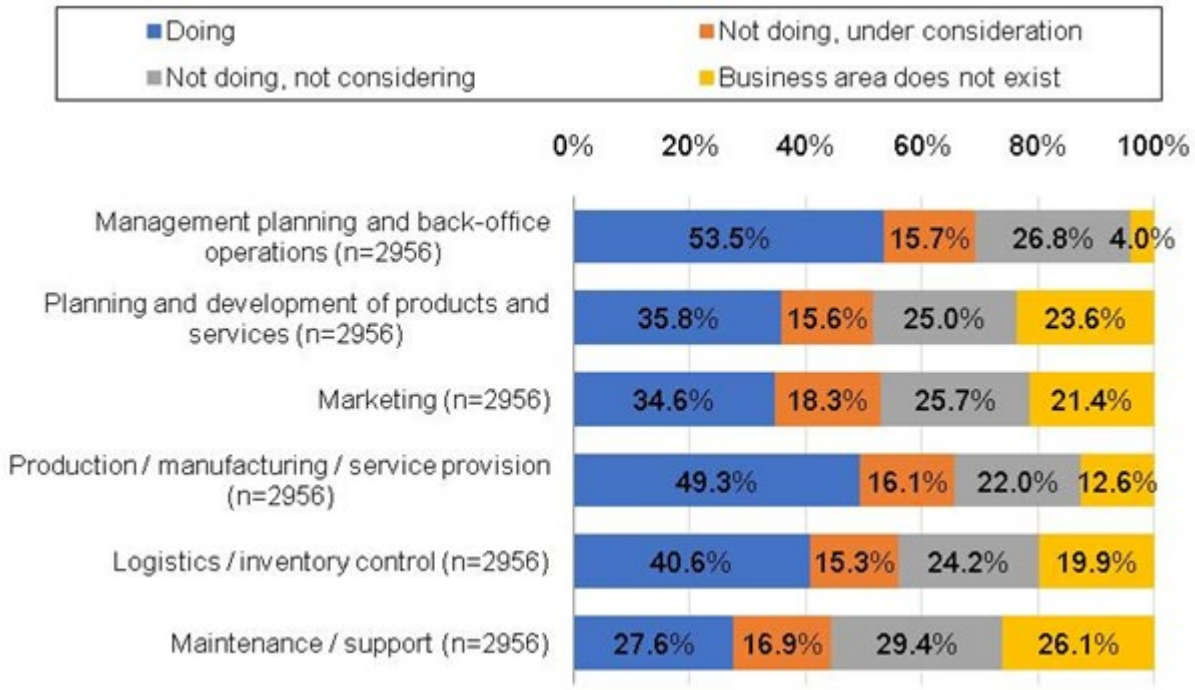


[6] Please refer to attachment regarding all of the survey questions and answers.

(B) Status of Data Analysis Implementation (by business area)

The business areas where data analysis was performed were “Management planning and back-office operations,” “Planning and development of products and services,” “Marketing, production / manufacturing / service provision,” “Distribution / inventory management,” and “Maintenance / support.” As shown in **Figure 2-4**, among the enterprises having all the business categories identified here, the largest numbers of enterprises use data analysis results for management planning and back-office operations, followed by production / manufacturing / service provision. This trend was the same when viewed by company size (large enterprises / SMEs) and by industry (manufacturing / non-manufacturing).

Figure 2-4 Status of Data Analysis Implementation (by business area)



Also, as shown in **Figure 2-5 and Figure 2-6**, large enterprises are more advanced than SMEs in all areas.[7]

Figure 2-5 Status of Data Analysis Implementation (by business area, large enterprises)

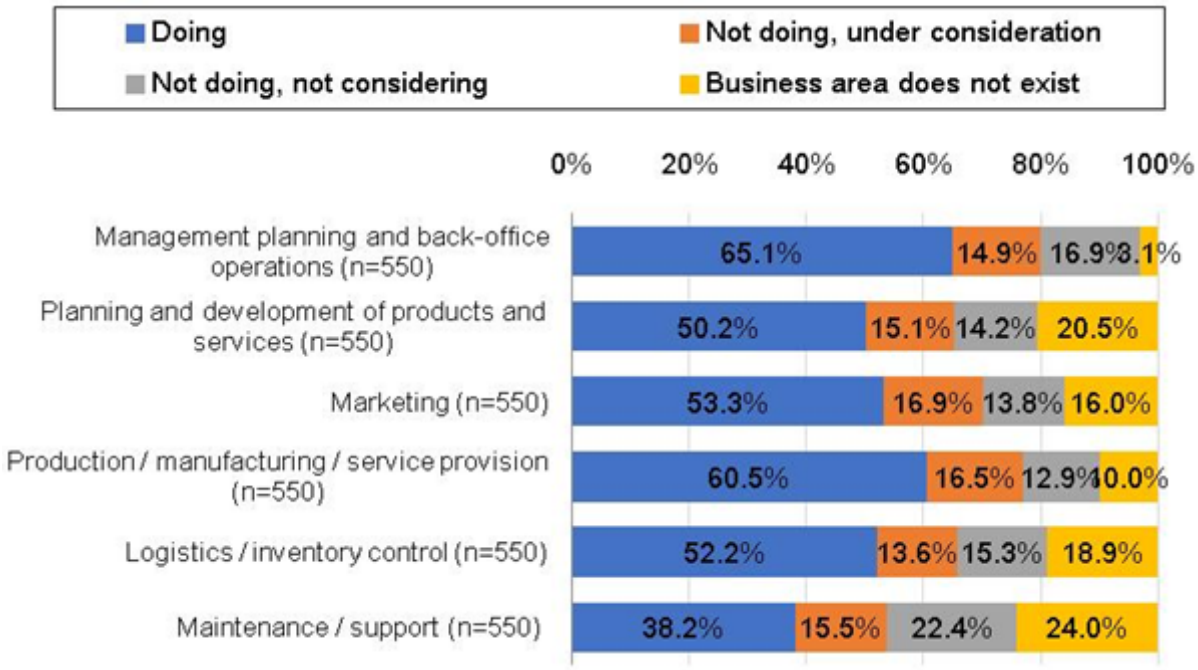
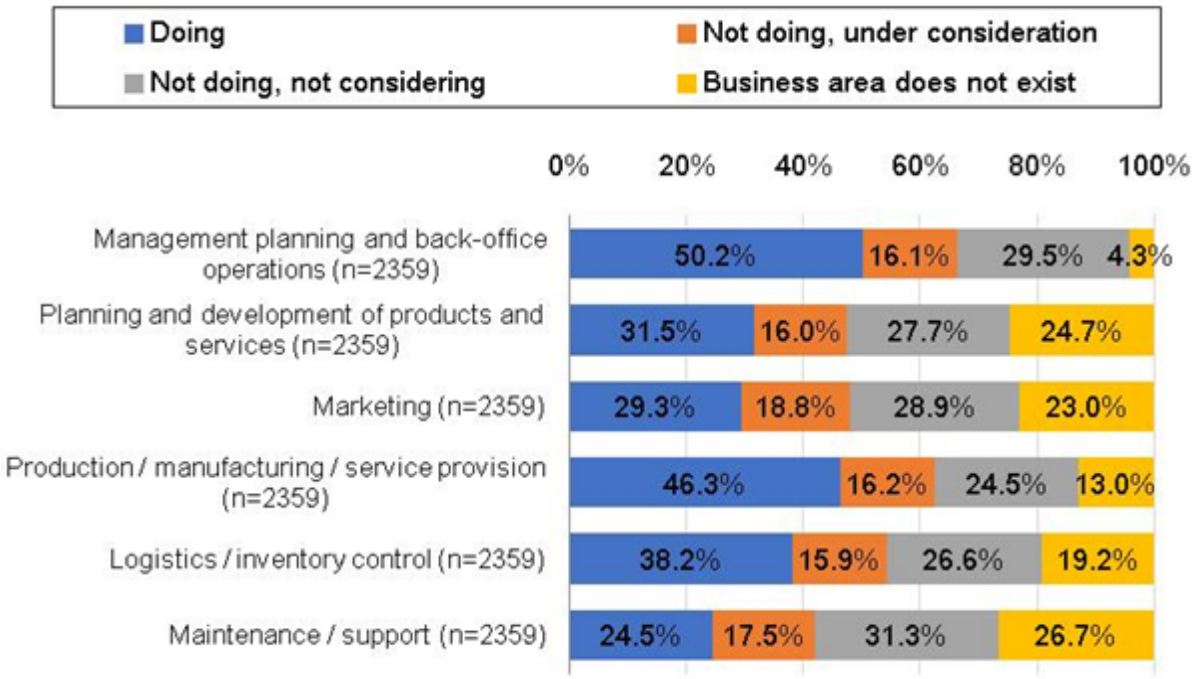


Figure 2-6 Status of Data Analysis Implementation (by business area, SMEs)



[7] Number of full-time employees less than 300 (definition is the same for the following sections)

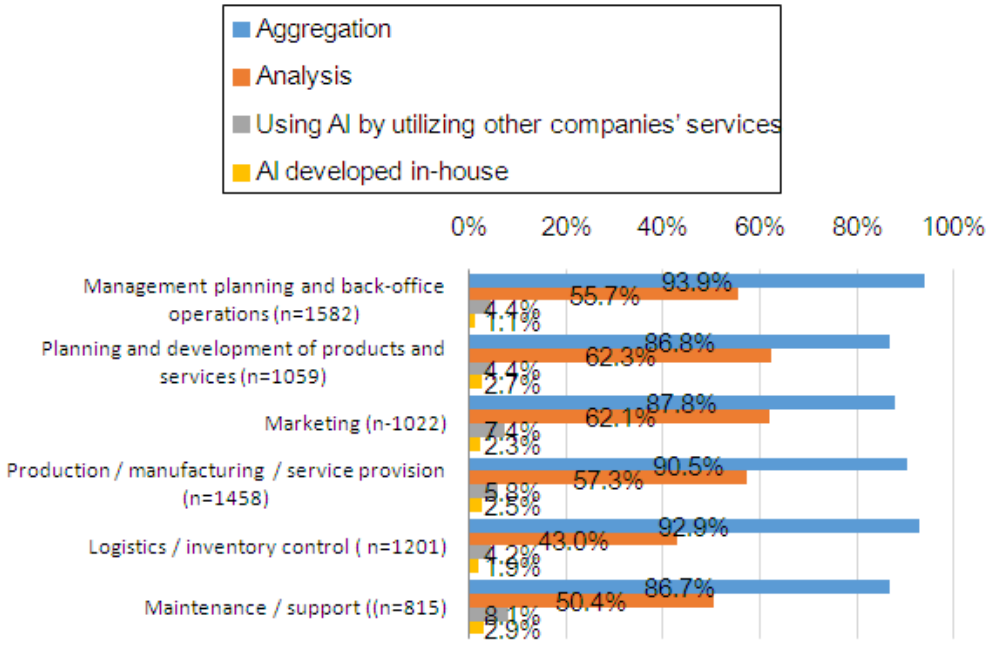
(C) Data Processing (by business area)

Data does not become useful just by holding and accumulating it, but only when the effect and the result of analysis that the data generates are utilized for management decision-making.[8] For that raw data to be aggregated in a meaningful way and appropriately analyzed with AI, the method of data processing influences the outcome and its effectiveness.

As shown in **Figure 2-7**, when asked how enterprises use the processed data in their respective business areas, in all areas, the most frequently used method of data processing was aggregation (processing by time period and by size of enterprise), followed by analysis (statistical analysis). In terms of AI used, more enterprises utilize other enterprises' services (not developed or tuned in-house) over those developed in-house. This figure also tells that utilization in maintenance and support, and in marketing are somewhat more advanced.

However, it is necessary to keep in mind that in all areas, the number of enterprises that use AI for data processing is less than 10% or slightly more than 10%, even when totaling in-house and third-party services. This trend was the same when viewed by company size (large enterprises / SMEs) and by industry (manufacturing / non-manufacturing).

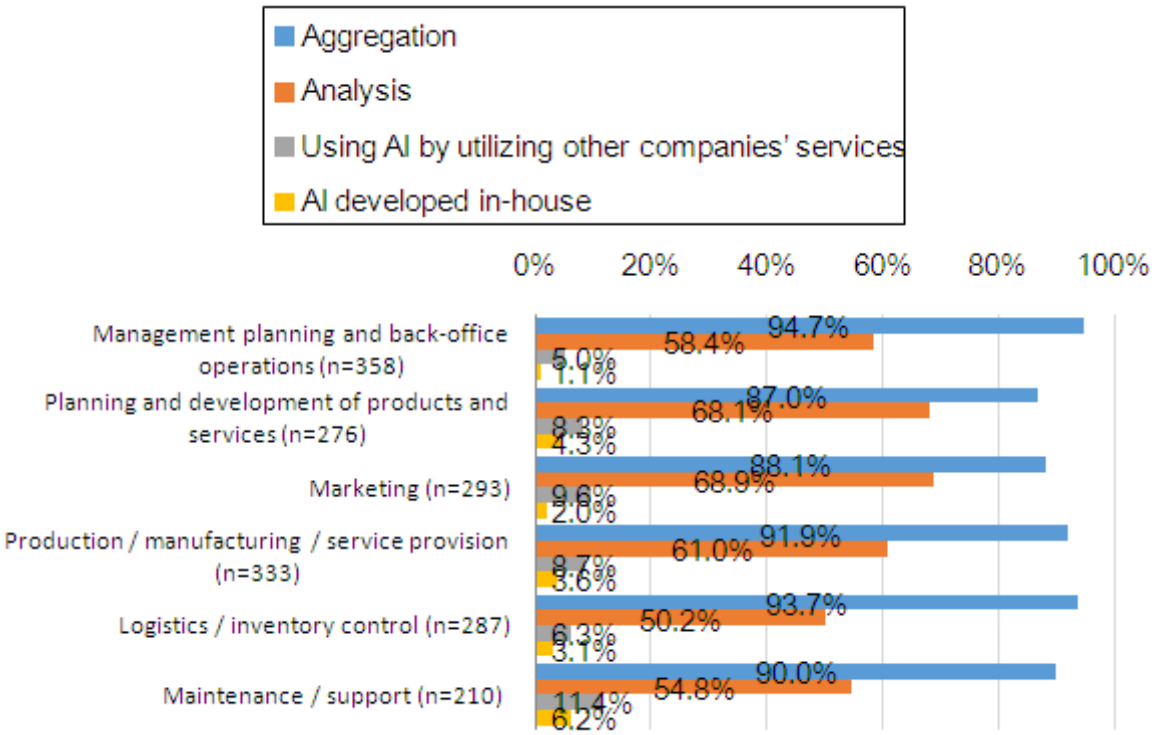
Figure 2-7 Data Processing (by business area)



The use of AI in maintenance and support is the most advanced among large enterprises, and over 10% of large enterprises said they are using AI by utilizing other enterprises' services (**Figure 2-8**).

[8] The Report of the Study Group on Data and Competition Policy of the Fair Trade Commission stated, "It is usually the case that data generates the useful value only if it is aggregated and analyzed." (Japanese), https://www.jftc.go.jp/en/pressreleases/yearly-2021/June/210625.html

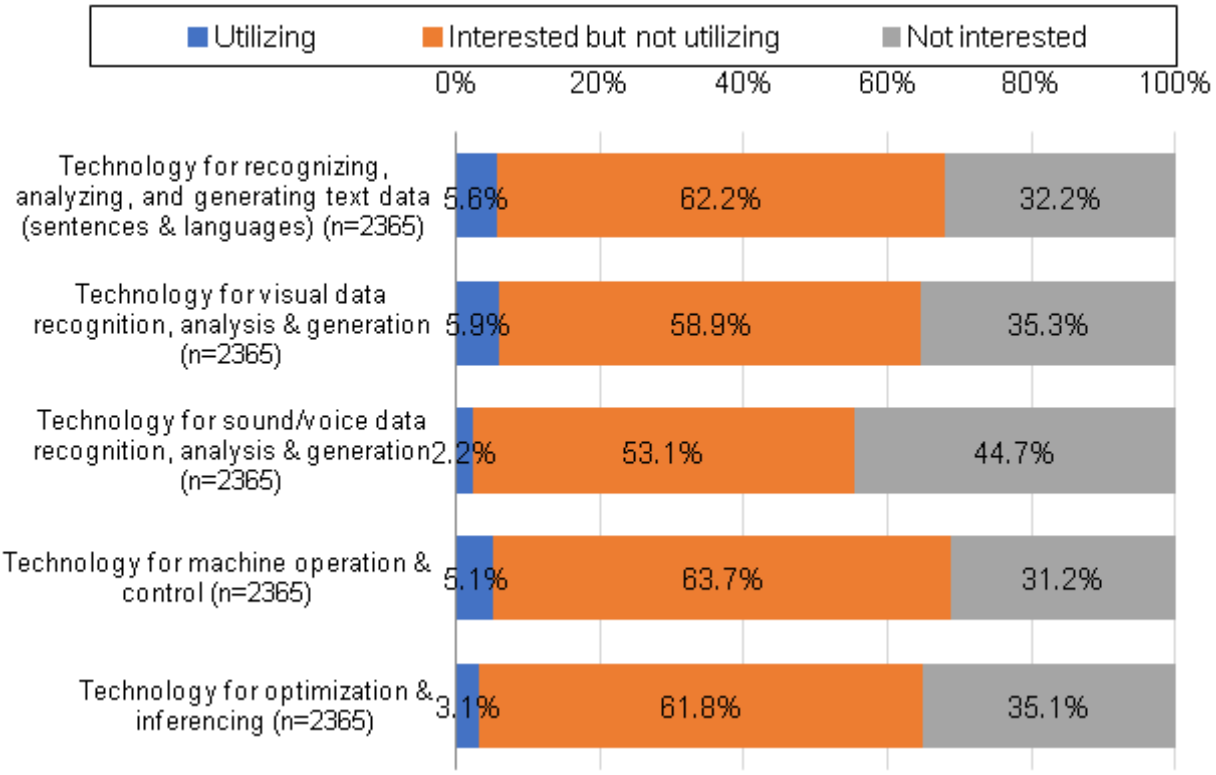
Figure 2-8 Data Processing (by business area, large enterprises)



(D) Status of AI utilization (by AI technology)

Regarding the status of AI utilization, regardless of the type of AI technology, more than half of the enterprises answered that they were interested, but not utilizing it (**Figure 2-9**). The types of technology most frequently utilized were (1) technology for visual data recognition, analysis & generation, (2) technology for recognizing, analyzing, and generating text data (sentences & languages), and (3) technology for machine operation & control. However, in each case, use of these technologies was less than 10%. This trend was roughly the same when viewed by company size (large enterprises / SMEs) and by industry (manufacturing / non-manufacturing). There, technologies for visual data recognition, analysis & generation and for recognizing, analyzing, and generating text data (sentences & languages) were more that 10% in each case.

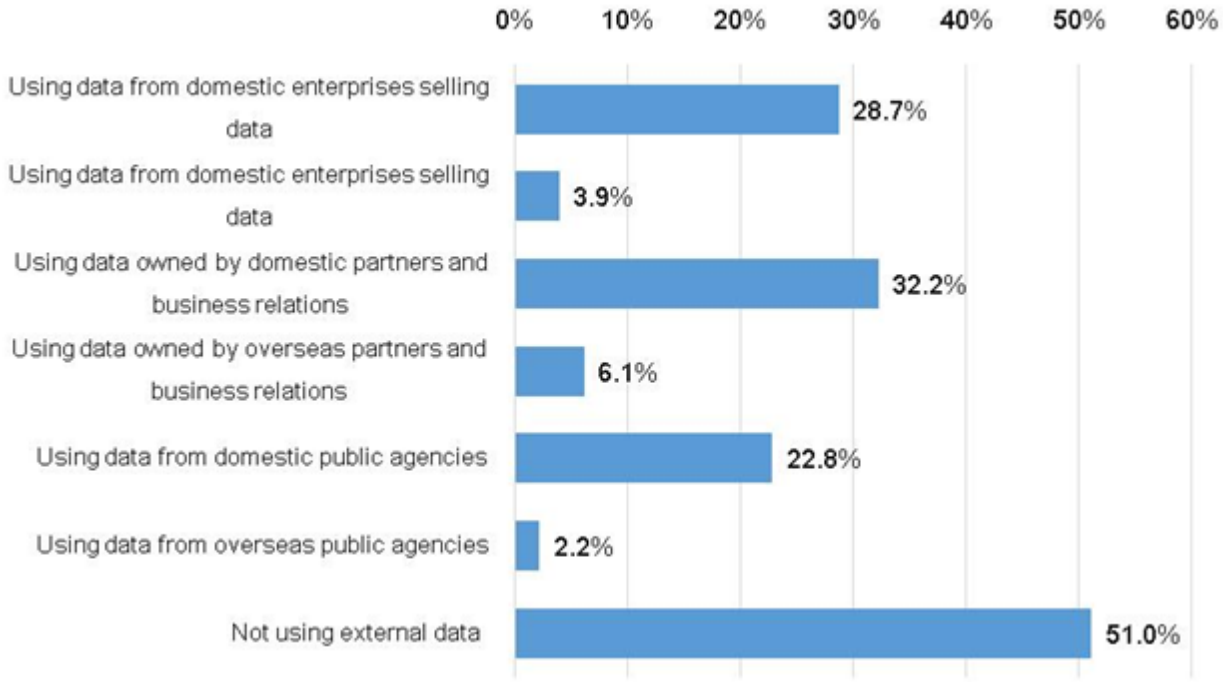
Figure 2-9 Status of AI Utilization (by type of AI technology)



(E) Data Sources

Regarding data sources, **Figure 2-10** shows that about half of the respondents, when asked about newly provided external data during FY2020, responded that they did not use external data. Among the enterprises that utilized external data, the most frequent response was "Using data owned by domestic partners and business relations," followed by "Using data from domestic enterprises selling data" (research enterprises, database sellers, via API), and "Using data provided by domestic public agencies." From these facts, it can be seen that enterprises that utilize external data often use domestic data. This trend in terms of data availability is the same when viewed by enterprise size (large enterprises / SMEs) and by industry (manufacturing / non-manufacturing).

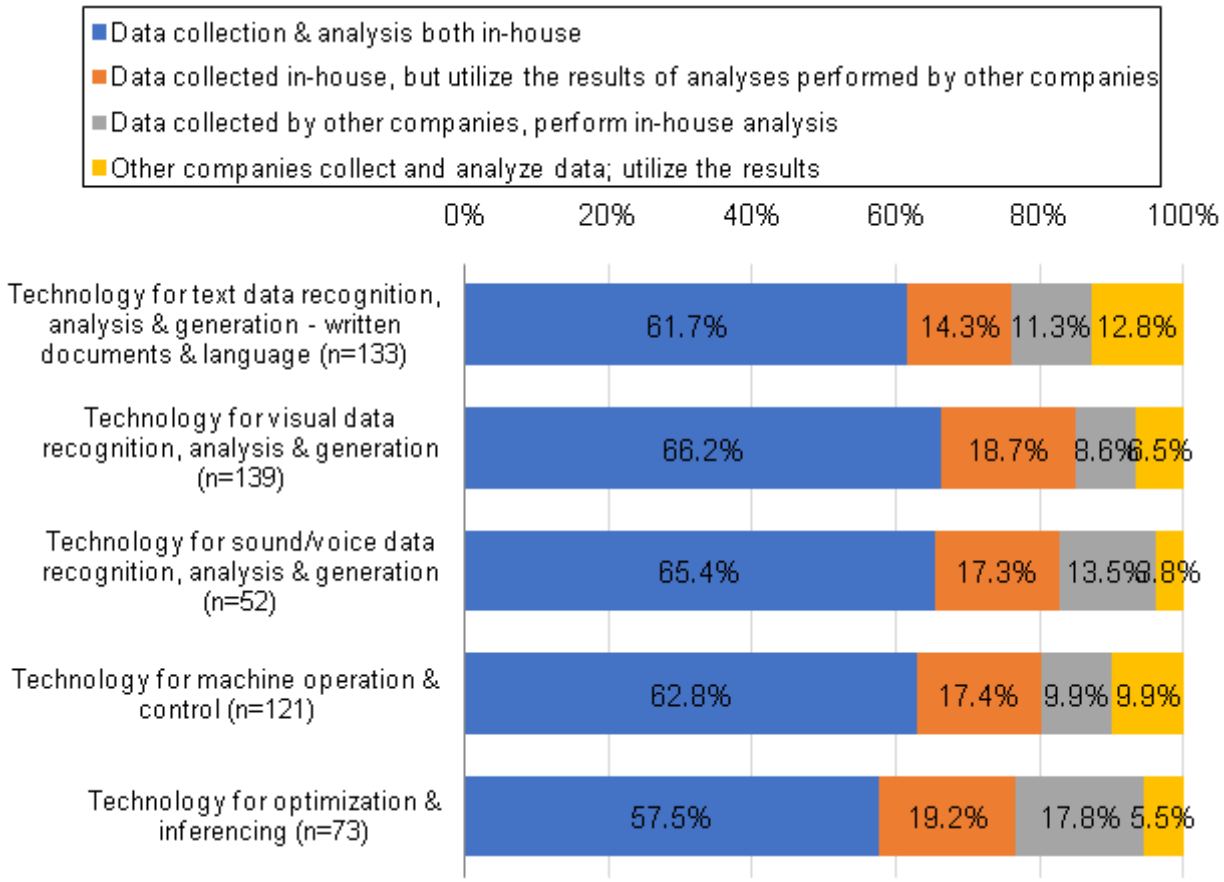
Figure 2-10 Data Sources



(F) Method of Aggregation and Analysis of the Data Using AI for the Analysis (by type of AI technology)

Figure 2-11 shows how the data to be used is aggregated and analyzed using AI. Regardless of the type of AI technology, the majority responded, "Data collection & analysis both in-house," followed by many responses of "Data collected in-house, but utilize the results of analyses performed by other enterprises." This trend is seen in all enterprise sizes (Large enterprises, SMEs) and in all industries (Manufacturing, non-manufacturing). The mainstream method of data analysis using AI is collecting data in-house.

Figure 2-11 Data Collection and Analysis Methods Used for Data Analysis Using AI (by type of AI technology)

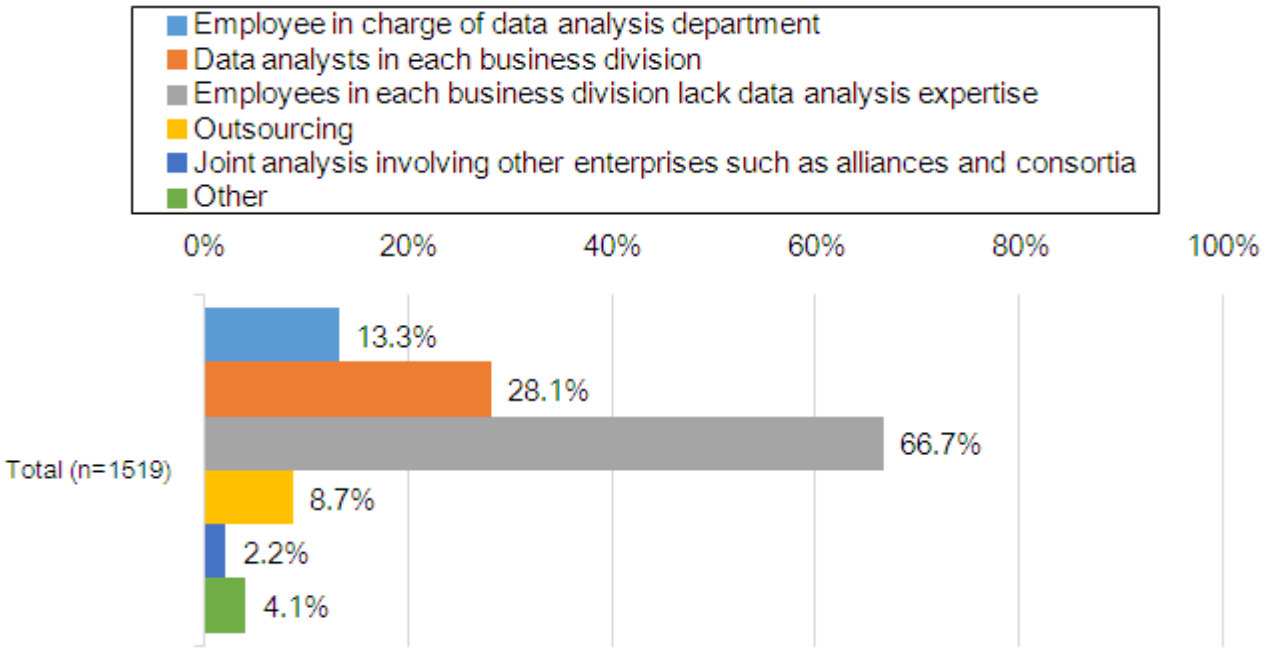


(G) Data Analysis System

The type of system (department / employee in charge) to analyze the data is also considered to be an important factor in obtaining the effects of data utilization. Regarding the data analysis system, as shown in **Figure 2-12**, the largest number of enterprises (over 60%) responded, "Employees in each business division lack data analysis expertise," followed by "Data analysts in each business division," "Employee in charge of data analysis department," "Outsourcing." This trend was the same when viewed by company size (large enterprises / SMEs) and by industry (manufacturing / non-manufacturing). From these results, it can be seen that the mainstream system for enterprises is one in which employees in each business division lack data analysis expertise.[9]

[9] It is necessary to pay attention to the possibility that an enterprise has specialists in data analysis conducting analyses for specific datasets but other datasets could be analyzed by non-specialists. This is because the results were aggregated from the responses to questions in which multiple answers were accepted.

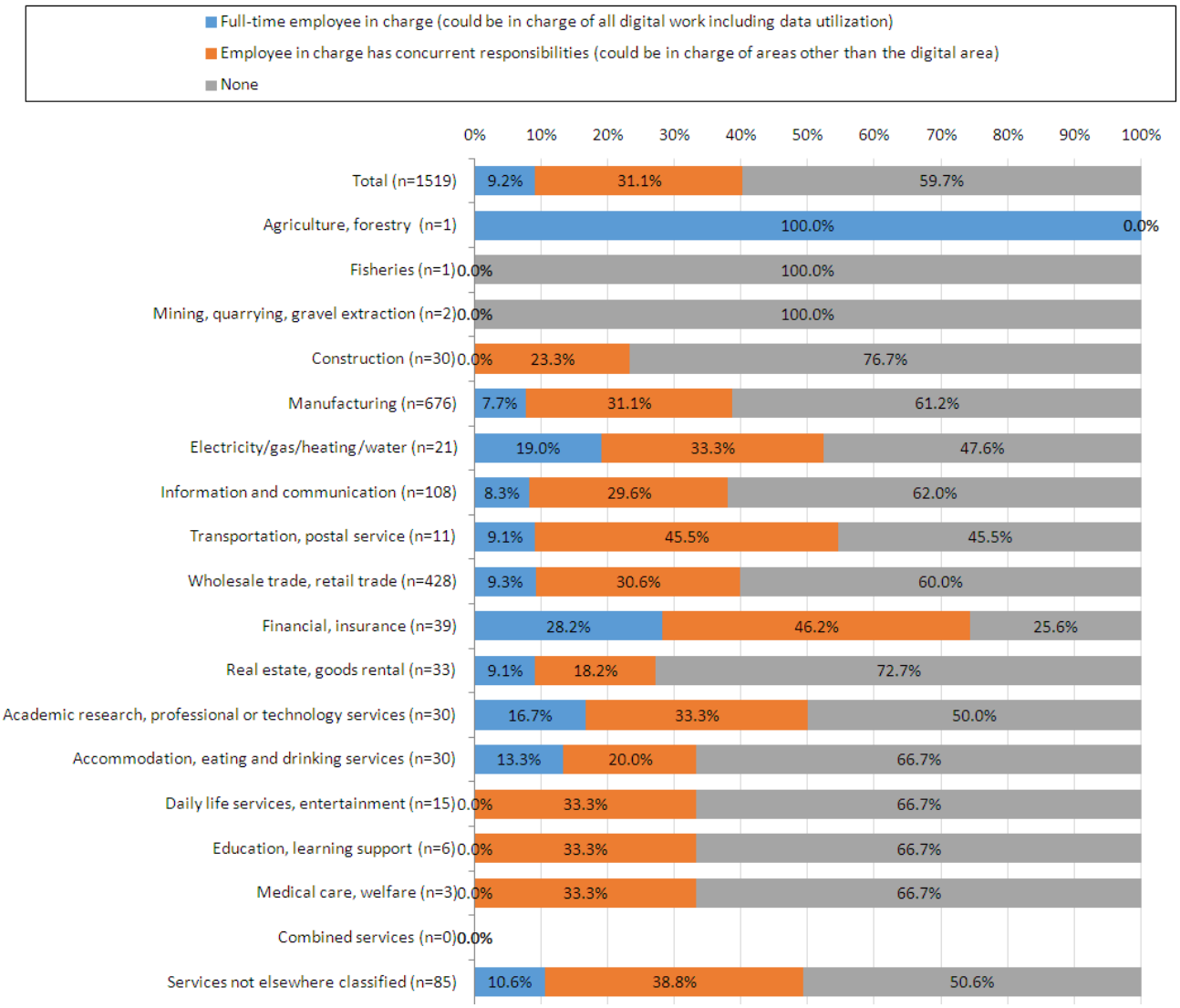
Figure 2-12　Data Analysis System



(H)　Whether There Is an Employee in Charge of Leading Data Utilization

In order to promote data utilization, it is also important to create an environment enabling data utilization as well as having an employee in charge. Regarding the presence or absence of an employee in charge of data utilization (CIO, CDO, CDXO, etc.), **Figure 2-13** shows that nearly 10% of enterprises responded that they have a full-time employee in charge, and about 30% of enterprises responded that the employee in charge has concurrent responsibilities. From this, it can be seen that about 40% of enterprises that are implementing data utilization have an employee in charge of leading data utilization. This trend is the same when viewed by company size (large enterprises / SMEs). In addition, in the construction, manufacturing, information and communication, transportation and postal, and real estate and goods rental industries, the percentage having a full-time employee in charge is less than the overall percentage (9.2%). From this it can be inferred that such employees in many enterprises hold other positions concurrently.

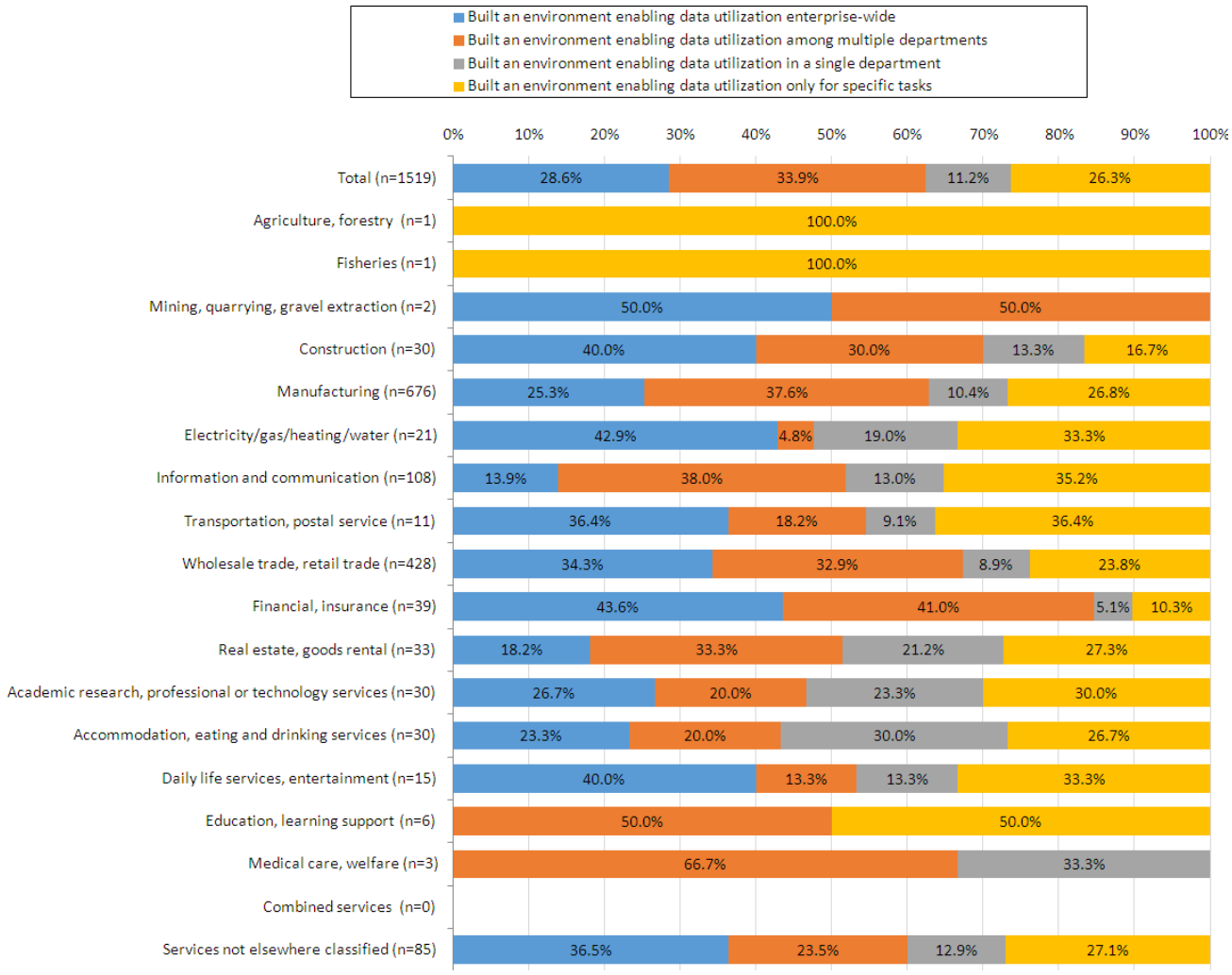
Figure 2-13　Whether There Is an Employee in Charge of Leading Data Utilization



(I)　Status of environment built to enable data utilization

Regarding the building of an environment for data utilization, as shown in **Figure 2-14**, nearly 30% of the enterprises that are implementing data utilization have built an environment enabling data utilization enterprise-wide. Slightly more than 30% responded that they have built an environment enabling data utilization among multiple departments. All in all, more than 60% of enterprises are using data across departments. This trend was the same when viewed by company size (large enterprises / SMEs). On the other hand, slightly fewer than 30% of all enterprises responded that they have built an environment that allows data to be used only for specific tasks, indicating that an environment for sharing and utilizing data company-wide has not been built. If the data are stored in silo fashion, the range of data utilization may become limited. Building the environment enabling cross-cutting data utilization is something to be hoped for.

Figure 2-14　Status of Environment Built to Enable Data Utilization

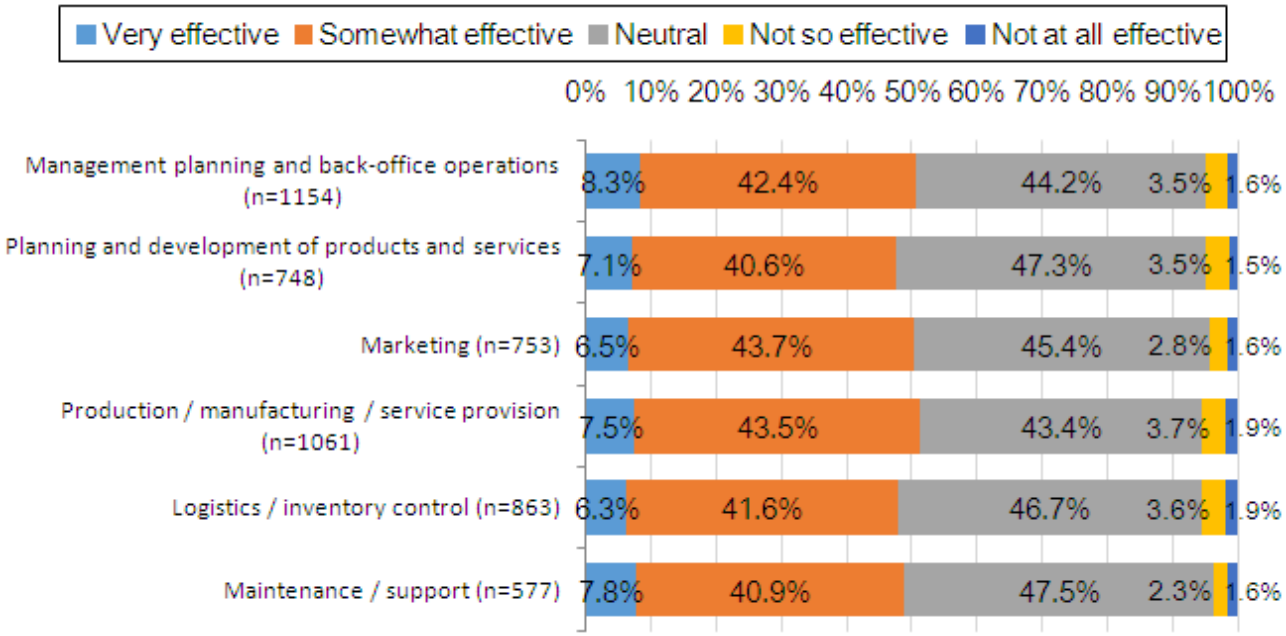


(J)　Effect of Data Utilization on Inputs

Although the purposes of data utilization, the analysis system, and the environment that is being built differ depending on the enterprise, the business effects to be obtained can be broadly divided into two categories: effects in terms of inputs and effects in terms of outputs. Therefore, we asked how effective the utilization of data in each of these two areas was in FY2020.

Regarding the effects of inputs (e.g., cost reductions through streamlining of operations), as shown in **Figure 2-15**, nearly 10% of enterprises answered that they were extremely effective, and more than 40% said that they were somewhat effective; therefore, approximately half of the enterprises saw it as effective. This trend was generally the same when viewed by company size (large enterprises / SMEs) and by industry (manufacturing / non-manufacturing).

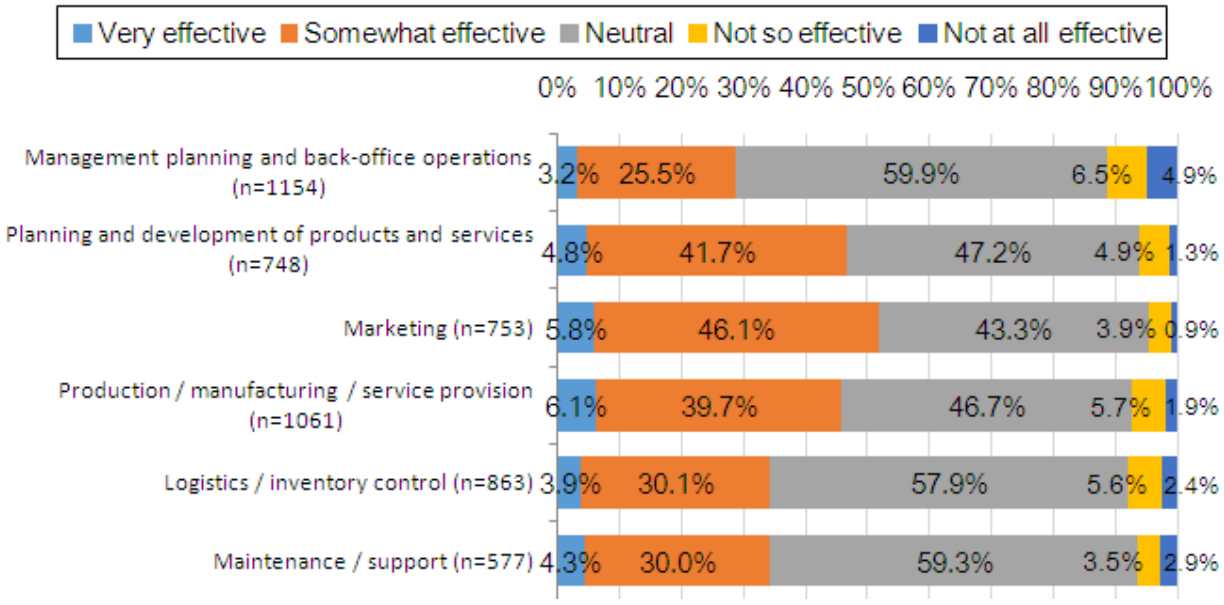
Figure 2-15　Effect of Data Utilization on Inputs



(K)　Effect of Data Utilization on Outputs

As shown in **Figure 2-16**, few enterprises felt that the effects of outputs (e.g., sales increases) were more effective overall than the effects of inputs, with the exception of marketing.[10] Marketing was most frequently reported as effective, followed by planning and development of products and services, and production / manufacturing / service provision. This trend was generally the same when viewed by company size (large enterprises / SMEs) and by industry (manufacturing / non-manufacturing).

Figure 2-16　Effect of Data Utilization on Outputs

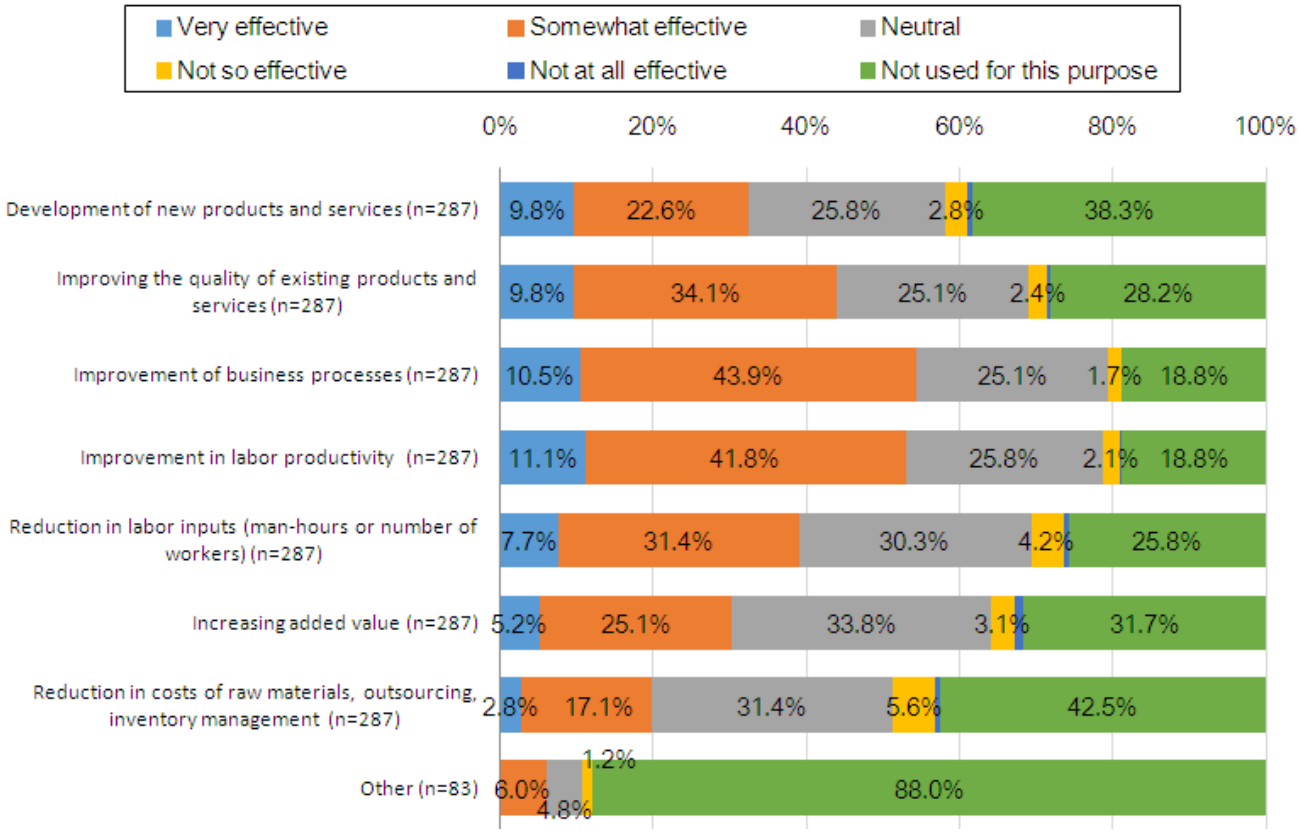


[10] It should also be taken into account that it takes time for the output effect to appear, and that it is difficult to measure the effect in back-office operations.

(L) Assessment of AI Utilization Effect

In the evaluation of the AI utilization effect (**Figure 2-17**), the most common answer was "Improvement of business processes," followed by "Improvement in labor productivity." More than half of the respondents evaluated AI as effective for those two cases. This trend was the same when viewed by company size (large enterprises / SMEs) and by industry (manufacturing / non-manufacturing). Overall, less than half of the respondents said that AI was effective in "Improving the quality of existing products and services;" however, more than 40% evaluated it as effective, regardless of size or type of industry. This suggests that enterprises mainly experience the effects of AI utilization in improving existing operations.

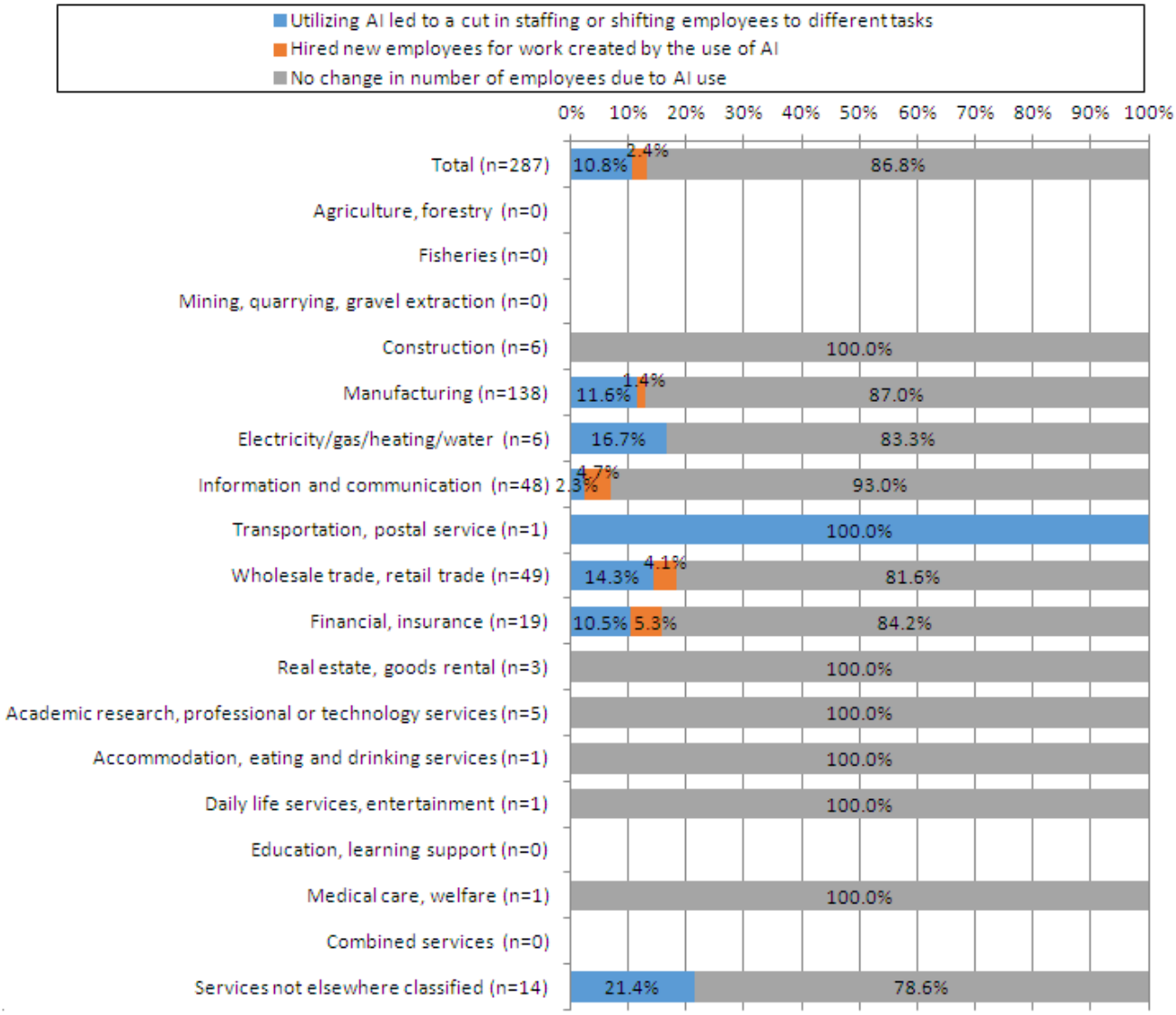
Figure 2-17 Assessment of AI Utilization Effect



(M) Changes in the Number of Employees Due to AI Utilization

Regarding changes in the number of employees due to AI utilization, as shown in **Figure 2-18**, nearly 90% of all respondents answered, “No change in number of employees due to AI utilization.” This trend was similar when viewed by enterprise size (large enterprises / SMEs). The majority of these enterprises responded, “No change in number of employees due to AI utilization.” However, the percentage of “Utilizing AI led to a cut in staffing or shifting employees to different tasks” was greater than the percentage of “Hired new employees for work created by AI utilization.” Therefore, it can be said that the percentage of enterprises that experienced a decrease in the number of employees is higher than those that experienced an increase.

Figure 2-18 Headcount Changes Due to AI Adoption



(N) Internal and External Issues in Data Utilization

Many enterprises are likely to feel that there are issues with data utilization. As shown in **Figure 2-19**, the most common response within the enterprise was, “Human resource barriers, e.g., lack of employees with know-how,” followed by “Financial difficulty with the cost burden,” then “Concerns about data protection and security.” As shown in **Figure 2-20** and **Figure 2-21**, large enterprises are more likely (over 80%) to have issues with “Human resource barriers, e.g., lack of employees with know-how,” than SMEs (less than 80%). As background, although many enterprises, both large and small, are facing a shortage of employees with know-how, the approaches to data utilization differ between large enterprises and SMEs. In terms of data utilization, it could be less likely that SMEs will feel a lack of know-how as compared with large enterprises.

Figure 2-19 Issues within the Enterprise Regarding Data Utilization

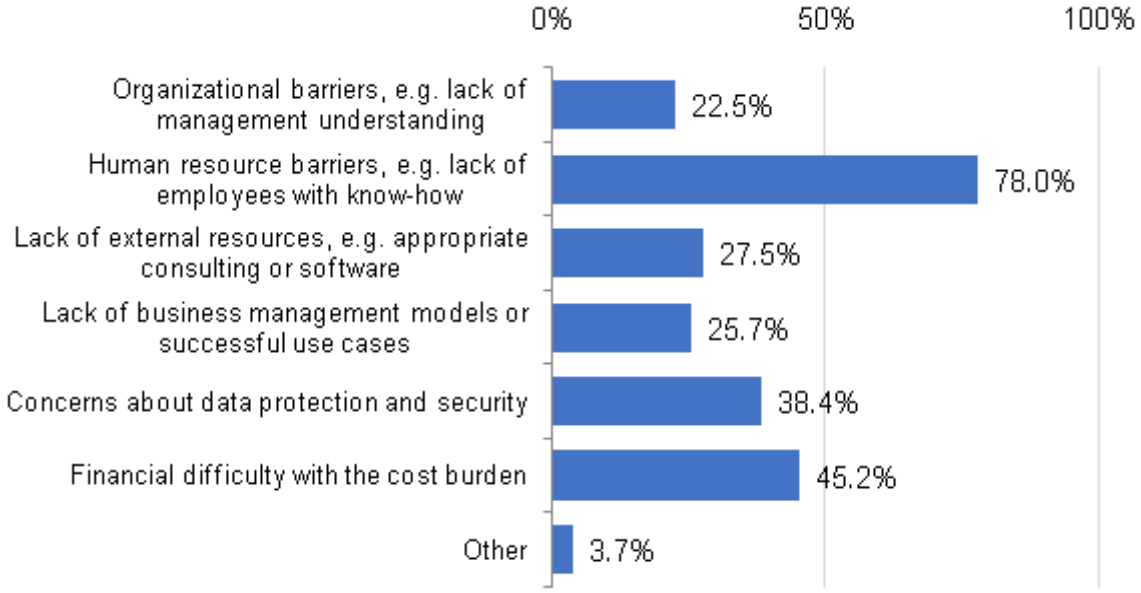


Figure 2-20 Issues within the Enterprise Regarding Data Utilization (large enterprises)

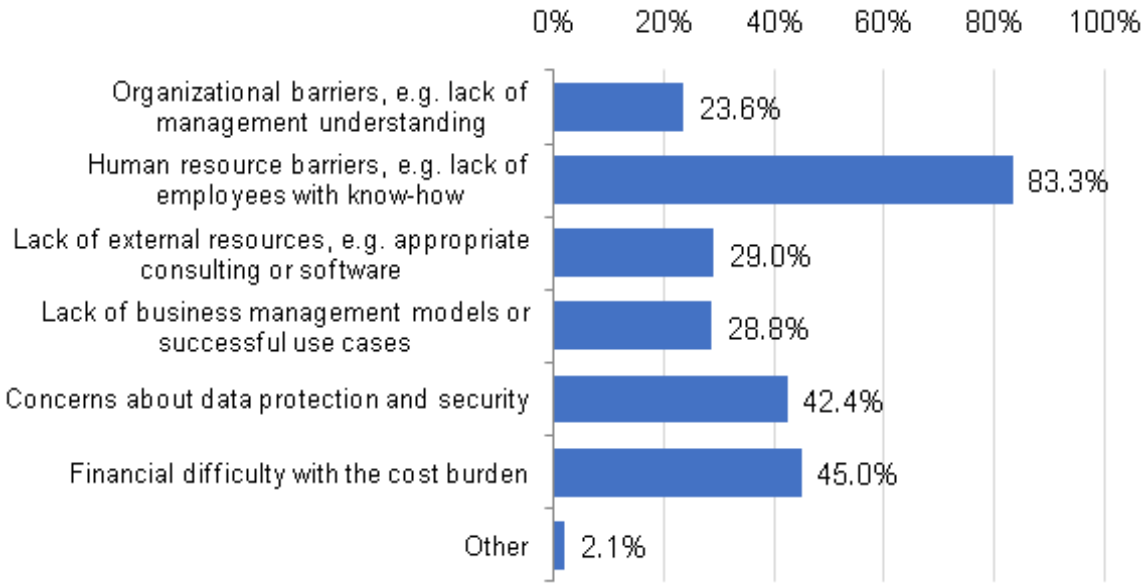
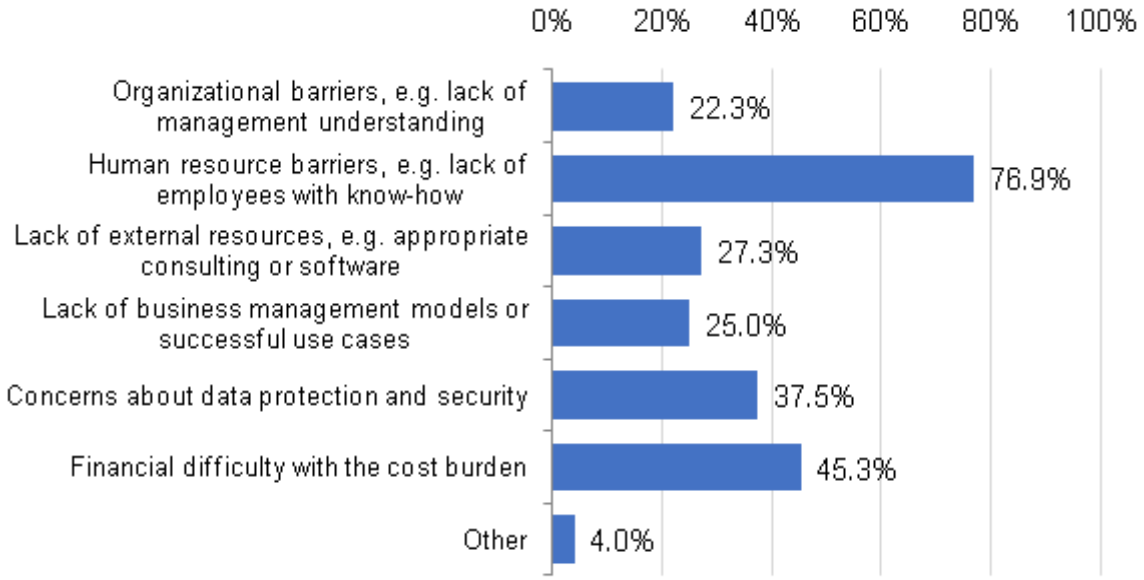
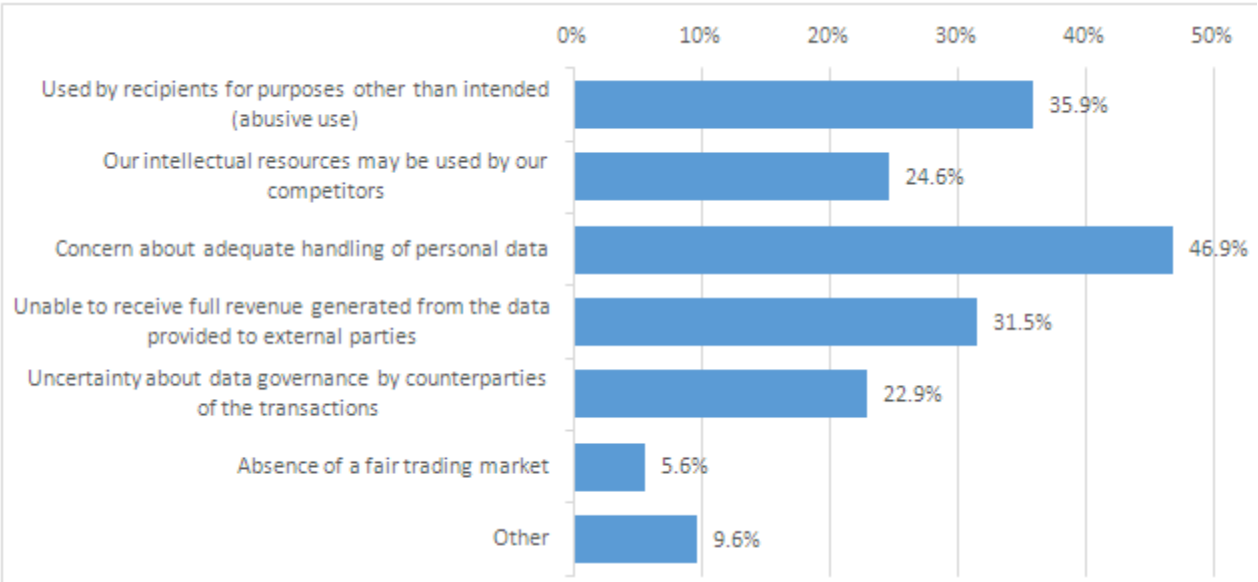


Figure 2-21 Issues within the Enterprise Regarding Data Utilization (SMEs)



As shown in **Figure 2-22,** the most frequently reported external issues are "Concern about adequate handling of personal data," followed by, "Used by recipients for purposes other than intended (abusive use)," and "Unable to receive full revenue generated from the data provided to external parties." This trend was the same when viewed by company size (large enterprises / SMEs) and by industry (manufacturing / non-manufacturing). From these facts, it can be said that in addition to internal problems such as the personnel and costs required for data utilization, enterprises have external problems such as data protection and lack of benefit from providing data to external parties. In order to increase the number of enterprises that can benefit from the use of data in the future, it will be necessary to consider measures to resolve these issues.

Figure 2-22 Issues outside the Enterprise Regarding Data Utilization (large enterprises)



2.2 Empirical Analysis of the Value and Effect of Data[11]

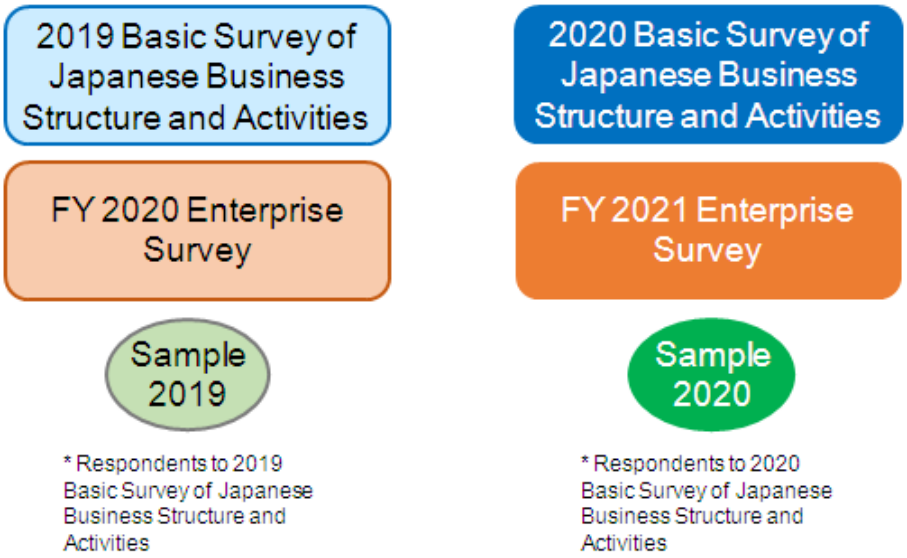
The results shown in Report 2020 and Report 2021 were that the volume and cases of data utilization had a positive significant relationship to added value on a par with capital and labor. Based on the continuity with the analysis up to the prior period, the production function model in the present report (Report 2022) also positions capital, labor and data as production elements for enterprises to create added value.

This Committee decided to utilize the data accumulated through past surveys to estimate[12] the production function. In addition to the data for which the empirical analysis was conducted for Report 2021, we also utilized the data from the Basic Survey of Japanese Business Structure and Activities up to the end of FY2019 (March 2020), and the data from the 2021 Enterprise Survey[13] up to the end of FY2020 (March 2021).

It should be noted that it is difficult to simply compare analysis results for two years with different samples, and that better analysis becomes possible with a greater number of total samples from two years versus an analysis using data from a single year. Thus, this analysis was performed by a method using two years' worth of aggregated data.

The Committee implemented the empirical analysis over two sets of data as one source using year dummies (0 = 2019 data, 1 = 2020 data). The first set is described in **Figure 2-23** as Sample 2019. It is the combination of the data as of the end of FY2018 from the 2019 Basic Survey of Corporate Activities and the data as of the end of FY2019 from the 2020 Enterprise Survey. The second set is described in the same figure as Sample 2020. It is the combination of the data as of the end of FY2019 from the Basic Survey of Japanese Business Structure and Activities and the data as of the end of FY2020 from the 2021 Enterprise Survey.

Figure 2-23 Data Used for Empirical Analysis



(A) Empirical analysis result 1 (production function analysis)

To estimate a production function model while keeping the analysis consistent with the ones from the prior

[11] Of the enterprises surveyed in the Enterprise Survey, those in the financial and insurance industries, which are not covered by the Basic Survey of Japanese Business Structure and Activities , are not included in the empirical analysis in this section.
[12] For details of the empirical analysis, refer to the Appendix.
[13] Refers to Survey with enterprises described in 2.1.1.

periods, capital, labor and data are positioned as the production factors with which enterprises create added value.

$$V = A_o K^{\alpha} L^{\beta} Data^{\gamma} e^{dmy}$$

where *V* is added value, *K* is capital (tangible fixed assets + intangible fixed assets), *L* is labor (number of full-time equivalent employees), and Data represents data variables. In addition, *dmy* (dummy variable) is estimated by including *indmy* (manufacturing industry dummy) and *sizedmy* (large enterprise dummy).[14] As shown in **Figure 2-24**, the estimation results show that all data variables were positively significant and there is a positive significant relationship to added value.[15] Specifically, without the assumption of linear homogeneous data,[16] a 1% increase in utilized data volume resulted in a 0.03% increase in added value.

In addition, based on the data source, the amount of data utilized was divided into internally acquired and externally acquired, and a similar analysis was conducted. Similar to the results of Report 2021, it was verified that both "Internally acquired utilized data volume" and “Externally acquired utilized data volume" have positive significant relationships with added value, and that the coefficient of "Externally acquired utilized data volume" is larger than that of "Internally acquired utilized data volume." From this, similar to the interpretation of the results in Report 2021, it can be interpreted that the greater the amount of data obtained from external sources, the greater is the increase in added value.

The year dummy was negatively significant, indicating that the added value in 2019 tended to be higher than in 2020. One of the possible factors impacting the added value of enterprises could be the effect of the Covid-19 pandemic.

Applying linear homogeneity to the estimation showed that the corrected coefficient of determination of the model decreased, but the added value increased by 0.02% as the utilized data volume increased by 1%. It could be suggested that utilization of data indicates acceleration in the rise of productivity. In addition, the coefficient of “Externally acquired utilized data volume” was larger than the coefficient of “Internally acquired utilized data volume,” while and both types of data had a positive significant relationship to added value. The same trend was more or less observed when linear homogeneity was not applied.

[14] One company with a data usage volume of "99999999" and enterprises that answered "Unknown", "Appropriate amount", or "No response" were excluded. Raw data is used for each variable.
[15] In order to confirm the multicollinearity due to the correlation between variables, we calculated the Variance inflation factor (VIF), and found that the multicollinearity was not suspected.
[16] The condition is that n times the capital and labor will result in n times the added value (constant returns to scale). $\alpha+\beta=1$ in the production function formula.

Figure 2-24 Outcome 1 of Empirical Analysis
(linear homogeneous and nonlinear homogeneous cases)

<Nonlinear homogeneous>

Data variable	Condition	n	Adjusted R^2	*K* (Capital)	*L* (Labor)	Data	Manufacturing dummy	Large enterprises dummy	Year dummy
Utilized data volume	–	2652	0.5594	0.40 ◎	0.55 ◎	0.03 ◎	0.02	-0.11	-0.33 ◎
Internally acquired utilized data volume	–	2652	0.5592	0.40 ◎	0.55 ◎	0.02 ◎	0.02	-0.11	-0.33 ◎
Externally acquired utilized data volume	–	2652	0.5588	0.40 ◎	0.56 ◎	0.04 ○	0.02	-0.12	-0.33 ◎

<Linear homogeneous>

Data variable	Condition	n	Adjusted R^2	*K* (Capital)	*L* (Labor)	Data	Manufacturing dummy	Large enterprises dummy	Year dummy
Utilized data volume	$\alpha+\beta=1$	2652	0.2533	0.40 ◎	(0.60)	0.02 ○	0.01	-0.19 ◎	-0.32 ◎
Internally acquired utilized data volume	$\alpha+\beta=1$	2652	0.2531	0.40 ◎	(0.60)	0.02 ○	0.01	-0.19 ◎	-0.32 ◎
Externally acquired utilized data volume	$\alpha+\beta=1$	2652	0.2525	0.40 ◎	(0.60)	0.04 △	0.02	-0.18 ◎	-0.32 ◎

* Externally acquired utilized data volume used the variable as 1+ externally obtained data volume.
Enterprises with utilized data volume equaling 0 are excluded from the analysis.

Note ◎: Significance level 1%, ○: Significance level 5%, △: Significance level 10%

In addition, taking into account the responses to the prior period's survey (2020 Enterprise Survey) and this period's survey (2021 Enterprise Survey), in order to take into account factors specific to those who responded two years in a row, the data for two years was used in performing a panel data analysis (fixed-effects model). **Figure 2-25** shows that all data variables are significant in the positive direction when all enterprises are targeted. The year dummy is also significant in the negative direction. The results were generally similar to those of the pooled data analysis.

Figure 2-25 Empirical Analysis Taking into Account Responses to Last Year's Survey and This Year's Survey (estimation of a production function model that does not assume linear homogeneity by panel data analysis of a fixed effect model using two years' worth of data)

Subject of analysis	Data variable	Sample size	Adjusted R^2	*K* (Capital)	*L* (Labor)	Data	Manufacturing dummy	Large enterprise dummy	Year dummy
Enterprises that responded two years in a row	Utilized data volume	276	0.4955	0.34 ○	0.004	0.02	-0.17	0.41	-0.05
All enterprises	Utilized data volume	2652	0.5821	0.40 ◎	0.54 ◎	0.02 ○	0.04	-0.05	-0.35 ◎
	Internally acquired utilized data volume	2652	0.5820	0.40 ◎	0.54 ◎	0.02 ○	0.04	-0.05	-0.35 ◎
	Externally acquired utilized data volume	2652	0.5815	0.40 ◎	0.55 ◎	0.03 △	0.04	-0.05	-0.35 ◎

* This analysis excludes enterprises with added value or data utilized volume ≤ 0.
Note ◎: Significance level 1%, ○: Significance level 5%, △: Significance level 10%

However, these results only reflect the current status of data utilization efforts. Increasing the amount of data utilized does not necessarily lead to increased added value. It should be noted that the results show that the effects of data utilization on enterprises split to ones that had a good effect and those that did not, which averaged out the results to some extent.

(B) Empirical analysis result 3 (by industry, size, and data)

Regarding the analysis by industry, as shown in **Figure 2-26**, the amount of data used was significant in the non-manufacturing and service industries. By size, it was significant for both large enterprises and SMEs, as was seen in Report 2021. By type of data, only utilized data volume, other than customer-related data, was significant. Based on these facts, increasing added value through data utilization seems effective regardless of size of the enterprise. Thus, it is expected that data utilization will progress further not only among large enterprises but also among SMEs. In addition, increasing added value through data utilization is especially effective in the service industry, among non-manufacturing industries.

However, in manufacturing, and in non-manufacturing other than services (wholesale and retail trade, information and communications, etc.), utilized data volume did not show significance.[17]). It may be necessary to improve approaches to effective data utilization to increase added value.

Figure 2-26 Empirical Analysis Result 3 (by industry, size of enterprise, and type of data)

Subject	Data variable	n	Adjusted R^2	*K* (Capital)	*L* (Labor)	Data	Manufacturing dummy	Large enterprises dummy	Year dummy
Manufacturing	Utilized data volume	1089	0.6797	0.54 ◎	0.55 ◎	0.01	–	-0.04	-0.38 ◎
Non-manufacturing	Utilized data volume	1563	0.4855	0.36 ◎	0.53 ◎	0.03 ◎	–	-0.20 ○	-0.25 ◎
Large enterprises	Utilized data volume	892	0.5855	0.53 ◎	0.44 ◎	0.03 △	0.22 ◎	–	0.04
SMEs	Utilized data volume	1760	0.3150	0.29 ◎	0.62 ◎	0.02 ○	-0.08	–	-0.50 ◎
Total	Volume of customer data utilized	2453	0.5573	0.41 ◎	0.56 ◎	0.01	0.02	-0.13 △	-0.34 ◎
Total	Utilized data volume other than customer-related data	1953	0.5852	0.41 ◎	0.55 ◎	0.03 ◎	-0.01	-0.08	-0.30 ◎

<Analysis of non-manufacturing segment in greater detail>

Subject	Data variable	n	Adjusted R^2	*K* (Capital)	*L* (Labor)	Data	Manufacturing dummy	Large enterprises dummy	Year dummy
Wholesale, Retail	Utilized data volume	958	0.4329	0.24 ◎	0.61 ◎	0.02	–	-0.14	-0.28 ◎
Information, communication	Utilized data volume	156	0.6771	0.37 ◎	1.00 ◎	-0.04	–	-0.66 ○	-0.25
Services	Utilized data volume	254	0.5071	0.34 ◎	0.38 ◎	0.08 ○	–	-0.25	-0.64 ◎
Other than the above	Utilized data volume	195	0.6604	0.55 ◎	0.39 ◎	0.04	–	-0.18	-0.22

Note ◎: Significance level 1%, ○: Significance level 5%, △ :Significance level 10%

(C) Empirical analysis result 4 (analysis incorporating AI utilization)

In order to explore what factors are important in conjunction with AI utilization in obtaining effective results, a production function analysis was performed including "Employee in charge of a specialized department that conducts data analysis," "Enterprise-wide environment built"," and "Joint analysis involving other enterprises such as alliances and consortia" in addition to "AI utilization". As shown in **Figure 2-27**, when "AI utilization × employee in charge" and "AI utilization × enterprise-wide environment built" are analyzed separately, the results show a positive significant relationship. It can be said that AI utilization in enterprises building an enterprise-wide environment and enterprises with an employee in charge are both producing good results. (However, with regard to the latter, it should be noted that "AI utilization" and "Enterprise-wide environment built" had a positive significant relationship by themselves.) In order to increase the added value through AI utilization, it is important to build an

[17] The information and communication industry includes not only the telecommunications industry, but also the broadcast and newspaper industries.

environment enabling enterprise-wide data utilization with an appropriate employee in charge who leads data utilization.

As shown in the lower part of **Figure 2-27**, when cross-tabulation was performed using pooled data, 4.2% responded that they used AI and did not have an employee in charge, while 3.8% responded that they used AI and had an employee in charge. Based on this, it can be assumed that there are employees in charge in about half of enterprises using AI. Similarly, 5.1% responded that they utilized AI, but did not build an enterprise-wide environment, and 2.9% responded that they utilized AI and built an enterprise-wide environment. One-third of enterprises that utilized AI are considered to be building an enterprise-wide environment.

Figure 2-27　Empirical Analysis Result 4 (AI utilization including Analysis 2[18])

	Estimated result	Estimated result
Log (tangible fixed assets + intangible fixed assets)	0.39 ◎	0.40 ◎
Log (total number of employees)	0.55 ◎	0.55 ◎
Log (utilized data volume)	0.02 ○	0.02 ○
AI utilization	0.14	-
Employee in charge	0.02	-
AI utilization × employee in charge	0.14	0.28 ◎
Industry dummy (manufacturing)	0.01	0.01
Large enterprises dummy	-0.11	-0.11
Year dummy	-0.34 ◎	-0.34 ◎
Adjusted R^2	0.5574	0.5574
n	2541	2541

	Estimated result	Estimated result
Log (tangible fixed assets + intangible fixed assets)	0.39 ◎	0.40 ◎
Log (total number of employees)	0.55 ◎	0.55 ◎
Log (utilized data volume)	0.02 ○	0.02 ○
AI utilization	0.24 ◎	-
Enterprise-wide environment built	0.16 ◎	-
AI utilization × enterprise-wide environment built	-0.11	0.22 ○
Industry dummy (manufacturing)	0.02	0.01
Large enterprises dummy	-0.11	-0.11
Year dummy	-0.32 ◎	-0.33 ◎
Adjusted R^2	0.5583	0.5559
n	2538	2538

Note ◎: Significance level 1%, ○: Significance level 5%, △: Significance level 10%

		Employee in charge	
		Yes	None
AI utilization	Yes	3.8%	4.2%
	None	21.6%	70.4%

		Enterprise-wide environment built	
		Yes	None
AI utilization	Yes	2.9%	5.1%
	None	18.0%	74.0%

* AI:1 is where AI is used in any business area regardless of whether it is developed in-house or provided by the other company. 0 is where AI is not used.
* employee in charge: 1 is where the enterprise has a person to lead data utilization regardless of whether the position is dedicated or shared. 0 is where there is no position.
* Enterprise-wide environment built: 1 is where enterprise-wide environment enables data utilization. 0 is any other environment.

Figure 2-28 shows that "AI utilization × analysis by a dedicated department for data analysis" is positively significant, while either element alone shows no benefit. Similarly, it shows that "AI utilization × Joint analysis involving other enterprises such as alliances and consortia" is positively significant, while either element alone shows no benefit. It is considered important to increase the added value through the use of AI for enterprises with conjunction with a dedicated department for data analysis or with enterprises that do joint analysis involving other enterprises such as alliances and consortia.

[18] Please refer to Attachment for the Analysis I including AI utilization.

Figure 2-28　Empirical Analysis Result 4 (AI utilization including Analysis 3)

	Estimated result	Estimated result
Log (tangible fixed assets + intangible fixed assets)	0.39 ◎	0.39 ◎
Log (total number of employees)	0.55 ◎	0.55 ◎
Log (utilized data volume)	0.02 ○	0.02 ○
AI utilization	0.08	-
Analysis done by dedicated department for data analysis	0.04	-
AI utilization × analysis done by dedicated department for data analysis	0.52 ◎	0.62 ◎
Industry dummy (manufacturing)	0.02	0.02
Large enterprise dummy	-0.11	-0.10
Year dummy	-0.33 ◎	-0.33 ◎
Adjusted R^2	0.5590	0.5591
n	2535	2535

	Estimated result	Estimated result
Log (tangible fixed assets + intangible fixed assets)	0.39 ◎	0.39 ◎
Log (total number of employees)	0.55 ◎	0.55 ◎
Log (utilized data volume)	0.02 ○	0.02 ○
AI utilization	0.16 ○	-
Joint analysis involving other enterprises such as alliances and consortia	0.12	-
AI utilization × joint analysis involving other enterprises such as alliances and consortia	0.50	0.75 ◎
Industry dummy (manufacturing)	0.02	0.02
Large enterprise dummy	-0.11	-0.11
Year dummy	-0.34 ◎	-0.34 ◎
Adjusted R^2	0.5577	0.5570
n	2535	2535

Note ◎: Significance level 1%, ○: Significance level 5%, △: Significance level 10%

		Analysis done by dedicated department of data analysis	
		Yes	None
AI utilization	Yes	1.9%	6.1%
	None	8.5%	83.6%

		Joint analysis involving other companies such as alliances and consortia	
		Yes	None
AI utilization	Yes	0.6%	7.3%
	None	0.9%	91.2%

(D)　Highlights of empirical analysis results

Although the empirical analysis of this report differs from the empirical analysis up through the prior period in that it uses multiple years of data, approximately the same results were obtained. It was verified that the data utilization has a positive significant relationship to added value and that data utilization suggests the possibility of accelerating productivity growth. The increase in added value through data utilization is considered to be effective regardless of enterprise size. In addition, the results of industry-specific analysis conducted this period show that it is also effective in non-manufacturing industries, particularly in the service industry. However, such a trend is not seen in manufacturing, and in non-manufacturing other than services (wholesale and retail trade, information and communications, etc.). It has also become apparent that improving the approach to data utilization is necessary.

Furthermore, a feature of this period's empirical analysis is the analysis performed of the synergistic effect using the cross items in order to analyze the important factors for obtaining the effect of AI utilization. Those results indicate that having an appropriate person in charge to lead data utilization, building an environment where data can be utilized enterprise-wide, having analysis done by a dedicated department of data analysis, and establishing a system that enables joint analysis involving other enterprises such as alliances and consortia are important factors.

Regarding the fact that the year dummies are negatively significant, one possibility is the impact of the Covid-19 pandemic on the added value of enterprises.

Report 2021 described three important points for enterprises to promote data utilization efforts and fully enjoy the added value: (1) building an enterprise-wide data utilization environment, (2) human resource development and appropriate organization structure, and (3) external collaboration (with other organizations, not limited to in-house data). Empirical analysis results from this period confirm the significance of these points as well. They are important not only for enterprises to obtain the effects of data utilization, but also from the viewpoint of obtaining

synergistic effects with AI utilization. It is hoped that these efforts will continue to be promoted.

2.3 Issues and Challenges

In this period's empirical analysis, based on the issues of the prior period, we have conducted in-depth analyses by industry and by the effect of AI utilization. The survey with enterprises dealt with in this report is linked to the Basic Survey of Japanese Business Structure and Activities. Therefore, there is little data for healthcare, education and other quasi-public sectors, as well as enterprises in the service industry sector. This has led to an ongoing issue that adequate analysis is not possible for these sectors.

In particular, the quasi-public sectors, such as medical care, is highly beneficial for the public, therefore it is necessary to try to analyze and evaluate the effects of data utilization using indicators different from those of general business enterprises.[19]

In addition, the various analysis results obtained this time showed that there is a correlation between added value and data utilization, but, as in the prior period, the causal relationship has not been clarified. Furthermore, there is room for further analysis of the relationship between issues with data utilization and added value. It is assumed that there was an issue with properly grasping the data utilization volume based on the comments of enterprises in this period's open-ended questionnaire survey[20] and the variability in the answers in the questionnaire survey.[21] It is necessary to carefully consider in what way future surveys should be based on these opinions.

[19] See the appendix for examination of evaluation and analysis methods for digitalization and data utilization in the medical field.
[20] There were voices such as concerns about the method of calculating numerical values and that the numerical values were unclear. For details, refer to the data section.
[21] See the Appendix for information on the variation in responses.

3. Issues Related to Data Utilization in Medical Care

In Report 2021, the delay in digitalization in the public sector (government) and quasi-public sector (medical care, education, etc.) is a factor in Japan's low growth, and It has been pointed out that consideration and efforts to promote digitalization are important.

In this Committee work, Chairperson hearings were conducted in the medical field.[22]

Advanced cases targeting the medical field where the promotion of digitalization and data utilization are expected were introduced. They were sorted out according to the effects and issues of the efforts. **Figure 3-1** shows the status of implementation in the medical field which are presented in the Chairperson hearings.

Figure 3-1 Status of Implementation in Medical Care presented in the Chairperson Hearings

Date	Presenter	Title
March 10, 2022	ASONUMA Motohiro Juntendo University Information Center Headquarters Visiting Professor Cabinet Office National Strategic Special Zones WG Member and Super City Concept Expert	Why Is Medical Information Sharing and Utilization Not Progressing: Facing Medical Information Based on 50 Years of History
	OHIRA Hiroshi President and Representative Director Information and Communications Research Institute, Inc. Sub-theme A Research Director, "Advanced diagnosis and treatment system by AI hospital" Cabinet Office Strategic Innovation Promotion Program (SIP)	SIP "Advanced diagnosis and Treatment System by AI Hospital"
March 22, 2022	SATAKE Junko, Public Affairs, Ubie Discovery Ubie, Inc.	Using Technology to Guide People to the Right Medical Care
	MIYAUCHI Hisashi, Director of Digital Strategy Department SUZUKI Atsuyuki, Director of Digital Strategy Department Sumitomo Mitsui Financial Group, Inc.	SMBC Group's Initiatives to Realize a Digital Society

3.1 Current Status of Data Utilization in Medical Care

3.1.1 Status of Initiatives for Digitalization and Data Utilization in Medical Care

In this section, "(A) Digitalization and data utilization efforts of advanced medical institutions" (three cases) and "(B) Information sharing of medical and health information network" (one example) are described, based on the

[22] Conducted privately on March 10 and 22, 2022
https://www.soumu.go.jp/main_sosiki/kenkyu/ai_network/02iicp01_04000274_00002.html

presentations of the four people who were the subjects of the chairperson hearing, with examples divided into two major themes.

Note that the descriptions in this section are based on the content of the presentations made at the chairperson hearing, and each person is engaged in various initiatives in addition to those described.

(A) Examples of advanced medical institutions' digitalization and data utilization efforts

a. Cabinet Office Strategic Innovation Promotion Program (SIP)] "Advanced Diagnosis and Treatment System by AI hospital" – Effort in development and improvement of medical technology through digitalization and data utilization of research institutes and ICT service enterprises.

Overview of initiatives

The AI Hospital research and development efforts aim to build medical big data utilizing medical equipment to reduce the burden on healthcare workers while ensuring the quality of medical care in a super-aging society. Furthermore, by utilizing AI technology, the project aims to assist diagnosis and communication support, which could lead to a reduction in the work burden on medical sites.

Major achievements so far include the start of operation of a system that stores data by secret sharing and the evaluation of secure computation methods using this system. A demonstration experiment to transcribe conversations and nursing records in medical care was initiated. It was reported that the burden of typing up the medical records decreased by about 30% (**Figure 3-2**).

Figure 3-2 Goals and Results of AI Hospital

1. SIP "Advanced Diagnosis and Treatment System by AI Hospital"

Goal of the overall plan

(1) Building a highly secure database system and extracting useful medical information
(2) At least 10 medical institutions have introduced the AI Hospital System
(3) Implementation of remote imaging/pathological diagnosis and automatic colonoscopy using AI
(4) Introduction to clinical practice of ultra-precise diagnostic method with blood using AI
(5) Reducing the burden on medical staff by operating a system that uses AI to convert speech into text (conversation in the examination room and nursing records) with an informed consent support system

Results achieved so far

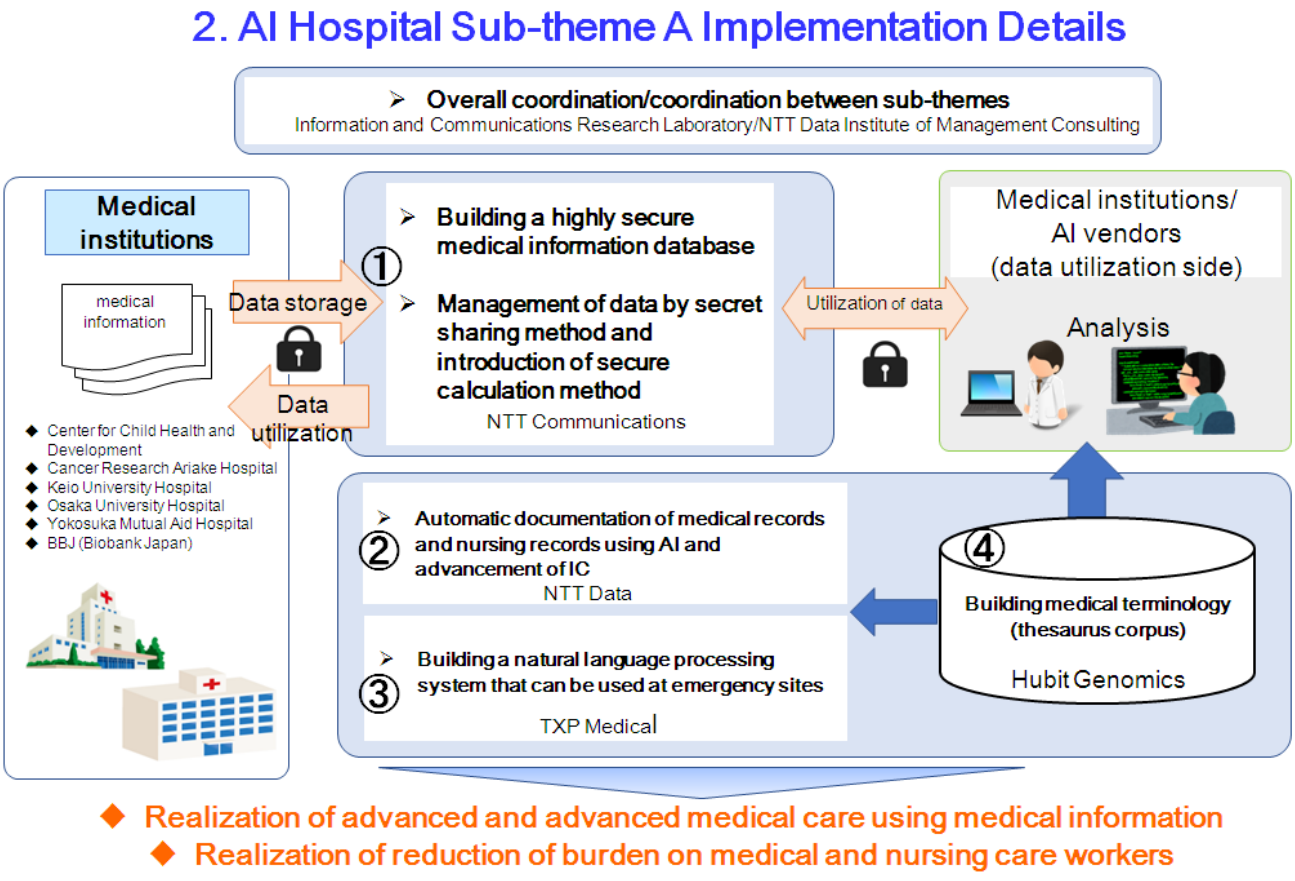
(1) Creation of a medical dictionary (approximately 420,000 words including 54,000 medicines and treatments) and the start of a demonstration experiment to convert conversations and nursing records in medical settings into text (burden for inputting medical information records) approx. 30% reduction)
(2) Commencement of operation of a system that stores data by secret sharing, and evaluation of secure calculation methods using them
(3) Voice input of doctor's commands during emergency medical care

(4) The AI Hospital Promotion Center will be established within the Japan Medical Association to formulate the grand design of the AI platform for medical use, and to disseminate and promote it.
(5) Standardization for cancer diagnosis by liquid biopsy using blood (standardization for transporting samples from remote locations) and its evaluation
(6) Reduction of radiation exposure for medical staff during PET examinations using artificial intelligence robots (approximately 50% reduction)
(7) Using the digitalization of pathological diagnostic images and an AI-equipped integrated cancer database that has been made into two screens with electronic medical records, we have built a system that displays patient summaries, AI prediction models, and simple nomograms.
(8) Operation of a new coronavirus infectious disease consultation support system (prototype) using artificial intelligence avatars

Source: Committee on AI Economy, Chairperson Hearing (1st) Material 3 based on the outline of "Advanced Diagnosis and Treatment System by AI (Artificial Intelligence) Hospital" (National Institute of Biomedical Innovation, Health and Nutrition)
https://www.nibiohn.go.jp/sip/outline/

Subtheme A targets realization of highly advanced medical care using medical information and reduction of the burden on healthcare workers (**Figure 3-3**). Examples of these efforts are: building a highly secure medical information database, extracting useful medical information from it, developing analysis technology, automatic documentation of medical records and nursing records using AI, natural language processing that can be handled at the emergency site, and creating a collection of clinical terminology.

Figure 3-3 AI Hospital Sub-theme A Outline



(Effects of Implementation)

If we quantify the effects of the implementation of AI Hospitals, for example, nurses will switch from manual input to voice input and automatic text conversion, which will result in a reduction in time and an expected cost reduction of 160 billion yen per year. In addition, the assistance by AI avatars in explaining CT examinations alone would lead to a reduction in doctors' working hours, possibly resulting in cost savings of hundreds of billions of yen.

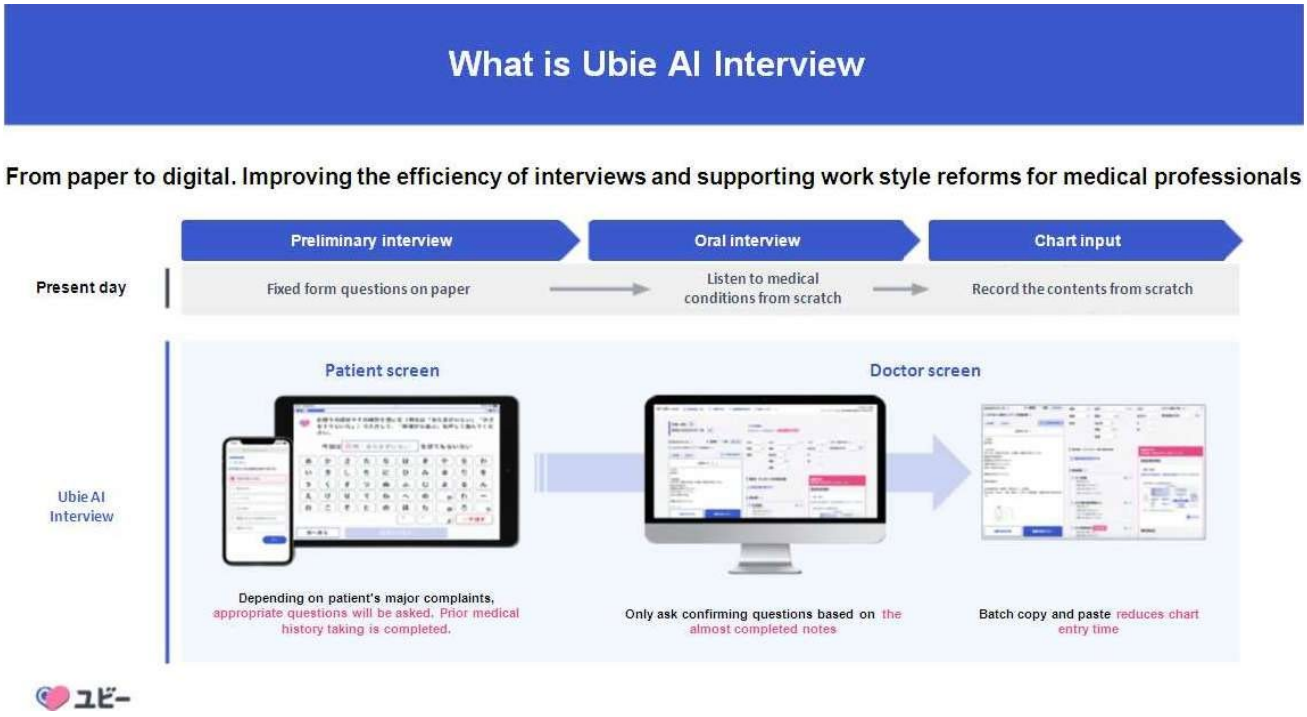
b. [Ubie, Inc.] "Ubie AI Interview", "Ubie AI Consultation[23]", "Ubie Link" Service - Efforts aimed at reducing the burden on medical institutions through digital support by medical service business project

(Overview of Initiatives)

Ubie, Inc. provides Ubie AI Interview for medical institutions, Ubie AI Consultation for consumers, and Ubie Link that connects local residents and their primary care doctors.

Figure 3-4 shows the Ubie medical interview. The patient responds to a questionnaire using a smartphone or tablet. The completed questionnaire is shared with the doctor. The doctor only asks additional questions as needed. The conversation can be easily documented by voice transcription in the electronic medical record. For patients, the main benefits include improved patient satisfaction and reduced time spent in the hospital, and for medical institutions, other than economic advantage, there are benefits in improved efficiency of office work, hospital infection risk prevention, and prevention of oversights.

Figure 3-4 Outline of Ubie AI Interview

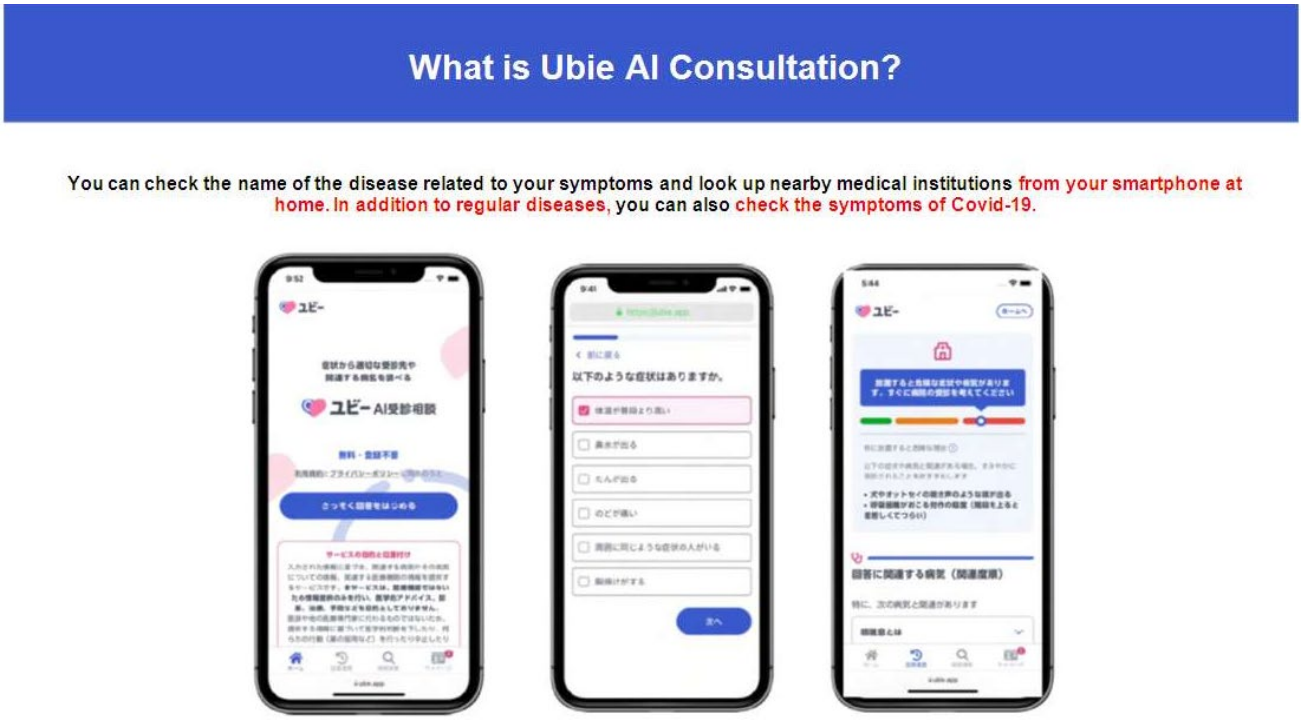


[23] This was the name of the service at the time of the hearing. The current name of the service is “Ubie”, a symptom search engine.

Source: Committee on AI Economy, Chairperson Hearing (2nd) Material 1

Ubie AI Consultation (**Figure 3-5**) is a service that allows consumers to search by smartphones and other devices for names of diseases associated to subjective symptoms as well as nearby medical institutions.In addition to displaying which diseases could be related to the symptoms the consumer entered, it also displays guidelines for how quickly the related diseases should be treated. Alternatively, it can display which medical department should be consulted and guide the consumer to the recommended clinic for consultation.

Figure 3-5　Overview of Ubie AI Consultation



Source: Committee on AI Economy, Chairperson Hearing (2nd) Material 1

Using the Ubie AI Consultation, the Ubie Link service (**Figure 3-6**) makes it possible to post information about clinics, set up appointment leads, and share consumer input and responses from the clinics in advance. Some medical institutions enable making an appointment for medical examination through Ubie Link.

Figure 3-6　Overview of Ubie Link

Source: Committee on AI Economy, Chairperson Hearing (2nd) Material 1

(Effect of efforts)

Over 500 medical institutions have implemented Ubie AI Interview in the four years since its release, covering all 47 prefectures of Japan. Some medical institutions that use Ubie AI Interview reported that outpatient interview time has been shortened by one-third. Based on these report, estimated business effect of shortened time of clerical work required for the first outpatient visit can be reduced by approximately 1,000 hours annually.

Some examples of clinics using Ubie Link are, for one, a patient's life was saved as timely referral to appropriate medical institution was possible since sufficient information was shared in advance. More generally, it led to appropriate matching with the patient, and by sharing the interview results in advance, smooth examination following the first visit is reported.

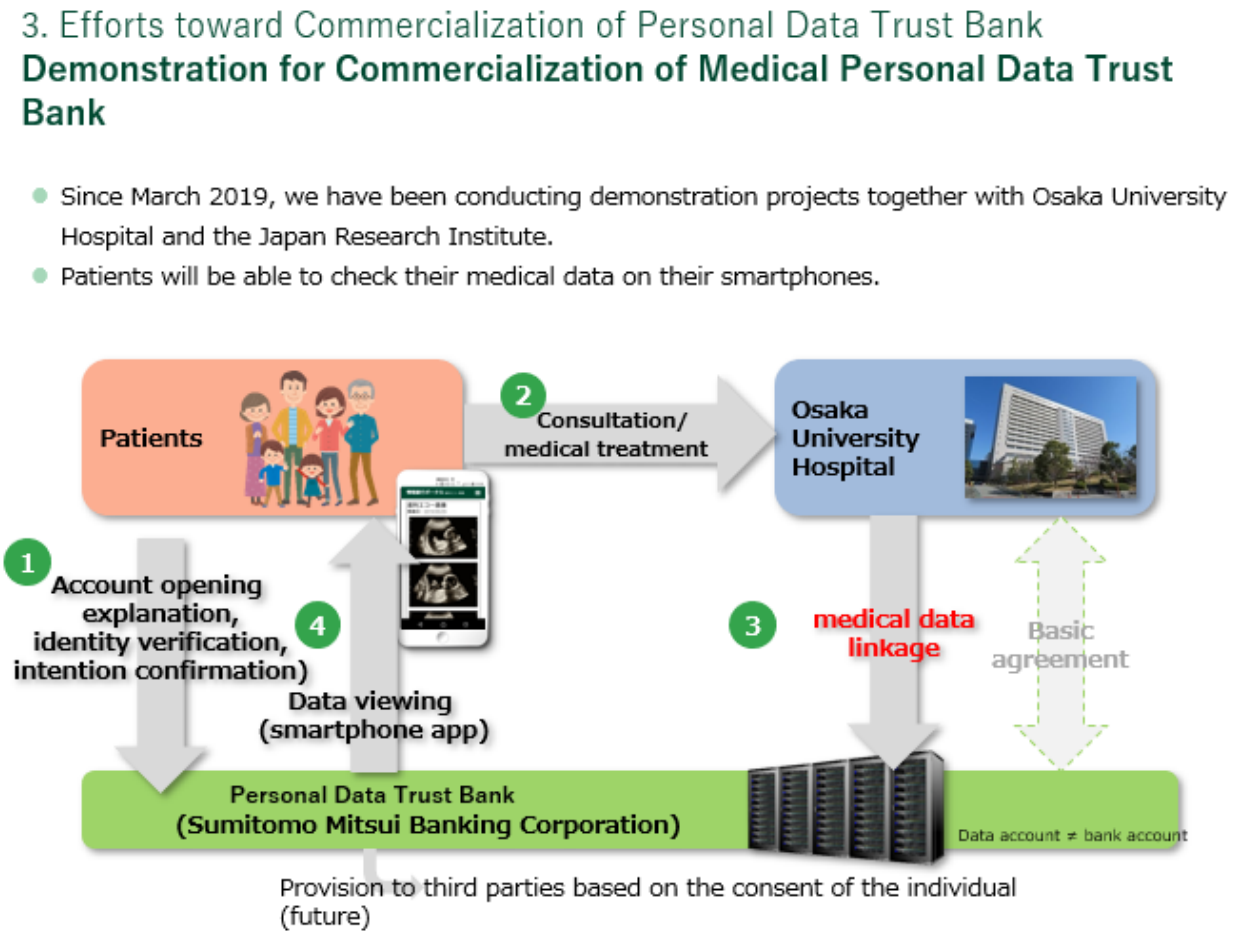
c.　[Sumitomo Mitsui Financial Group, Inc. (SMFG)] Medical information bank smartphone app "Decile"　- Efforts aimed at improving the ease of managing personal medical and health information by utilizing personal data trust banks

(Overview of initiatives)

SMFG is working on the commercialization of a personal data trust bank for the type of medical data considered to be most important. This is under the goal of a data-driven society which is to make full use of personal data and digital technology to create a society where everyone's lives are fulfilling. Decile is an application that provides a personal data trust bank service for medical data. It was used as part of the demonstration for the commercialization of medical personal data trust banks (**Figure 3-8**). You can view and organize personal medical and health information (allergies, test results, drug prescriptions, etc.) managed by medical institutions on your smartphone. It has three features: classification of a wide variety of medical data (data that can be freely used by patients and data mainly for medical institutions), online identity verification, and easy-to-understand explanations using videos. Aiming for further dissemination based on the demonstration project, SMFG acquired the venture company Plus

Medi Corporation to realize a better user experience. The personal data trust bank will be integrated with Plus Medi's MyHospital (https://www.wellcne.com/myhospital/), a service that supports patient visits and medical consultations.

Figure 3-7　Outline of Demonstration for Commercialization of Medical Personal Data Trust Bank



Source: Committee on AI Economy, Chairperson Hearing (2nd) Material 2

(Effect of efforts)

While data portability for individuals is very important for the success of a data-driven society, at the same time it is difficult for individuals to properly manage and effectively use their own data. In this respect, personal data trust banks are valuable. In addition, SMFG believe that one of the new social missions required of financial institutions in the future is to provide the functionality to store and operate personal data safely and securely.

(B)　Example of constructing an information sharing network for medical and health information[24]

In order to share medical and health information within the region, more than 200 regional medical information collaboration networks have been constructed nationwide by utilizing the Regional Medical and Nursing Care

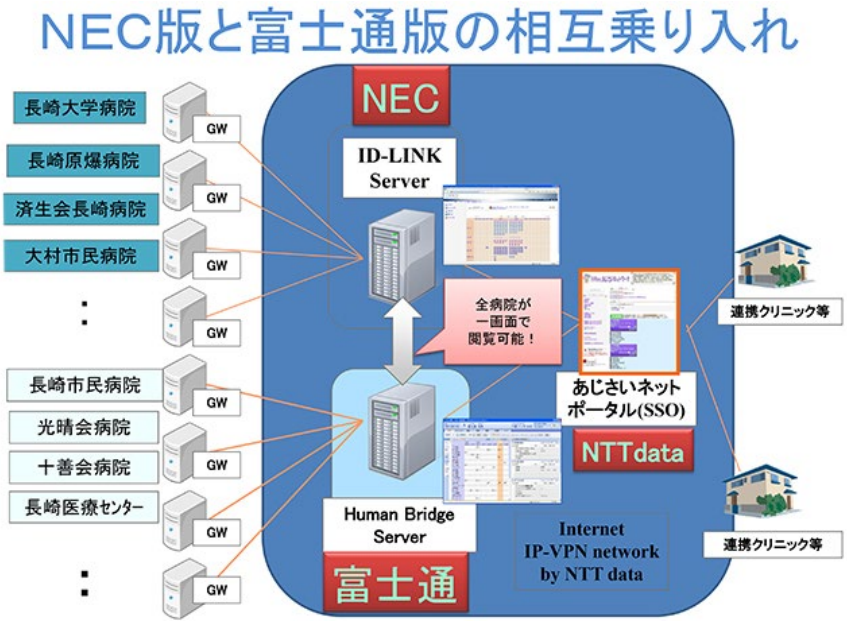
[24] This is the example by Professor ASONUMA Motohiro, Juntendo University Information Center Headquarters Visiting Professor, Cabinet Office National Strategic Special Zone WG Member and Super City Concept Expert in a presentation at the chairperson hearing, "Why is medical information sharing and utilization not progressing: Facing medical information based on 50 Years of History."

Comprehensive Securing Fund and the Regional Medical Revitalization Fund. Of these, nearly 30 prefecture-wide networks have been built. In other prefectures, networks have been built for secondary-medical-care, municipality-wide or by designated geographical unit of multiple municipalities.

In medical care, each region often builds its own network, which is an issue in inter-regional collaboration. **Figure 3-8** shows an example of the networks created by collaboration by different vendors. This has enabled some information sharing, albeit still inadequately.

・ Networks of Fujitsu and NEC are linked in the "Ajisai (Hydrangea) Net" of the Nagasaki Regional Medical Coordination Network System Association, a specified non-profit organization.

Figure 3-8 Outline of Network Cooperation in Ajisai Net

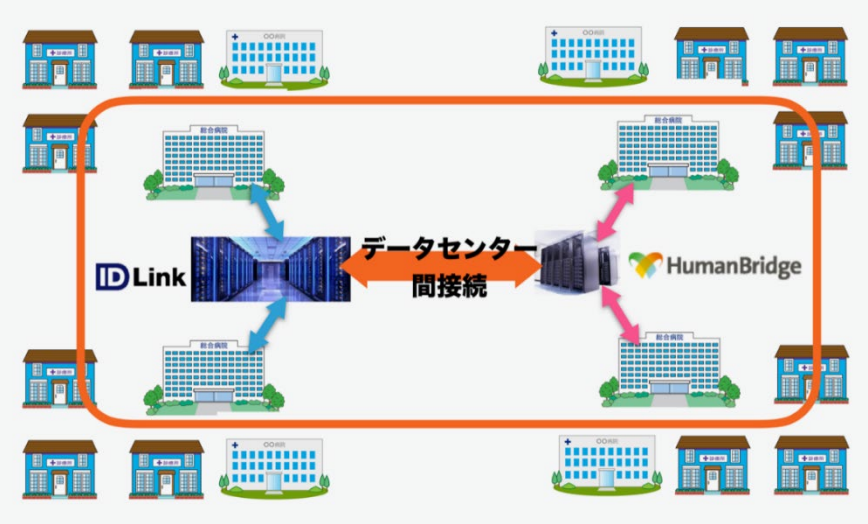


Source: Ajisai Net Homepage of the Nagasaki Regional Medical Cooperation Network System Council[25]

・ In the Tokyo Comprehensive Medical Care Network of the Tokyo Comprehensive Medical Network Management Council, different regional medical collaboration systems are connected using data center connections from multiple vendors such as Fujitsu's HumanBridge and NEC/SEC's ID-Link (**Figure 3-9**).

[25] http://www.ajisai-net.org/ajisai/07_outline/index_4.html

Figure 3-9　Overview of network collaboration in the Tokyo comprehensive medical network



Source: Public Interest Incorporated Association Tokyo Medical Association "Tokyo Comprehensive Medical Network"[26]

3.1.2　Effects of Digitalization and Data Utilization Efforts in Medical Care

Based on the results confirmed through interviews with the chairperson, the following are examples of the main effects of digitalization and data utilization efforts in medical care.

(Examples of main effects)

- It is possible to grasp the patient's condition more accurately
- Reduces the doctor’s time to see a patient
- Reduces the time for providing treatment
- Improves patient convenience
- Reduces burden on doctors and other medical staff
- Reduces administrative burden

In addition, in the efforts of digitalization and data utilization in medical care, the characteristics that can be regarded as success factors are assumed to be, for example, the following.

- Securing a stable source of funds for a certain period of time becomes possible through substantial support from wide-area municipalities and by the fact that the main body of the initiative has other main business that make it easier to work over a long period on projects that take time to commercialize and become profitable.
- The needs of the users who will benefit from the effects of the efforts can be properly grasped by obtaining the cooperation of medical institutions that will be involved in the demonstration project, by continually grasping the needs of healthcare workers in detail and reflecting them in initiatives, and by a wide range of the users being covered in the initiatives.

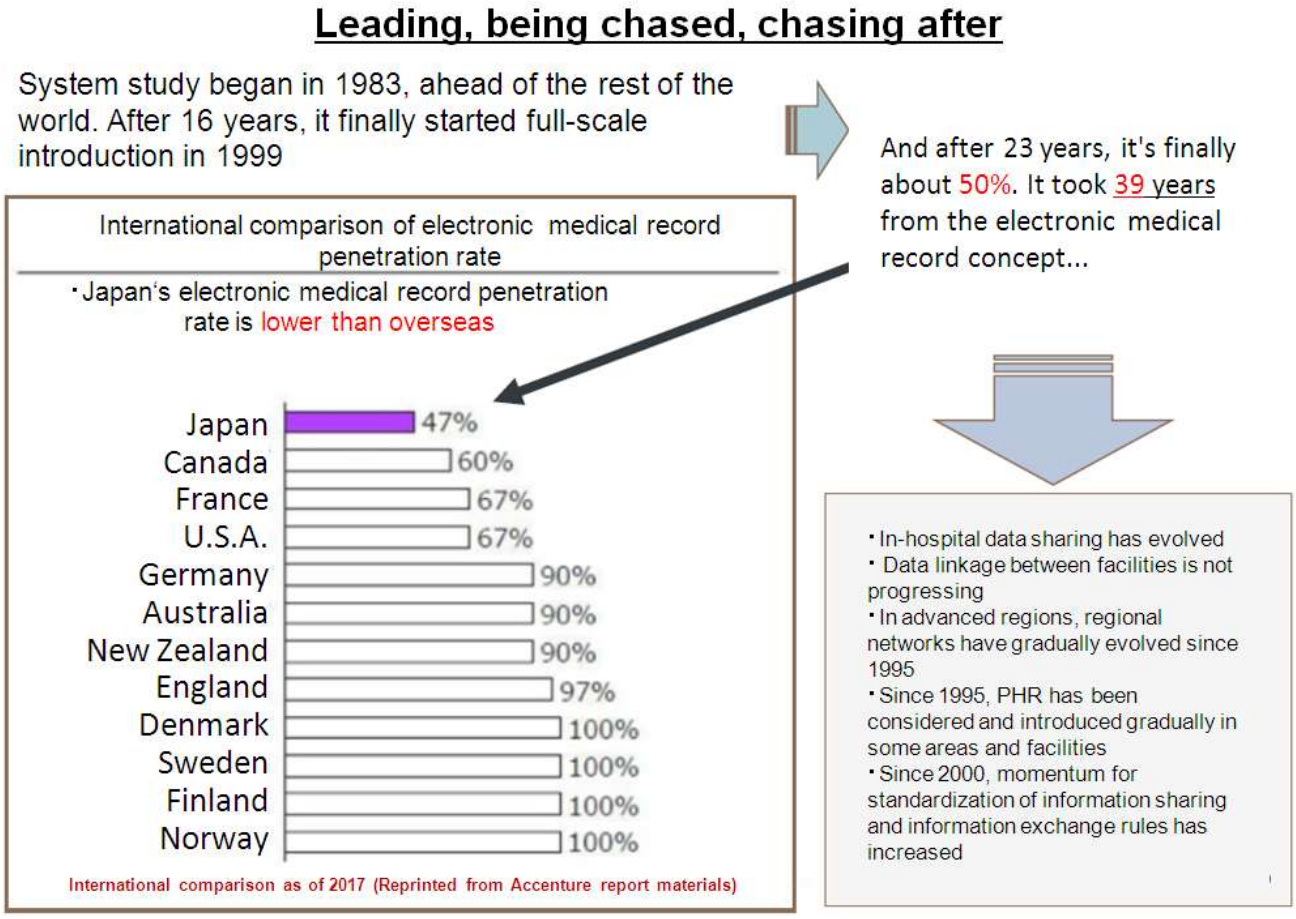
[26] According to "About the start of full-scale operation (updated November 1, 2018)," https://www.tokyo.med.or.jp/tokyo_medical_network

In addition to the above factors, it is also important to foster social momentum such that the main body of the initiative becomes strongly aware of social issues and social missions, and recognizes the significance of the fact that the efforts of the participating bodies of the initiative have a shared mission.

3.2 Issues in Data Utilization in Medical Care

As described in 3.1.1, there are advanced examples of digitalization and data utilization efforts in medical care, and the effects of these efforts are recognized. On the other hand, from a global perspective, it has been reported that efforts to digitize and utilize data in medical care in Japan are lagging behind in connecting databases necessary for sharing data, especially medical chart information (**Figure 3-10**). Based on the interview with the chairperson, it is thought that the following issues exist in Japan in terms of digitalization and data utilization unique to medical care.

Figure 3-10 Penetration of Electronic Medical Records



Source: Committee on AI Economy, Chairperson Hearing (2nd) Material 2

- It is difficult to openly share medical and health information data between different data management entities such as medical institutions and governments.

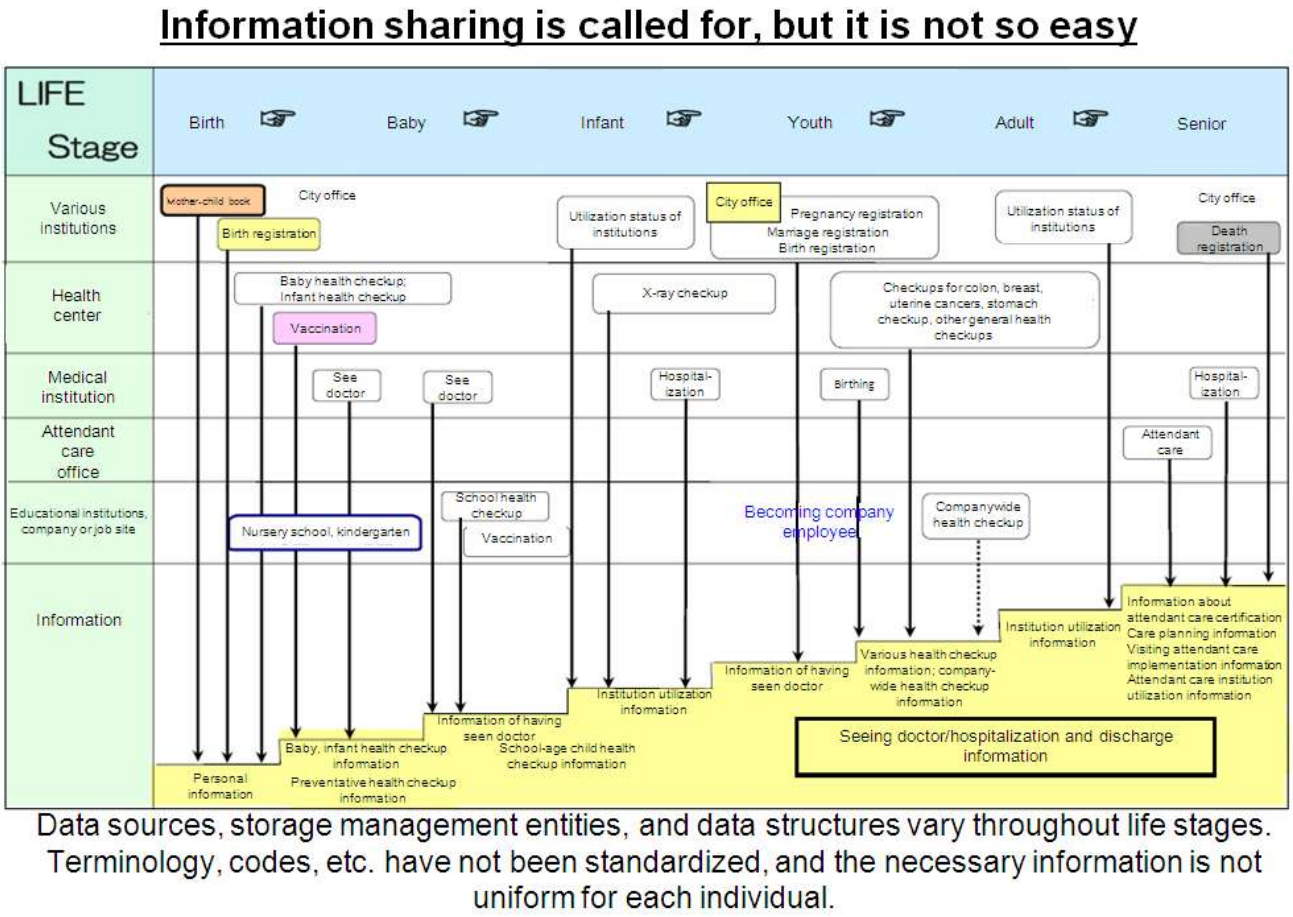
Currently, efforts to digitize and utilize data at medical institutions are mainly aimed at improving hospitals' internal work efficiency. In addition, pieces of individuals' health information are distributed in various

organizations and not unified nor centralized. Therefore, it is difficult for medical institutions and governments to link (unify) personal data for mutual utilization. In recent years, intra-regional cooperation has progressed little by little, but inter-regional cooperation is yet to come.

In terms of code systems, data structuring, data entry rules to prevent data loss and aggregation errors, terminology, inter-system cooperation rules, and APIs - standardization of system usage and specifications have not progressed much.

Under these circumstances, even if the individual or the subject with their consent intends to utilize the medical and health information throughout the individual's life stage for the purpose of contributing to medical care and health promotion, it will not be possible to access it immediately and collectively when necessary. The current situation is that it is difficult, time-consuming and costly (**Figure 3-11**).

Figure 3-11 Information Sharing through Life Stages



Source: Committee on AI Economy, Chairperson Hearing (2nd) Material 2

- There is a great deal of concern about the use of personal information by individuals, and the use of information for research with high public interest by research institutions, government agencies, and enterprises is not progressing.

In Japan, the concept of data portability is hardly understood. It is difficult to obtain consent from individuals for use of personal medical and health information due to deep-rooted concerns about information security when providing and sharing for the use of one's personal information. This makes it difficult to use it for research purposes and has become a hindrance.

・ Digitalization and data utilization are unlikely to lead directly to profits for medical institutions

Digitalization and data utilization do not directly affect the profits of medical institutions, and it is difficult to recover the costs of digitalization and data utilization efforts through medical fees. Even large-scale medical institutions face this situation; conceivably large expenditures may not be affordable to many smaller medical institutions with smaller balance sheets. In addition, a business model that provides medical and health information may not be profitable over short period.

Possible countermeasures for these problems include the following.

Regarding the use and specifications of medical systems, it is necessary to standardize code systems, data structuring, data entry rules to prevent data loss and aggregation errors, terminology, inter-system cooperation rules, and APIs, and to examine the efforts necessary to realize the purpose, such as the framework for information provision by medical institutions and the establishment of a more flexible operation system for data utilization.

Regarding the acquisition of consent from individuals for the provision and sharing of data, it is crucial to discuss the measures to educate the general public about the significance of data portability and the use of personal medical and health information, not only for one's own benefit, but also for beneficial public health purposes. Case studies from foreign countries might be good references.

In doing so, it is considered important to ensure and realize the merits of both patients and medical providers in the digitalization and data utilization of medical care. In addition, in promoting the use of information for research with a high public interest, government efforts are considered important, but alleviating individual anxieties over personal information use is equally important.

4. Initiatives in Digitalization and Data Utilization

The Committee held hearings with businesspeople and field experts to deepen discussion and understanding around the state of digitalization and data utilization. They provided examples of initiatives in an array of fields, and held forth on government data policies.

Meanwhile, MIC held an international symposium, the Global Forum on AI Network Society 2022, on March 1. Expert panelists from Japan and the world discussed data utilization and distribution, a key to widespread adoption and use of AI.

This chapter reports on the hearings and the Global Forum as the starting point for a broader consideration of current initiatives for digitalization and data utilization in various fields, and the significance of the efforts. It also sums up the issues involved.

Figure 4-1 below summarizes the last year of major data-related hearings and moderated sessions held by the Committee (other than those in medical care).

Figure 4-1 Implementation Status of Hearings and Chairperson Hearings by the Committee (other than those in medical care)

Date	Presenter	Title
December 3, 2021[27]	HIRAMOTO Kenji, Data Strategy Manager, Digital Agency	Promotion of National Data Strategy
March 10, 2022	TAKI Toshio, Representative Director of the Japan Association for Financial APIs and Group Executive Officer, Money Forward, Inc.	Current Status and Issues of Financial API Utilization
March 22, 2022	MIYAUCHI Hisashi, Director of Digital Strategy Department SUZUKI Atsuyuki, General Manager, Digital Strategy Department, Sumitomo Mitsui Financial Group, Inc.	SMBC Group's Efforts to Realize a Digital Society
	MURAKAMI Kazuya Senior Manager, Planning Department, Smart Construction Promotion Headquarters, Komatsu, Ltd.	The Future of ICT on Construction Sites

4.1 Initiatives in the Financial Industry (Financial API)

Over the last few years, open banking, enabled by financial APIs, has advanced, with an array of financial services now available through apps and other digital platforms. This section summarizes the situation surrounding financial APIs and the issues facing the technology. The assessment is derived from the findings of the 2021 Enterprise Survey, as well as a Committee Chairperson Forum presentation, “Adoption of Financial APIs: Current Status and Challenges,” by TAKI Toshio, Representative Director of the Japan Association for Financial

[27] Committee on AI Economy (17th) Special-Interest Group on Data (16th) Joint Meeting

APIs and Group Executive Officer, Money Forward, Inc.

4.1.1 Current Status and Issues of Financial API Utilization (from a hearing with the Chairperson)

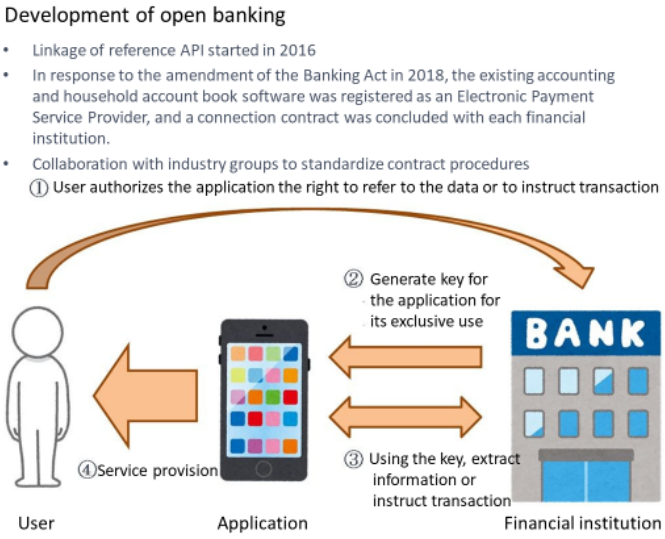
(Current status of open banking)

In an increasingly digitized society, account holders at financial institutions find a greater need for open banking, including a mechanism known as embedded finance, or embedded banking, which incorporates banking tools in the non-financial platforms they use on an everyday basis. It is important that these services increase user convenience within a secure format.

Under open banking, consumers authorize their financial institution to allow third parties (such as Electronic Payment Service Providers, or EPSPs) to access their data and issue transaction instructions via an app on their smartphone. The financial institution automatically generates a unique key that can only be used on the user's smartphone and provides it to the app, which then uses the key to access the user's account information and issue the transaction instructions. As illustrated in **Figure 4-2**, financial institutions create APIs which enable interconnection between their own systems and their account holders' various user applications. Since, unlike standard transaction models, the mechanism doesn't require EPSPs to store a user's ID or password in order to access their financial institution account; thus open banking represents a more secure system for information sharing and use.

Japan finds itself in a nearly unparalleled position in terms of connectivity between financial institutions. This has arisen because industry groups have been working together to standardize contracting procedures, in turn creating an environment which enables access to nearly every bank in the country via read-only APIs (which fetch information such as balance inquiries and bankbook entries without allowing payments or other actions from the account).

Figure 4-2 Open Banking: Recent History and a Simplified System Diagram



Source: Committee on AI Economy, Chairperson Hearing (1st) Material 1

(Issues in financial API implementation)

Electronic payment service providers (EPSPs) face three major issues in the use of financial APIs:

(1) Financial institutions offer few read/write API's capable of modifying or updating data

(2) Individual rights concerning access to their data have not been defined in law

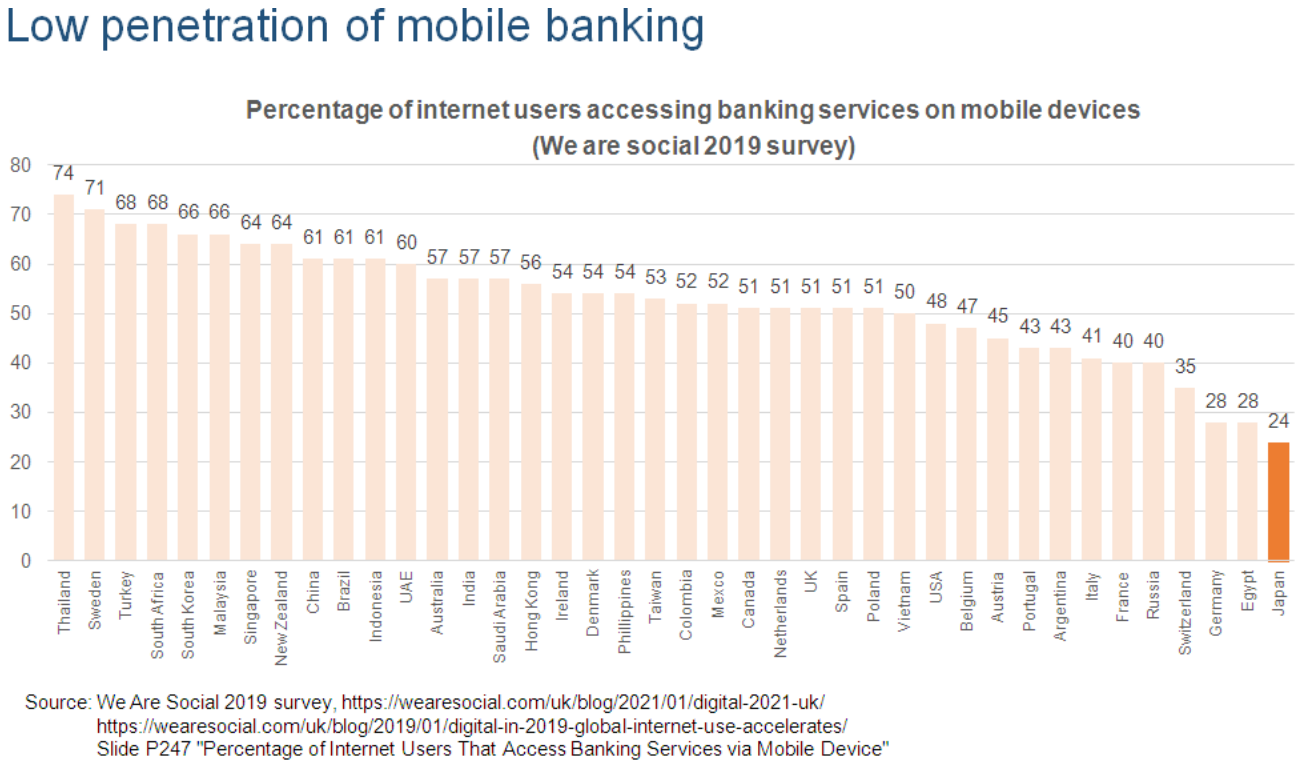
(3) Online banking is relatively sparsely used in Japan.

Regardinig issue (1), so few banks use Read & Write APIs that enable transaction instructions to execute transfers and withdrawals from accounts. Without these read & write APIs, e-money app users face inconvenience as they cannot charge their e-money app balances from their own bank accounts.

Meanwhile, issue (2), the legal ambiguity around individuals' rights in respect to data access, makes the process costly, as EPSPs need to pay for access. They are charged on a usage-based or fixed fee basis for obtaining account information, such as balances, deposit and withdrawal history.

Figure 4-3 illustrates issue (3) — the relative unpopularity of online banking in Japan, both by individuals and enterprises. Because APIs are employed as part of the online financial infrastructure, including mobile banking, low penetration of online banking necessarily means limited use of APIs.

Figure 4-3 Mobile Banking Penetration in 40 Nations Worldwide



Source: We Are Social 2019 survey, https://wearesocial.com/uk/blog/2021/01/digital-2021-uk/
https://wearesocial.com/uk/blog/2019/01/digital-in-2019-global-internet-use-accelerates/
Slide P247 "Percentage of Internet Users That Access Banking Services via Mobile Device"

Source: Committee on AI Economy, Chairperson Hearing (1st) Material 1

The first step in addressing these issues is to systematize the rights of individuals regarding data access. This, in turn, requires a mechanism to build a robust security standard for all businesses that handle financial APIs, including small startups.

It is also important to review and revise current policies to penetrate internet banking, with an eye to increasing

implementation of policies that most effectively increase penetration.

Reference: Other issues related to the use of financial APIs (from the enterprise questionnaire survey)

In the 2021 Enterprise Survey, questions (optional answers, free descriptions) on "problems and issues of business using open APIs" were set as survey items for banks and responses were received. These responses can be broadly classified into two issues: Issues related to infrastructure development and Issues related to costs and monetization (**Figure 4-4**).

Figure 4-4 Responses to Enterprise Survey Q21[28] Categorized by Type

Issue type		Problems and issues
Infrastructure development		Establishment of API infrastructure by core system vendors and securing appropriate access
		It is necessary to develop authentication infrastructure and strengthen the authentication method in order to promote business using open APIs.
Costs and monetization	Business preparation	Contract terms with EPSPs
		It takes too much time to promote social recognition and confirm the eligibility of the banking business.
	Business operations	Revenue from fintech companies, but vendor costs are high and monetization is a challenge
		Not enough revenue (such as API service usage fee) can be secured, while there are costs of the API connection to the system vendor
		Understanding and analyzing connection costs and usage volume
		It takes effort to check the data management status at the API connection destination

4.2 Advanced Initiatives in Digitalization and Data Utilization in Other Fields

This section considers the significance of several representative leading-edge initiatives in the construction sector, including drives toward carbon neutrality, which were introduced at the Chairperson Hearing. Note that while the section highlights programs described in the Chairperson Hearing presentations, the presenters' enterprises and industries are also pursuing a number of other initiatives that are not covered here.

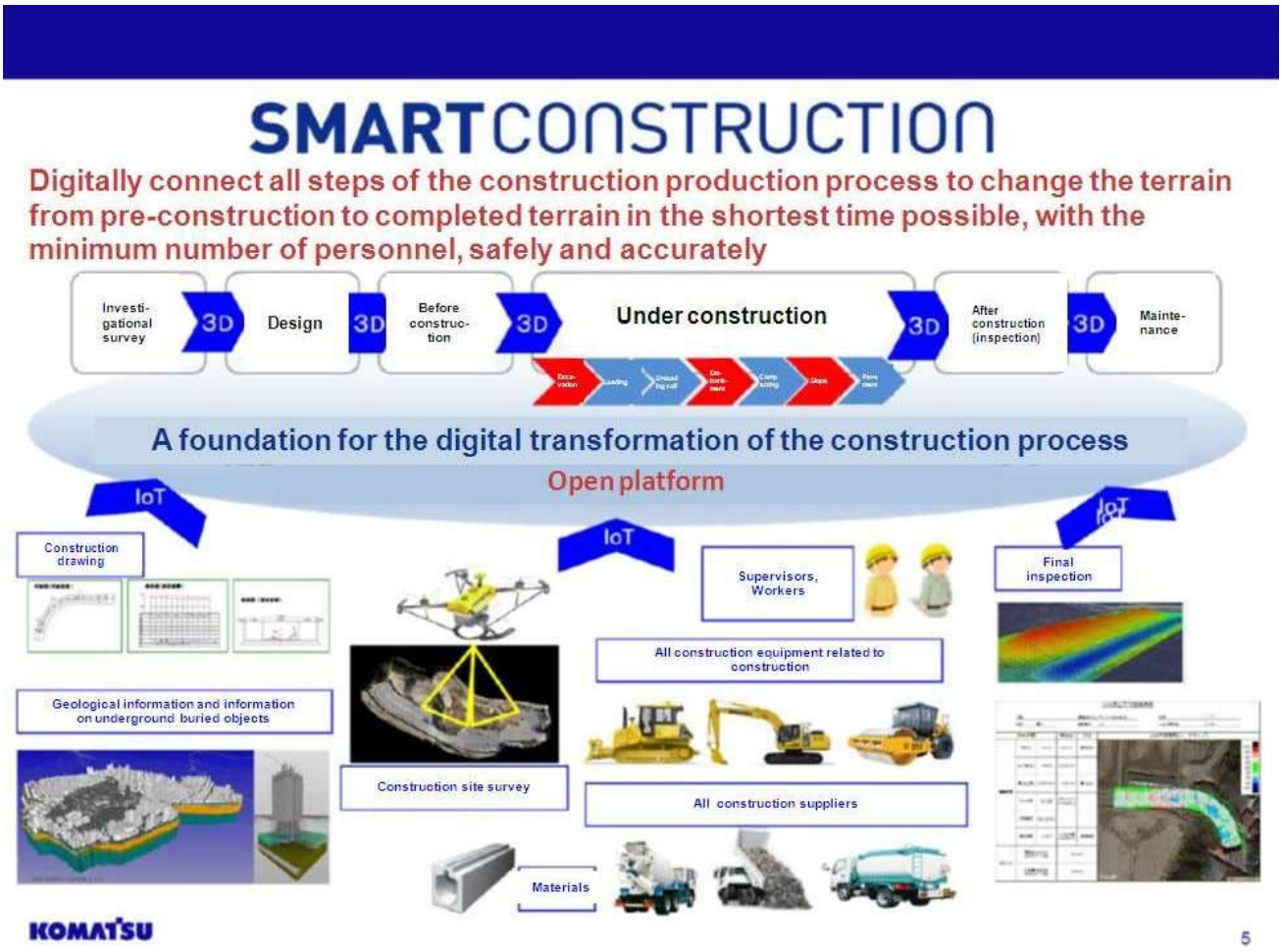
4.2.1 Example and Significance of Advanced Initiatives for Data Utilization and Digitalization in the Construction Sector: Komatsu, Ltd.

(Overview of the initiative)

In addition to an aging workforce, on-site labor shortages comprise a major issue for the construction industry. Accomplishing the same amount and quality of work with fewer workers requires mechanizing, automating, and improving the efficiency of work, while boosting productivity. Komatsu began addressing these challenges with the world's first intelligent machine-controlled bulldozer in 2013, followed by a machine-controlled hydraulic excavator a year later, another first. Next, the heavy equipment manufacturer set its sights on improving the overall construction production process, from initial survey to continuing maintenance. In a bid to improve on-site productivity, Komatsu launched Smart Construction, a solution that provides digital data on the activities of every worker, every materials and every machine, in every stage of construction, in real time. It connects all datasets, and allows them to be visualized in one place, facilitating site management from any location (**Figure 4-5**). Smart Construction has been employed at more than 20,000 job sites and counting in Japan.

[28] Please describe any problems or issues you face in further promoting your company's business using open APIs.

Figure 4-5 Overview of Smart Construction



Source: Committee on AI Economy, Chairperson Hearing (2nd) Material 3

Enterprises deploying Smart Construction enjoy advantages facilitated by digitalization, such as real-time work approvals and checks. These eliminate most of the current back-and-forth between the various parties in the construction process, and between the foreman and the supervisor. Smart Construction also simplifies the construction process itself, shortening lead times and accelerating time-to-completion.

Moving forward, the construction industry will use the technology to further digitize the entire process, from pre-construction to completion. By integrating digital data on the status of each process, visualizing the overall status of the construction, and further driving DX Smart Construction, the system maximizes productivity across the site (**Figure 4-6**).

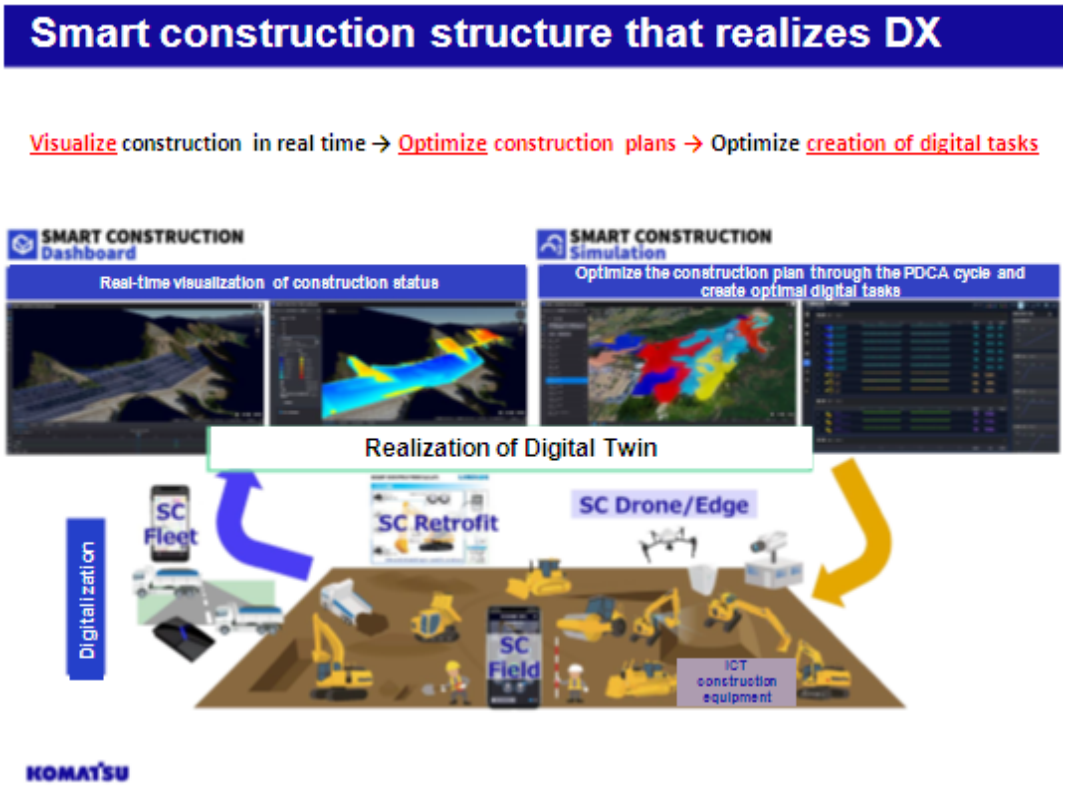
At the jobsite, DX Smart Construction digitally captures terrain and construction data using a visualization platform, drones and ICT construction equipment. This digitized data, including images of the construction site and 3D terrain maps, is aggregated and stored on a central platform. It is then visualized in real time on the platform's dashboard. This virtual representation of the construction site, in the form of a digital twin, can then be used to perform high-accuracy simulations on a PC or mobile device. The digital twin is updated in real-time with

construction site data, generating and optimizing digital tasks. These tasks are then fed back to the ICT equipment and the construction workers, driving a PDCA cycle at the construction site (**Figure 4-7**).

Figure 4-6 DX Smart Construction Concept

Source: Committee on AI Economy, Chairperson Hearing (2nd) Material 3

Figure 4-7 Overview of the Digital Twin Deployed in DX Smart Construction



Source: Committee on AI Economy, Chairperson Hearing (2nd) Material 3

(Significance of the initiative)

Komatsu's Smart Construction solution enhances efficiency and productivity in construction project management. It accomplishes this by digitizing the activity of every worker and machine involved in every stage of the construction process, and then aggregating the data on a platform that makes the entire process easier to visualize and manage. Simply by adopting the technology, construction enterprises without extensive knowledge or experience in ICT development and implementation can embrace digital transformation (data use and digitalization).

4.2.2 Digitalization and Data Utilization Initiatives in the Carbon Neutral Field: Sumitomo Mitsui Financial Group (SMFG)

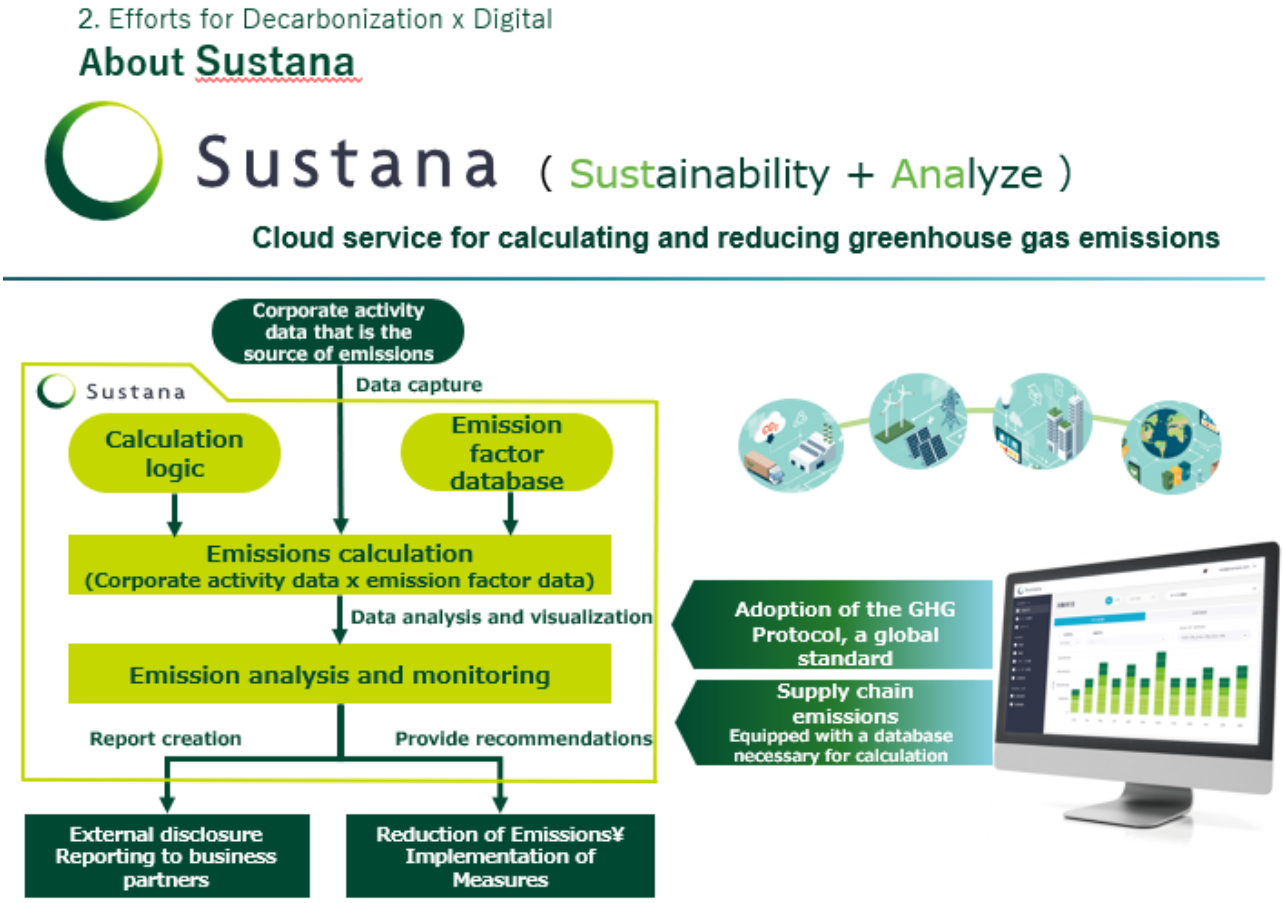
(Overview of the initiatives)

The results of SMFG intervies of decarbonization and digitalization conductedsince April 2020 show that more than 30% of enterprises, regardless of size, have been asked to calculate emissions by their stakeholders such as shareholders and trading partners. However, even among listed enterprises, less than 10% can calculate emissions throughout their supply chains. The main reason is that that more than 90% of companies are not using digital technology to automate emission calculation and management. SMFG believes that many enterprises unable to take concrete measures to reduce their emittions due to the lack of data of their own emissions and the emissions in their supply chains. The first step that companies need to do to realize carbon neutral is to understand their current status,

and for this purpose, data collection can be made much more efficient by using technologies such as API linkage, AI-OCR, and natural language processing. In this context, SMFG is proposing three DX-driven solutions in support of enterprise decarbonization.

The first is Sustana, a cloud-based tool used to calculate greenhouse gas (GHG) emissions and reccomend reduction plans (**Figure 4-8**). It incorporates an array of data on the company's business activities, allowing easy calculation of GHG emissions, which can then be reported to trading partners and disclosed publicly.

Figure 4-8 Overview of Sustana



Source: Committee on AI Economy, Chairperson Hearing (2nd) Material 2

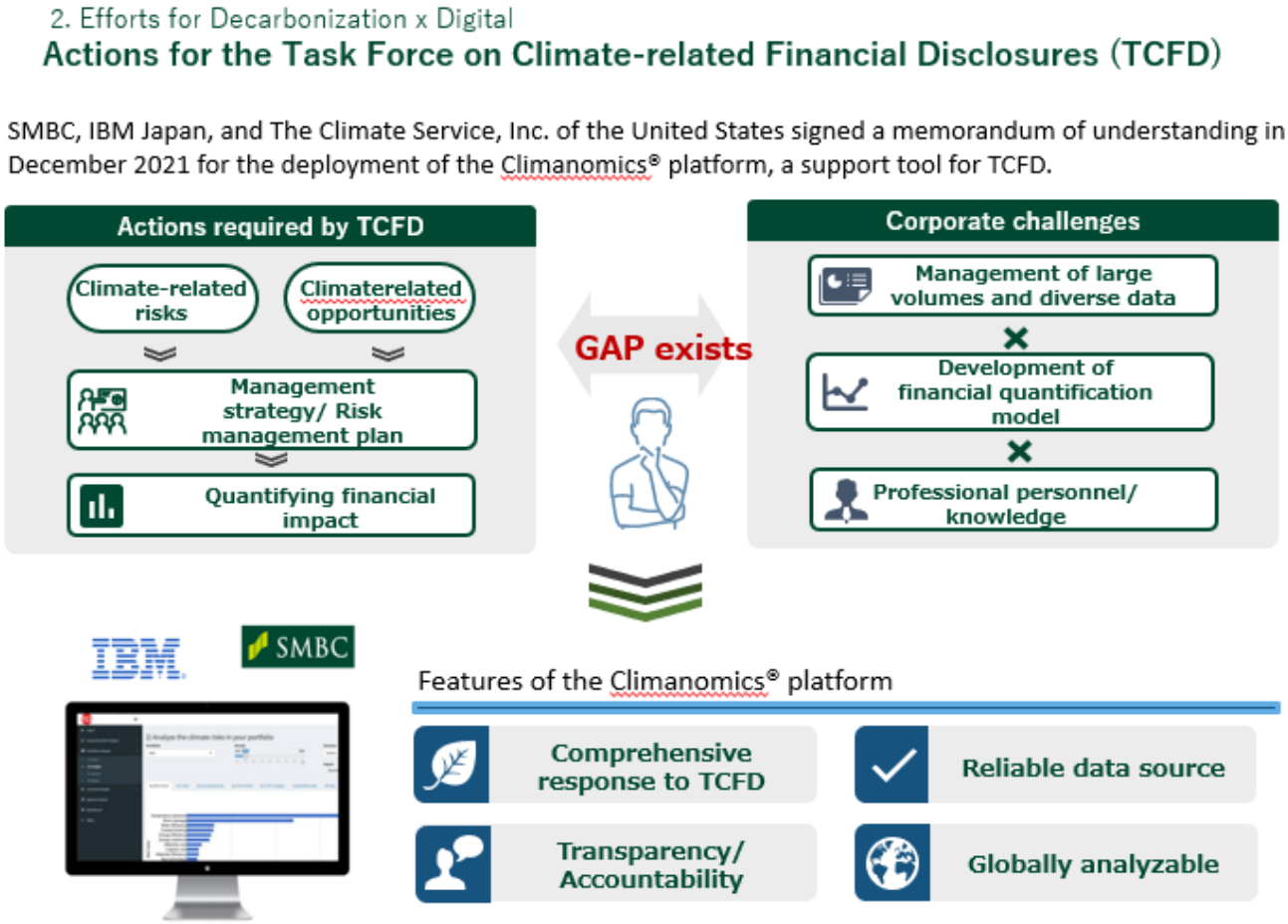
The second decarbonization initiative is the Persefoni platform, developed in collaboration with Persefoni AI, Inc.,[29] and designed for large enterprises with overseas operations. SMFG invested in Persefoni AI in 2021. SMFG plans to expand the platform as a strategic partnership in Japan.

The third SMFG-supported efforts is a climate disclosure support solution that aligns enterprises' disclosures with the Task Force on Climate-related Financial Disclosures (TCFD) framework. Enterprises listed on the Tokyo Stock Exchange Prime Market are required to disclose their assessment of the anticipated financial impacts of

[29] https://persefoni.com/ja

climate-related risks and opportunities. This entails gathering a variety of external data as well as internal information, and developing a model to calculate emissions and other metrics. Meeting these needs, SMFG partnered with IBM Japan and S&P Global , TCS jointly develop the Climanomics® platform (**Figure 4-9**), which offers customers the ability to comprehensively analyze all items related to climate change in line with the TCFD. Analysis contents and results are available to users in real time through the cloud-based platform.

Figure 4-9　Overview of the Climanomics® Platform

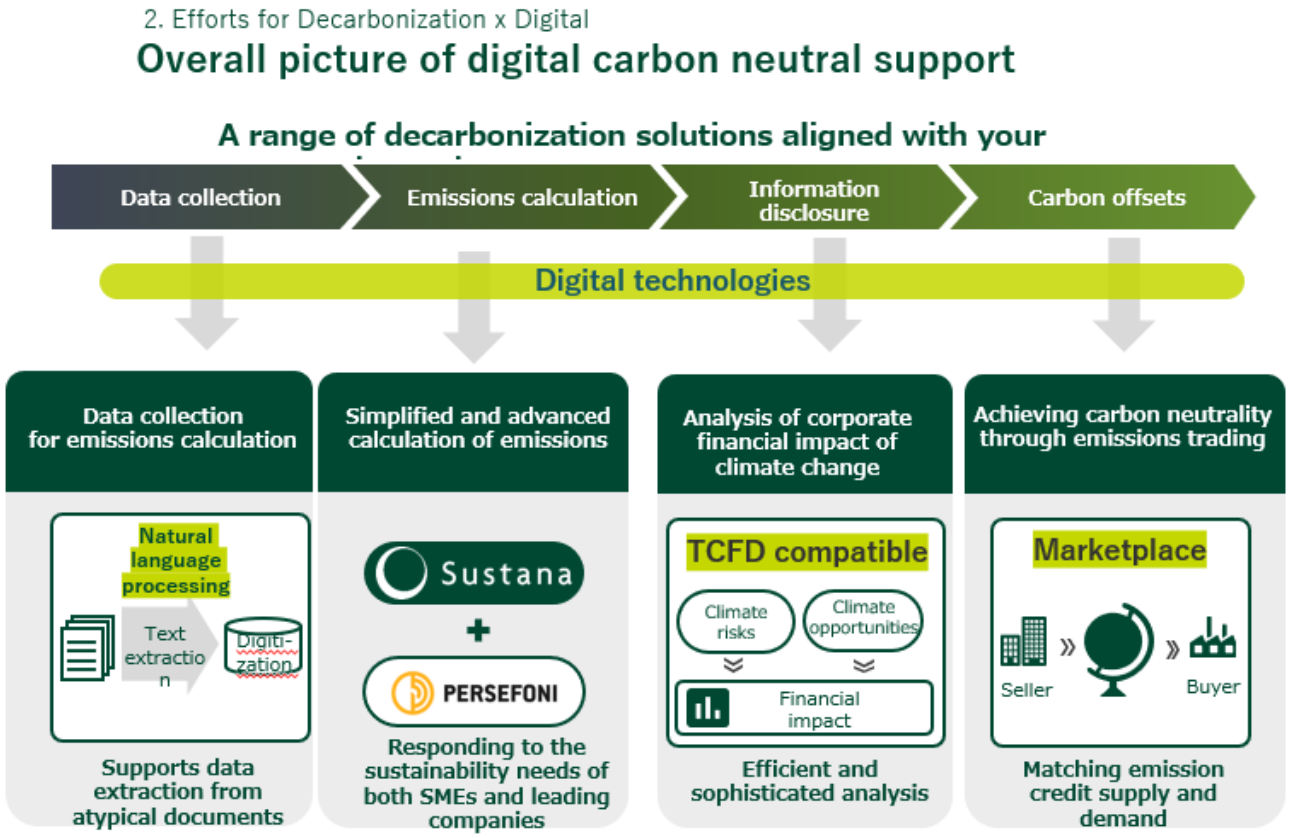


Source: Committee on AI Economy, Chairperson Hearing (2nd) Material 2

(Significance of the initiatives)

As the three examples introduced above demonstrate, even sectors like financial services that are not centered on developing ICT solutions can offer an integrated value chain (**Figure 4-10**) by pursuing initiatives in data technology and digitalization. Leveraging digital technology in this way, these firms can not only support financial activity itself, but also visualization, disclosure, policy formulation, the matching of emission reduction technologies, and finally emissions trading schemes that can ultimately enable carbon neutrality.

Figure 4-10 Overview of the Value Chain, which Supports Various Processes toward Carbon Neutrality



Source: Committee on AI Economy, Chairperson Hearing (2nd) Material 2

4.3 Government Initiatives for Data Utilization and Digitalization: Promoting the National Data Strategy

(Overview of the National Data Strategy)

The National Data Strategy, adopted by the Cabinet June 18, 2021, envisions Japan becoming a world-class digital nation and developing digital infrastructure capable of supporting that goal. It also addresses the challenges identified by the Data Strategy Task Force at the end of 2020. Specifically, the new data policy seeks to enable the generation, collection and use of big data, including real-time data, in order to: drive new value for the nation; create a more prosperous, human-centered society; and enhance Japan's national capabilities. To realize the vision, the government believes that citizens, administrative agencies, businesses, academia, and other entities will need to share a common recognition about the importance of data.

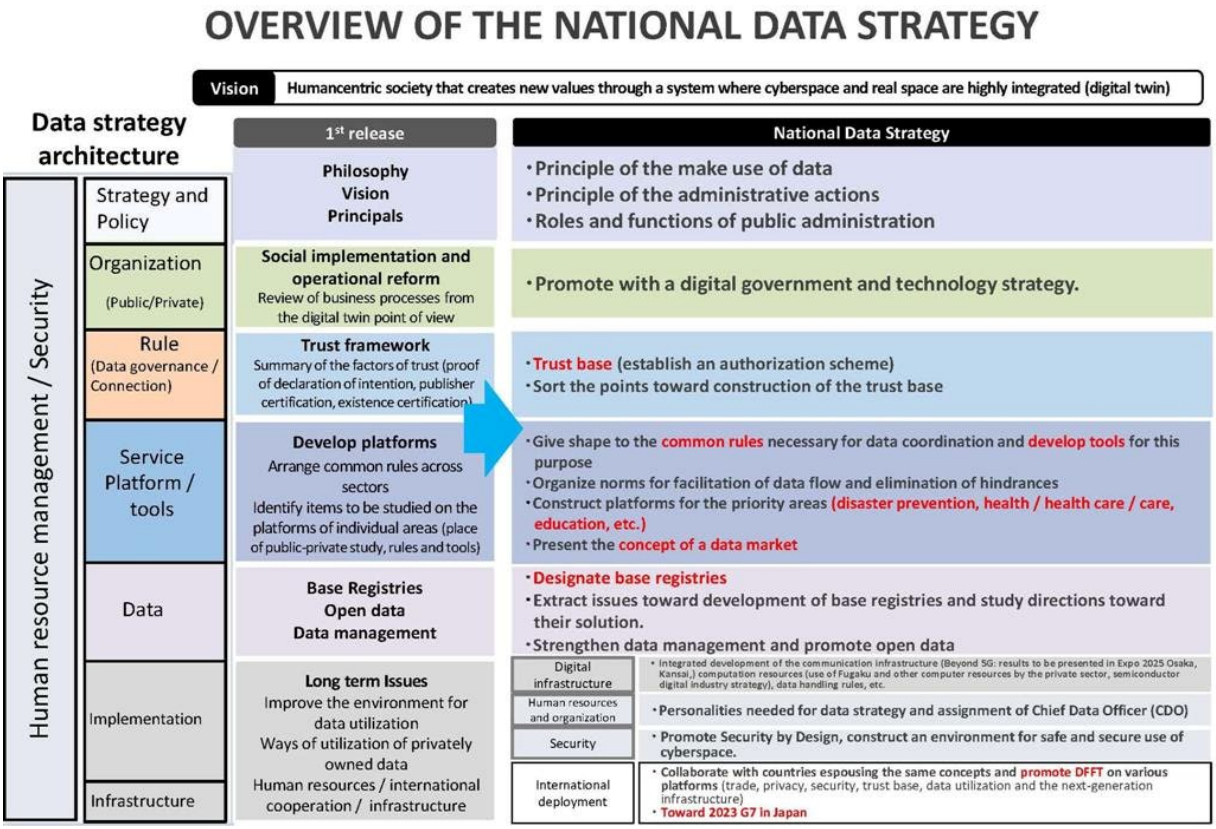
The strategy’s philosophical underpinnings involve ensuring trust and maintaining the public interest in order to use data safely and efficiently. The comprehensive plan elucidates mechanisms to achieve that. Internationally, the strategy seeks to win the world's trust in Japan's data and the way it is generated and distributed, so that the international community can be confident using that data, and in entrusting its own data to Japan.

Realizing the vision requires Japan to develop a human-centered digital society that strikes a balance between economic development and the resolution of social issues (creating new value and new values). This prosperous society of thriving individuals will be based on and supported by a highly integrated physical-cyber (digital twin)

system.

The new data strategy also proposes architecture that goes beyond data itself, to encompass all aspects of data technology, including tools, infrastructure and the rules of operation (**Figure 4-11**).

Figure 4-11 Overview of Japan's National Data Strategy



Source: Committee on AI Economy (17th) Special-Interest Group on Data (16th) Joint Meeting Material 1 (https://www.digital.go.jp/assets/contents/node/basic_page/field_ref_resources/0f321c23-517f-439e-9076-5804f0a24b59/20210901_en_05.pdf)

(Data-related issues)

The shortage of data-related human resources is a common issue worldwide, persisting throughout the data lifecycle, from design through the implementation phase. There are also a host of other challenges, including data subjectivity and ownership, difficulty or inability to locate data, and the time, effort and resources needed to cleanse data in preparation for use. Here are some representative examples:

(Examples)

- Lack of qualified staff for data operations
- The data is unusable either because use conditions are not met or are not specified
- Not understanding how the data will be used
- The data cannot be located
- Labor-intensive and time-consuming data cleansing
- Greater variety of data is needed than is available
- Greater quantity of data is needed than is available
- Need for high-quality data

- Uncertainty around data governance
- Uncertainty around data security

(Specific initiatives)

Japan's comprehensive data strategy focuses on building up the data infrastructure, with a particular emphasis on maintaining an ample supply of diverse data. Efforts are underway to develop the repositories and directories to accommodate this data, including open data catalogues, Registry Catalog, and code lists. The drive is further supported by the implementation of recommended data sets, including data standards and open data examples, and by dispatching open data evangelists to encourage adoption of open data practices. Other measures include making base registries available as open data. This would provide wide access to commonly referenced basic data that is released by public organizations, such as data concerning people and qualifications, enterprises, and land and buildings, while maintaining the necessary accuracy and currency of the data. Thus, the open base registry data will serve the greater society, not least because it includes high-value information with potentially substantial economic impact, such as addresses, parcel numbers, and enterprise- and business-oriented data. It is a "once-only" system, meaning that it can be accessed by different organizations and systems to complete tasks without having to gather the information multiple times.

To meet another critical objective — providing data in an easy-to-use form — the government has established the Government Interoperability Framework (GIF), a common technical framework that ensures compatibility and consistency across systems. The GIF seeks to enable smooth data access, sharing and use throughout society. As a standardized data model, compatible with international standards, the GIF also facilitates data utilization across borders.

Meanwhile, the government has published Uniform Terms of Use for government websites. It also released Implementation Guidance for Data Handling Rules on Platforms, a set of rules promoting transparency and fairness in handling digital data, designed to remove disincentives to using data in transactions and other important platform applications.

These initiatives are the foundation for the data approaches to be implemented in the public and quasi-public sectors. Public sector entities — government agencies — are developing their strategy in line with the National Data Strategy, while preparing base registries for basic data. The quasi-public sector is likewise publishing guidelines and data standards that align with the strategy. At the same time, it is promoting adoption of the data standards in areas of high data demand, including education, disaster prevention and smart cities. In terms of the private sector, support will center on those business areas most willing to establish data standards of their own.

4.4 Tomorrow's World Spurred by Data and AI

MIC held an international symposium, the "Global Forum on AI Network Society 2022," on March 1, 2022 (**Figure 4-12**).[30]

On March 1, 2022, MIC held discussions on the utilization and distribution of data, which will be the key to the spread and utilization of AI.

[30] Details are available on this Ministry of Internal Affairs and Communications webpage: https://www.soumu.go.jp/main_sosiki/kenkyu/ai_network/02iicp01_04000286.html

Discussion focused on the utilization and distribution of data, which will be the key to the spread and utilization of AI, and the state of AI regulation and governance, including international trends, all in the context of seeking solutions to various social issues related to AI. Experts in an array of fields from Japan and abroad joined the Committee in exchanging ideas and opinions.

This section outlines a vision for the world that will be spurred by AI, based on the discussions at the Forum, and considers the issues to be resolved in order to realize the vision.[31]

Figure 4-12 Program for the international symposium, Global Forum on AI Network Society 2022

13:00-13:05	Opening Remarks (5)	KANEKO Yasushi, Minister for Internal Affairs and Communications
13:05-13:25	Keynote Lecture (20)	**How to Value Data in a World with AI** Laura VELDKAMP, Professor, Columbia University
13:25-14:05	Keynote Dialogue (40)	**The Industrial Revolution by AI and Data** Laura VELDKAMP, Professor, Columbia University IWATA Kazumasa, President, Japan Center for Economic Research
14:05-15:25	Panel Discussion (80)	**Tomorrow s World Spurred by Data and AI** « Moderator » OHASHI Hiroshi, Professor of Economics and Dean, Graduate School of Public Policy, The University of Tokyo « Panelists » TAKI Toshio, Executive Director, Head of Sustainability and CoPA, Head of the Money Forward Fintech Institute, Money Forward, Inc. TAMAKI Emi, Professor, Computer Science and Intelligent Systems Program, Faculty of Engineering, University of the Ryukyus; CEO, H2L, Inc. MUTO Shinsuke, President, Tetsuyu Institute Medical Corporation; Chairman, Integrity Healthcare
15:25-15:55	Special Lecture (30)	**AI, Globalisation, and the Future of Work** Richard BALDWIN, Professor, International Economics, The Graduate Institute, Geneva Moderator: SEKIGUCHI Waichi, President, MM Research Institute; Former Editorial Writer, Nikkei, Inc.
15:55-16:00	- Break-	
16:00-16:15	Honor Lecture (15)	SUDO Osamu, Professor, Faculty of Global Informatics, Chuo University; Director, ELSI Center, Chuo University; Project Professor, Graduate School of Interdisciplinary Information Studies, The University of Tokyo
16:15-16:35	Special Lecture (20)	**"AI Ethics : Translating Principles into Governance and Regulation"** Francesca ROSSI, IBM Fellow and the IBM AI Ethics Global Leader, IBM Corporation
16:35-17:55	Panel Discussion (80)	**"Governance for the World Living in Harmony with AI"** « Moderator » SUDO Osamu, Professor, Faculty of Global Informatics, Chuo University, Director, ELSI Center, Chuo University; Project Professor, Graduate School of Interdisciplinary Information Studies, The University of Tokyo « Panelists » EMA Arisa, Associate Professor, Institute for Future Initiatives, The University of Tokyo HIRANO Susumu, Professor and Dean, Faculty of Global Informatics, Chuo University FUKUDA Takeshi, Director of IBM Research – Tokyo, IBM Japan MOCHIZUKI Yasunori, NEC Fellow, NEC Corporation
17:55-18:00	Closing Remarks (5)	NAKANISHI Yusuke, State Minister for Internal Affairs and Communications

※ Affiliations and titles of participants as of the time of the event

4.4.1 Value of Data in the AI Era[32]

As artificial intelligence is adopted throughout society, it will be crucial for enterprises to create value through data technology. Thus, the amount of data they use is expected to increase. This, in turn, will likely impact data- and labor-intensity changes that impact corporate productivity and make data more important as an intangible asset.

[31] In addition, this section assesses, in summary form, future prospects for data and AI technologies, as put forth by the expert panelists and speakers.

[32] Based primarily on the keynote lecture "How to Value Data in a World with AI" by Columbia University Professor Laura Veldkamp.

Given the crucial role of AI technology, the growth rate of AI-skilled workers is rapidly outpacing that of old-tech workers and data managers. Although data itself cannot always be quantified in monetary terms, the amount of data that a company possesses has become a determinant of its value, and thus is considered an indispensable asset.

Although AI-skilled workers still make up a small percentage of the workforce, looking ahead, it is worthwhile to consider the experience of the Industrial Revolution, where originally only 5-13% of the workers actually used the then-emerging technologies. Changes in the labor share of old-tech versus new-tech data workers will be essential and unavoidable as data utilization through AI develops into a key source of value creation.

What the experts said: Forum panel and presentation highlights

- A great amount of value is created by leveraging AI to produce knowledge from data. As the volume of data grows exponentially, the value of a company is determined by the amount of data it possesses. The growth of large U.S. enterprises stems not from their tangible assets, but the vast amount of an intangible asset they possess: data. Maximizing data value through AI is a key to maximize enterprise value.
- Data utilization will have different outcomes depending on data-intensity and labor-intensity. It is essential to employ an optimal ratio of workers who manage data and workers with older technological skills, and then to increase employment of workers who use AI to generate knowledge for the future. In practice, the growth rate of AI-skilled workers has outpaced that of old-tech workers and data managers over the past few years. Wages are also higher for AI-skilled workers, old-tech workers, and data managers, in that order.
- Currently, the proportion of AI workers among entire workforce is low. Workers with older technical skills contribute more to earnings through data utilization. During the Industrial Revolution, only 5-13% of workers used new technologies. However, there is no doubt that the utilization of data by AI is a source of value creation already. Therefore, labor distribution ratio in enterprises will have to change.

4.4.2 Labor Market in the AI Era[33]

Digital technology has already impacted primary and secondary industries, such as manufacturing and agriculture. Now, it is hastening globalization and automation in white-collar, professional work. The trend is further accelerated by the growth of remote work brought on by the Covid-19 pandemic, as well as the takeover of some traditionally human work by software robots. With change accelerating more rapidly than originally predicted, it is crucial to consider future job availability and the measures that should be taken in preparation for the new labor market on the horizon.

Meanwhile, AI itself is a dramatically evolving technology, with computers acquiring significant new cognitive skills since around 2016. Many tasks that once required human intervention, such as translation, editing, and graphics, can now be accomplished through machine learning. However, for some jobs that require collecting big data, humans will be difficult to replace. These are endeavors that involve uniquely human complexity, such as

[33] Based primarily on the special lecture "AI, Globalization, and the Future of Work," by Professor Richard Baldwin (The Graduate Institute, Geneva)

ethics, creativity, curiosity, and motivation. In this light, the jobs that people do in the relatively distant future will likely be both more humanized and more localized.

As some work is taken over by robots, many people will be forced into new careers. It will be incumbent on governments to adopt proactive labor market policies, such as human resources development, retraining, job matching and relocation support, to help workers adjust.

What the experts said: Forum panel and presentation highlights

- In his 2019 book "GLOBOTICS," Richard Baldwin posits that digital technology will simultaneously automate and globalize white-collar and professional jobs. As computers acquire new cognitive skills, many jobs that once required human intervention, such as translation, editing, and graphics, can now be accomplished through machine learning.
- Digital technology grows slowly at first, and then extremely fast at some point, where disruptive innovation occurs.
- In the future, jobs that can be automated by software robots will leave human hands. Jobs that can be done by cheap labor in emerging markets will be offshored. But collecting big data about ethics, creativity, curiosity, motivation, and other human and complex things will be difficult for remote intelligence and AI.
- Jobs that can be automated, including bookkeeping, accounting, and certain legal work, will be replaced relatively quickly by robots, while competitive workers will have more opportunities.
- Governments will be required to have proactive labor market policies, such as retraining and relocation supports to help workers readjust.

4.4.3 The AI and Data Industrial Revolution[34]

In the same way that technology changed the way goods were produced in the Industrial Revolution, AI technology will change the way knowledge is generated. Sustaining growth through AI and data technologies will require implementing them in areas beyond traditional demand forecasting and advertising applications, putting the focus on inventive research and development that generates new ideas and technologies.

One study has found that if AI and IoT were fully utilized, the projected growth rate of the Japanese economy would change from less than 1% to 5 percent. Yet, the economic imperative for artificial intelligence notwithstanding, Japan's industry lags behind other world players in AI adoption. Whereas 85% of Chinese enterprises and 51% of U.S. firms actively use AI, the figure for Japan hovers at under 40 percent. Looking at the U.S. economy, where adoption is moving apace, AI is destined to have a significant impact, but it will still take decades for AI technology to become a general-purpose technology and to be adopted in a variety of industries. Active AI implementation has just begun, and it has not yet had a significant effect on productivity. However, as AI continues to gain momentum and is integrated into the market, it will bring about changes that should be closely monitored, such as in labor allocation and other work and employment structures.

Data is knowledge, and knowledge must be shared as a source of growth. However, this presents issues that need to be addressed globally. While the free distribution of data will bring benefits such as increased efficiency and

[34] Created mainly from a special dialogue between Professor Veldkamp and IWATA Kazumasa, Chairman of the Japan Center for Economic Research, chairman of this Committee

productivity to enterprises, and will support services that make the lives of individuals more convenient, in sharing knowledge and data, it is important to strike a balance between privacy protection and respect for the owner of the information.

What the experts said: Forum panel and presentation highlights

- Out of predictive algorithms and inventive algorithms in AI technology, which leads to higher economic growth by directly influencing productivity? Inventive algorithms may generate higher economic growth. What are the differences from the 18th Century Industrial Revolution?
- In the Industrial Revolution, technology changed the method of production of goods. AI technology changes the way knowledge is generated. Therefore, inventive algorithms dealing with R&D contribute more, and capital investment in R&D may lead to higher economic growth than the capital investment in plants and equipment.
- Regarding the impact of the AI revolution on the U.S. economy, it is certain that it will have a large impact, but it will take several decades for AI technology to become a general-purpose technology and be adopted in various industries. Also, technology alone is not enough to sustain growth.
- A survey conducted by the Japan Center for Economic Research predicts that the growth rate of the Japanese economy will change from less than 1% to 5% if AI and IoT are fully utilized. In the long run, technological progress will converge, but this impact is likely to be large.
- Business sectors are aware of that AI technology is far more productive and will lead to profitability in comparison to older technology. That is why they promote AI use and working on human resource development as well.
- What kind of impact would be predicted on enterprise productivity if the free flow of data across different industries or across national borders becomes a reality?
- Our daily life became more convenient and efficient through data utilization. Productivity has improved as well. On the other hand, enterprise behavior is transformed as data sharing progresses. Facing the free flow of data, taking into account privacy issues, a cautious approach is required.
- Due to the lack of a data sharing system in Japan, the utilization of AI is lagging behind. In China, more than 80% of enterprises have been using AI, but less than 40% of enterprises use it in Japan.
- The utilization of AI has just started, and it is necessary to pay close attention to changes in the labor share and changes in intangible assets due to the utilization of AI in the future.
- Some equate data flow as equivalent to money flow. What would emerge out of the world where hypothetically data and currency are combined?
- The two are different. Money serves as the consideration for services provided or goods to be purchased. Data, on the other hand, is knowledge. Knowledge must be shared. By doing so we can grow. It is important to share knowledge and data while paying attention to balance personal information protection and respect to information owner.

4.4.4 AI x Data for a Prosperous Future[35]

The Committee's empirical analysis reveals that enterprises tend to add value at an accelerating pace as digitalization and data utilization continue to advance. Moving forward, differences in how data technologies impact various industries should be factored into the analysis. The effects vary, for example, between the financial sector, increasingly driven by smartphone apps, and quasi-public sectors such, as healthcare.

The study also found that enterprises that adopt AI across the entire organization and those who form alliances with external partners tend to have higher added value, highlighting the importance of data distribution, both within and outside the company. Thus, it is crucial to promote free and reliable data distribution. In this light, the importance of Data Free Flow with Trust (DFFT) should be a topic for discussion in international forums.

One of the foremost challenges in improving the data distribution environment is establishing data ownership, which in turn helps ensure user trust and safety. Another involves optimizing the presentation of information to create user experience of consent. The third challenge is data security and sharing across disciplines. The recent trend toward first ensuring data security and then creating and sharing use cases will eventually lead to standardization of these processes.

What the experts said: Forum panel and presentation highlights

- To fully leverage the ever-increasing economic value of data, it is important to conduct in-depth sector-specific analyses in areas such as healthcare and finance.
- The Japanese financial industry is increasingly using application programming interfaces (APIs) to connect different programs, but there is insufficient awareness and legislation concerning data access and ownership rights. Clear consent for information transfer is necessary when APIs are linked up.
- In order to achieve personalized medicine with high-quality data, a valuable platform must be developed that also reduces the burden on healthcare providers. Good AI must be helpful to healthcare professionals.
- A key challenge is digitizing the "sensation of a person acting on an object to obtain a sense of presence" and its data output, which can create added value such as working in a virtual space or gaining shared experiences in sports and sightseeing. However, there are many issues to consider, and researchers are discussing rule-making for practical use.
- The key to financial digitalization is to prevent incidents such as information leaks. Fintech businesses, even if they are ventures, require security standards.
- Online medical care is growing, but a new digital divide is emerging, and it is important to reduce the load that some in healthcare have been bearing without realizing it.
- It is necessary to explore how to integrate data, return results to users, and control self-information and user movements and transformations.
- To achieve trusted and free data distribution (DFTT), the development of an appropriate environment must be investigated.
- While the transfer of personal information is protected by law and easy to discuss, statistical and processed

[35] Based on the results of the analysis presented in Chapter 3, and the panel discussion ""Tomorrow's World Spurred by Data and AI," moderated by OHASHI Hiroshi, Professor of Economics and Dean, Graduate School of Public Policy, The University of Tokyo. Professor OHASHI chairs the Committee's Expert Group on Data.

information are more difficult to handle, and enterprises must take actions such as issuing data statements.

- The goal of democratizing healthcare is to protect the right to self-determination and create a well-governed framework. In preventive medicine, data from multiple fields must be shared and utilized.
- The three challenges to improving the environment are data ownership, user experience of consent, and data security and sharing across disciplines.

4.4.5 Summary (Prospects and Challenges)

The adoption and integration of AI and data into society is still in its early stages, and their full impact has yet to be fully seen or understood. However, history has shown that new technologies born in an industrial revolution can transform production. Thus, AI is expected to become a general-purpose technology. By adopting AI and utilizing data, enterprises can generate new ideas and technologies, increase productivity, and ultimately achieve high growth. Individuals stand to benefit from personalized services like personalized medicine and digital environments like the metaverse, which provide new sources of added value. The array of possibilities of digital and AI technology can be leveraged to help society better address its challenges and pave the way for a more prosperous future.

As AI and data become more prevalent, we must be mindful of their evolving nature and how we engage with them. While AI has the potential to replace humans for many tasks, intrinsically human and complex activities, such as those involving ethics and creativity, will likely remain difficult to automate, and will continue to be performed by humans. Data should be understood as a source of knowledge that ought to be shared, and thus we need to make global efforts to promote data exchange, while keeping it secure and reliable.

One challenge for the future is the need for proactive labor policies that adopt to the evolving labor-intensive and data-intensive nature of enterprise production. This includes identifying and recruiting talent suitable for the AI era, as well as supporting human resource development and worker retraining as the AI labor market changes. Additionally, we need to promote the free flow of data, guided by the principles of DFFT. Achieving this requires creating a secure and reliable environment for sharing and utilizing data, with an emphasis on the concepts of data ownership, user experience of consent, and data security and sharing across disciplines.

The Committee on AI Economy has been discussing the impact of AI implementation on the social economy and the role of data in creating value for enterprises. Empirical analysis by the Committee's Expert Group on Data has informed these discussions since they began in 2019. During this period, global events such as the Covid-19 pandemic and Russia's invasion of Ukraine have had a significant impact on Japan's social economy. This has raised awareness of the need for economic sustainability and independence, including the importance of supply chain resilience. This chapter provides a summary of the Committee's investigation and discussion, looking at the current state of AI and data in Japan, and offer recommendations for how to address the social challenges facing Japan and promote sustainable growth through the use of AI and data.

5. Summary

The Committee on AI Economy has been discussing the impact of AI implementation on the social economy and the role of data in creating added value for enterprises. Empirical analysis by the Committee's Expert Group on Data has informed these discussions since they began in 2019. During this period, global events such as the Covid-19 pandemic and Russia's invasion of Ukraine have had a significant impact on Japan's social economy. This has raised awareness of the need for economic sustainability and independence, including the importance of supply chain resilience. This chapter provides a summary of the Committee's investigation and discussion, looking at the current state of AI and data in Japan and offer recommendations for how to address the social challenges facing Japan and promote sustainable growth through the use of AI and data.

5.1 Status of AI and Data Utilization

5.1.1 Status and Impact of Data Utilization

AI and data technologies have been advancing throughout the society, and like other nations, Japan recognizes the expanding benefits of their use. Several key adopters gave talks at the Committee Chairperson Forum, including TAKI Toshio, Director of the Japan Association for Financial APIs and Group Executive Officer of Money Forward, Inc., who spoke on open banking initiatives using financial APIs. From the construction sector, MURAKAMI Kazuya of Komatsu, Ltd. outlined an initiative to digitize every element involved in the construction processes to improve job site management. MIYAUCHI Hisashi and SUZUKI Atsuyuki, representing Sumitomo Mitsui Financial Group, Inc. (SMFG), described SMFG initiatives in support of enterprise decarbonization, with DX the backdrop for the carbon-neutral drive. Examples such as these, demonstrating the positive impact AI and data technologies bring to a wide swath of industries underscore their potential to improve productivity and convenience.

However, the value of data is difficult to precisely define or express[36], due to its multifaceted functions and roles. This challenge notwithstanding, the Committee's empirical analysis in Chapter 2 indicates a positive significant relationship between data utilization and added value in addition to indicating the possibility of data utilization accelerating the productivity improvement (**Figure 2-24**). The research suggests that several factors are necessary for enterprises to increase value-added by adopting AI. They need the right staff in data technology leadership positions, an environment that enables data utilization company-wide, and a data management system that facilitates effective use of data. Establishing a specialized analysis section is another key to increasing value-added through AI, as is a system for joint analysis involving other enterprises such as alliances and consortia. **Figure 2-27** and **Figure 2-28** illustrate the concept.

The questionnaire survey of enterprise AI adoption and data utilization in various industries revealed a multifaceted picture of the status of these technologies and the challenges involved. Over 50% of respondents reported conducting data analysis in enterprise planning and back-office operations. However, 20-30% of respondents across business areas reported neither conducting nor considering data analysis (**Figure 2-4**). A majority of enterprises primarily use data from data sellers or business partners in Japan, with limited use of data

[36] See Report 2020, 3.1 Function and role of data and method of measuring the effect and value of data as new capital (P. 21)

from overseas institutions, but approximately 50% of enterprises do not use external data at all (**Figure 2-10**). In terms of where in the organization the use of data has the greatest impact, roughly half of respondents said that on the input side, all areas of company feel the effect, while a similar number reported that on the output side, data utilization mostly impacts marketing, planning and development of product and service (**Figure 2-15**, **Figure 2-16**).

The most common internal challenge enterprises report, at 78%, is staffing limitations, such as too few employees with expert knowledge, while the greatest external challenge, mentioned by about 50% of enterprises surveyed, is concern over the proper handling of personal data. Over 30% said they fear that other parties will misuse or misappropriate data that their company provides them. (**Figure 2-19**, **Figure 2-22**)

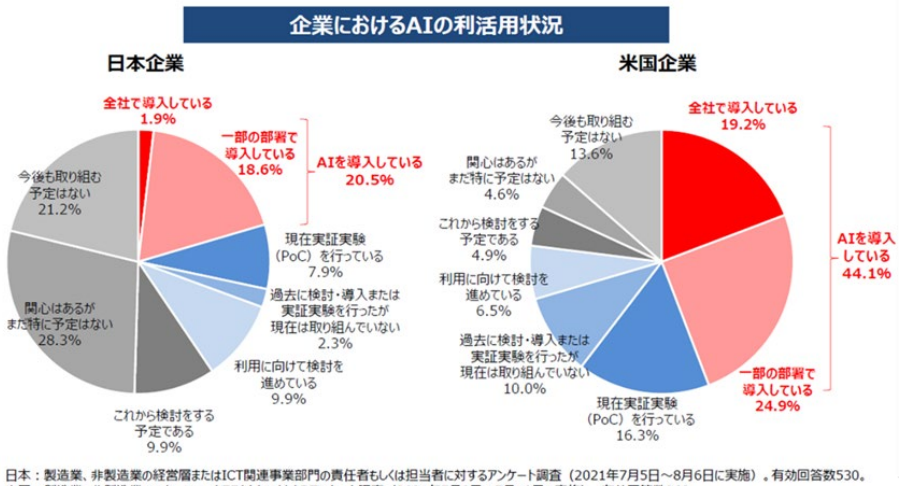
Regarding the current state, AI utilization is around 10% in all business areas (**Figure 2-7**), and more than 90% of enterprises say that they do not utilize it although they are interested in various AI technologies, or not interested (**Figure 2-9**).

As for the effects of AI utilization, more than 50% of enterprises responded that it was extremely effective or somewhat effective for improving business processes and improving labor productivity. Approximately 30% of the enterprises, however, answered "Neither" (**Figure 2-27**).

Regarding the relationship between AI adoption and the labor force, many responded that there was no change. However, some enterprises experienced a decrease in the number of employees while others experienced an increase (**Figure 2-18**). AI and labor force relations may be viewed[37] as substitution or complementarity. Knowing the possibility that the picture is in the process of further change, careful observation is considered necessary.

Regarding the international comparison of AI utilization, according to a questionnaire survey of Japanese and U.S. enterprises, the percentage of U.S. enterprises that answered "Introduced enterprise-wide" or "Have introduced in some departments" was 44.1%, while the figure for Japan was 20.5% (**Figure 5-1**). Based on the results of the survey, AI in Japan seems to be in the process of implementation in society.

Figure 5-1　Japan-U.S. Comparison in AI Adoption and Utilization among Enterprises



(注)　日本：製造業、非製造業の経営層またはICT関連事業部門の責任者もしくは担当者に対するアンケート調査（2021年7月5日～8月6日に実施）。有効回答数530。
米国：製造業、非製造業のマネージャークラス以上に対するアンケート調査（2021年7月8日～7月19日に実施）。有効回答数369。
(出所) 独立行政法人情報処理推進機構「DX白書2021」を基に作成。

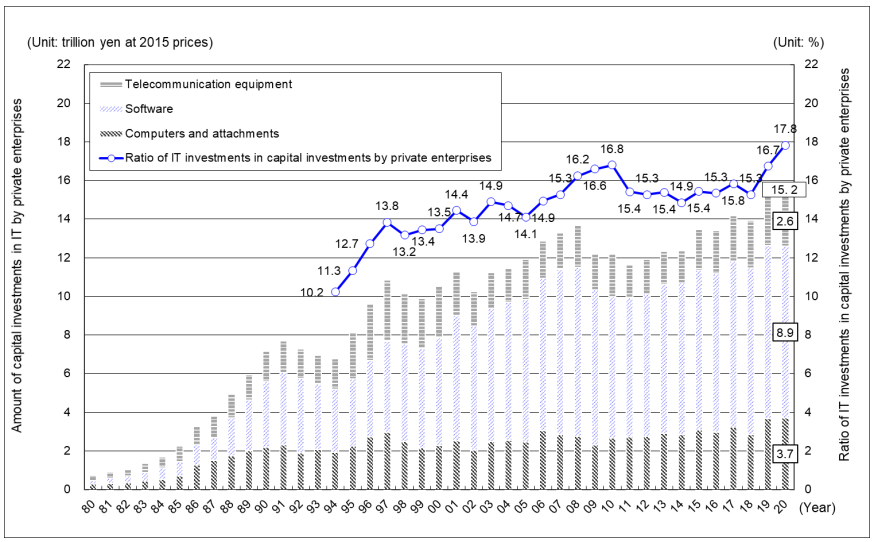
(Source) Material used in the Conference for the Realization of New Capitalism (4th) Material 1 Basic Materials (March 8, 2022),[38] created based on "DX Whitepaper 2021" by the Information-technology Promotion Agency, Japan

[37] See Report 2019 "3.1 Employment Transformation in the AI Economy" (P.19).
[38] https://www.cas.go.jp/jp/seisaku/atarashii_sihonsyugi/kaigi/dai4/shiryou1r.pdf

5.1.2 ICT Environment and Economic Situation

Regarding the ICT environment related to AI and data utilization, the ratio of information technology investment to private company capital investment is increasing year by year, reaching 17.8% in 2020 (up 1.1 percentage points from the previous year) (**Figure 5-2**).

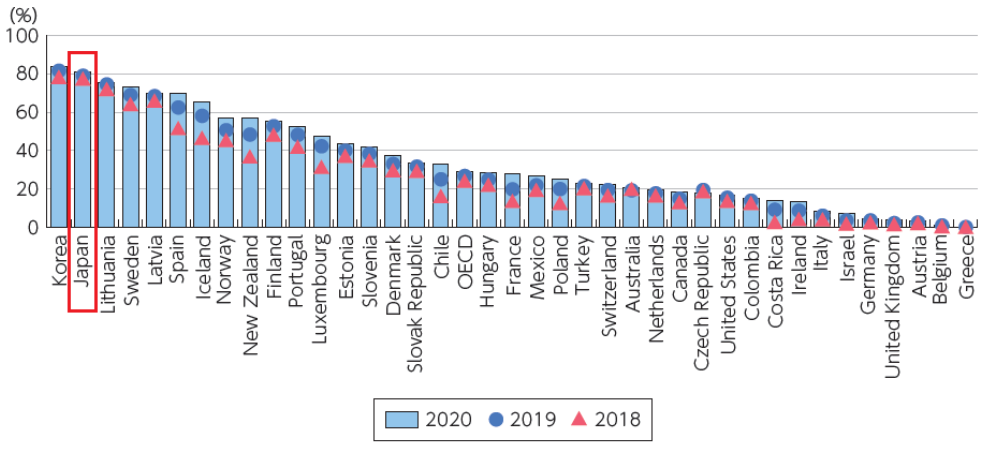
Figure 5-2 Changes over Time in Investment in the Digital Ecosystem in Japan



Source: MIC, 2022 Whitepaper on Information and Communications in Japan[39]

As for ICT infrastructure, Japan's broadband infrastructure is among the world's top class, with both the percentage of fiber-optic lines in fixed broadband and the penetration rate of mobile broadband services. That far exceeds the OECD average (**Figure 5-3**, **Figure 5-4**).

Figure 5-3 Percentage of Fiber-optic Lines in Fixed Broadband Lines

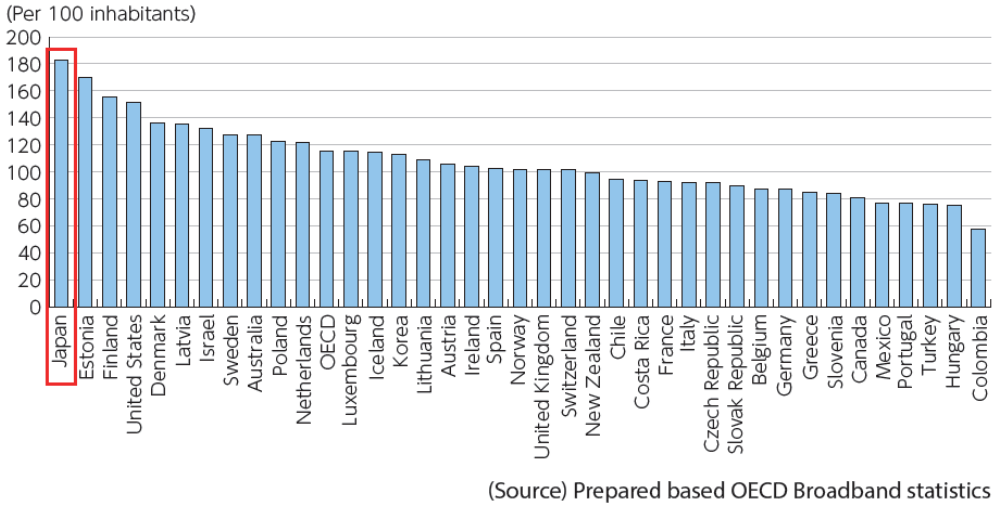


(Source) Prepared based on OECD Broadband statistics

Source: Ministry of Internal Affairs and Communications, 2021 Whitepaper on Information and Communications in Japan[40]

[39] https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/2022-index.html
[40] https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2021/chapter-introduction.pdf

Figure 5-4 Penetration Ratio of Mobile Broadband Service (June 2019)



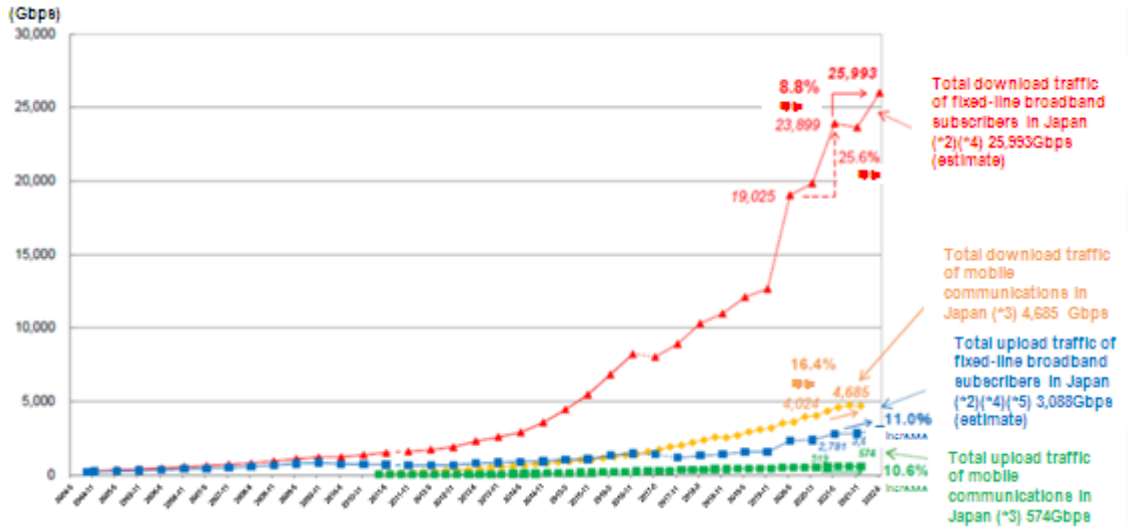
Source: Ministry of Internal Affairs and Communications, 2021 Whitepaper on Information and Communications in Japan[41]

Over the past few years, various global changes have also affected Japan's socio-economy.

Due to the Covid-19 pandemic that began in 2020, people's behavior, work styles, and enterprise activities have also significantly changed. The digitalization of socioeconomic activities, such as remote work, online meetings, and online provision of medical care, has greatly advanced.

The impact of the progress in digitalization of Japan can be seen in the increase of Internet traffic since the pandemic. Its volume approximately doubled from November 2019 to November 2021 (**Figure 5-5**).

Figure 5-5 Internet Traffic Changes over Time



Source: Ministry of Internal Affairs and Communications "Internet Traffic in Japan[42] as of May 2022, published Aug 2022

Japan's real GDP had been on an upward trend but showed a drop in FY2020 and started to rise again in FY2021 (**Figure 5-6**).

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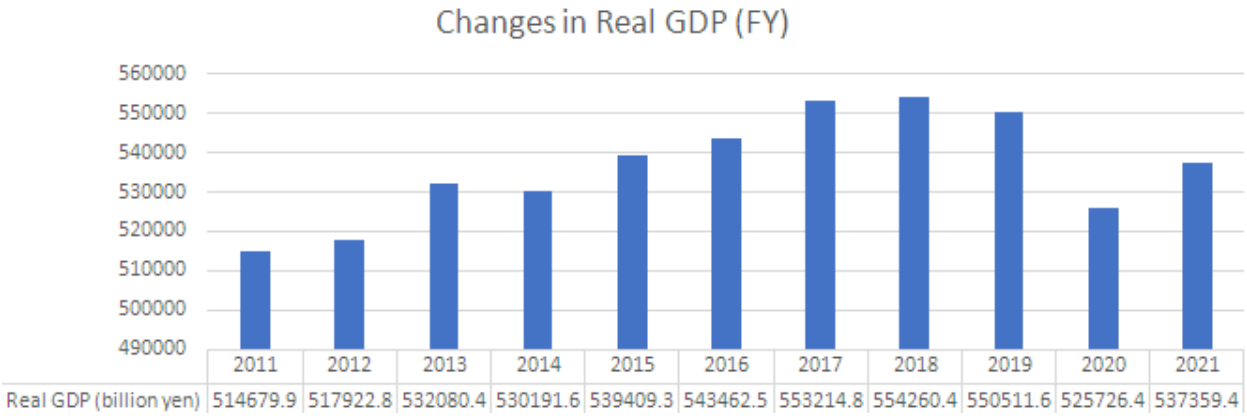
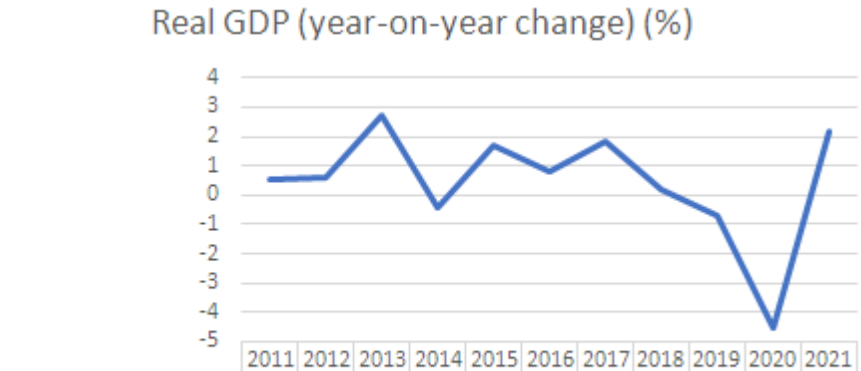
[41] https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2021/chapter-introduction.pdf
[42] https://www.soumu.go.jp/main_content/000828247.pdf

Figure 5-6 Real GDP and Year on Year Changes in Real GDP



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Real GDP (billion yen)	514679.9	517922.8	532080.4	530191.6	539409.3	543462.5	553214.8	554260.4	550511.6	525726.4	537359.4



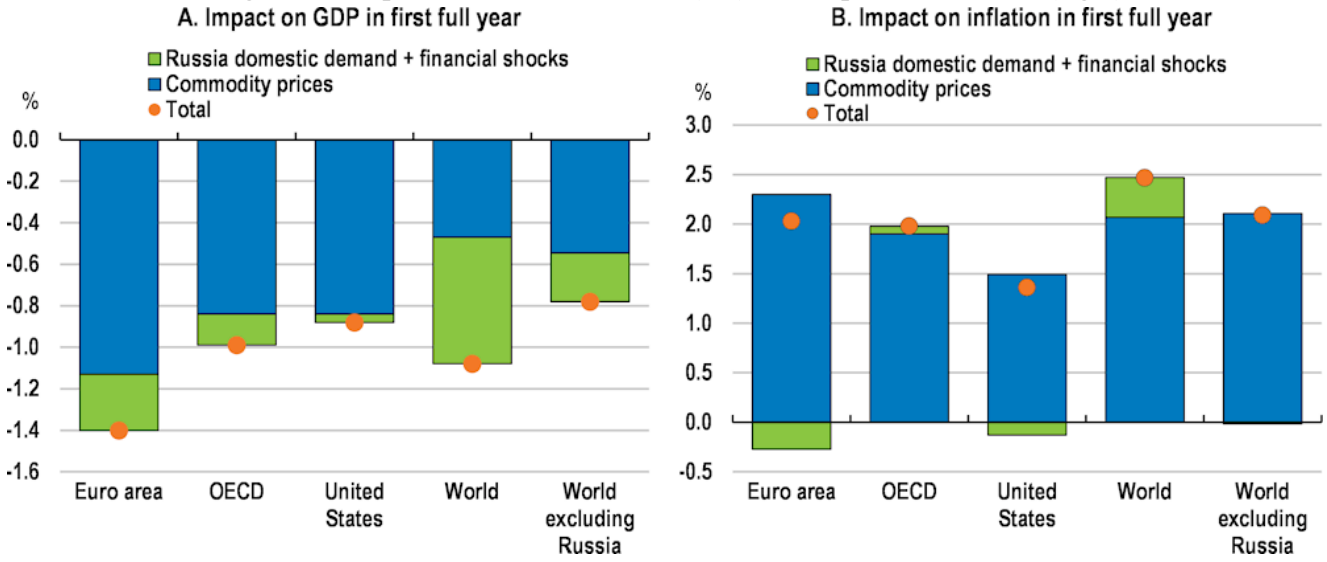
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Real GDP (year-on-year change) (%)	0.5	0.6	2.7	-0.4	1.7	0.8	1.8	0.2	-0.7	-4.5	2.2

Source: Created by author based on the material from the Cabinet Office (quarterly GDP newsletter time series table – January to March Quarter 2022 – secondary preliminary values)[43]

Furthermore, according to a report released by the OECD regarding the impact on the economic growth of each country from February 2022 of Russia's invasion of Ukraine, the degree of impact on GDP worldwide will be 1.08%, and it is expected to increase the inflation rate of the global economy by 2.5% (**Figure 5-7**).

[43] https://www.esri.cao.go.jp/jp/sna/data/data_list/sokuhou/files/2022/qe221_2/pdf/jikei_1.pdf

Figure 5-7 Impact on GDP in One Year (left) and Impact on Inflation (right)



Source：OECD (2022) Economic and Social Impacts and Policy Implications of the War in Ukraine | OECD Economic Outlook, Interim Report March 2022: Economic and Social Impacts and Policy Implications of the War in Ukraine | OECD iLibrary (oecd-ilibrary.org)[44]

5.1.3 Trends in AI and Data Utilization in the EU

In the past few years the regulatory trend in the EU has been that multiple bills related to AI and data utilization were published. Based on the European Data Strategy, the Data Governance Act was announced in November 2020 and the Data Act in February 2022.

The Data Governance Act[45] is a legal framework for data sharing within the EU. It promotes the reuse of data held by public institutions and creates a notification obligation for data sharing service providers and a registration system for organizations promoting data altruism. The Act was adopted by the European Parliament and the European Council in November 2021 and is in the final stages of implementation.

The Data Act was announced in February 2022. It has comprehensive rules for industrial data access. Bearing in mind that a large amount of data is monopolized by a small number of enterprises, it includes rules to facilitate switching between providers of cloud services and other data processing services.[46]

In December 2020, the Digital Markets Act and Digital Services Act related to platform regulation were announced. The Digital Markets Act stipulates the obligations for businesses designated as gatekeepers, i.e. those that provide “core platform services” within the EU and are large-scale businesses. In terms of data, there are obligations to ensure data portability and interoperability, and for companies using services to be able to access data generated by their own activities.[47] It entered into force on November 1, 2022.[48]

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[44] https://www.oecd-ilibrary.org/economics/oecd-economic-outlook/volume-2022/issue-2_4181d61b-en

[45] Data Governance Act explained (European Commission) https://digital-strategy.ec.europa.eu/en/policies/data-governance-act-explained

[46] Data Act (European Commission) https://digital-strategy.ec.europa.eu/en/policies/data-act

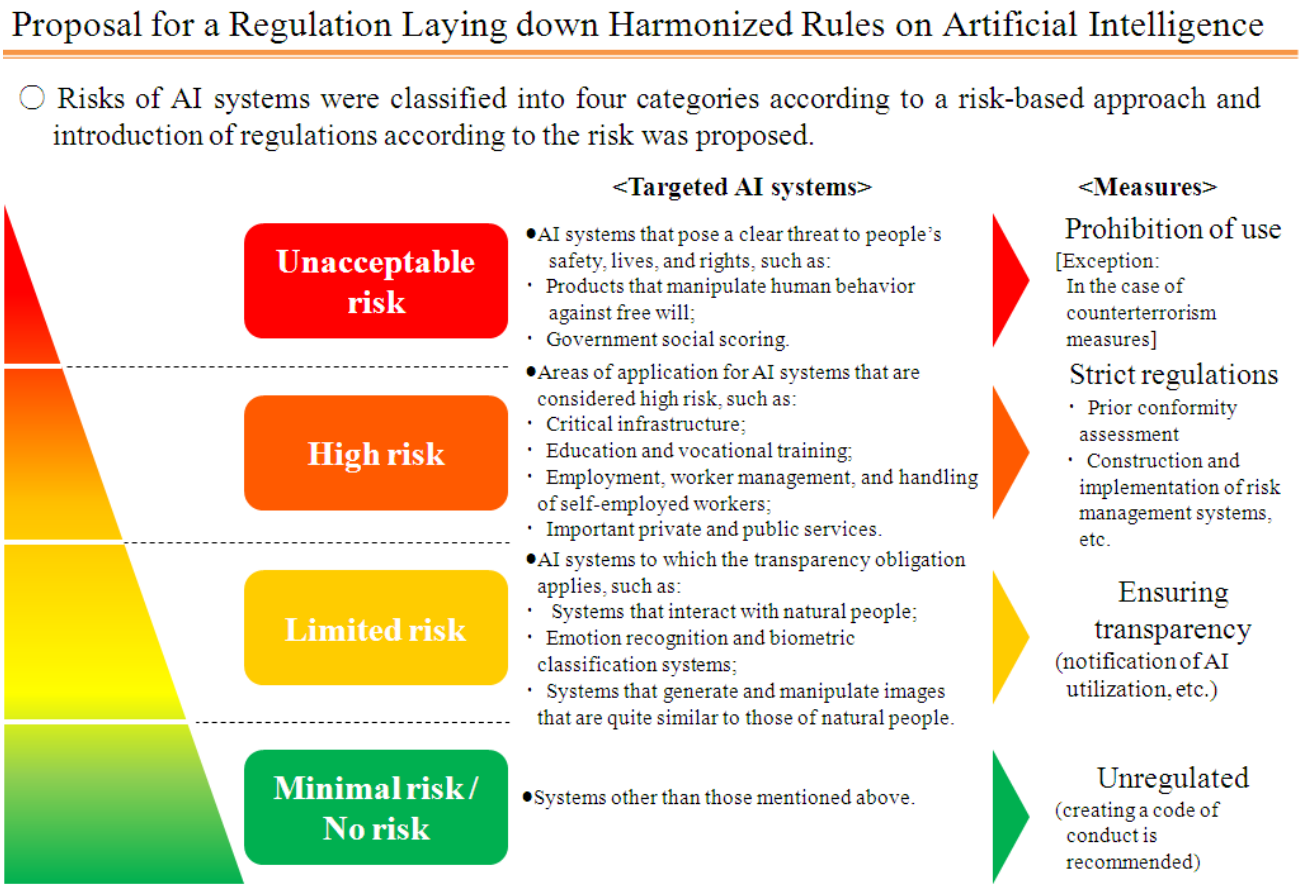
[47] Questions and Answers: Digital Markets Act: Ensuring fair and open digital markets (European Commission) https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_2349

[48] Digital Markets Act: rules for digital gatekeepers to ensure open markets enter into force (European Commission) https://ec.europa.eu/commission/presscorner/detail/en/IP_22_6423

The Digital Services Act stipulates obligations on digital service providers to combat the proliferation of illegal content, online misinformation and other social risks. In particular, it is tightening regulations on "very large online platform (VLOP)" operators, which have an average of 45 million or more monthly users within the EU, including search engines.[49] The act entered into force on November 16, 2022.[50]

In April 2021, the Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (AI Act) was announced to address the risks of AI (**Figure 5-8**). It aims to form a trust ecosystem by proposing a legal framework for trustworthy AI. Deliberations and adjustments are being made in the European Parliament and the European Council.[51]

Figure 5-8 Proposal for a Regulation Laying down Harmonized Rules on Artificial Intelligence



Source: Committee on AI Economy "Report 2021"[52]

5.1.4 Japan's Data Strategy

As described in 4.3, based on the National Data Strategy, policy measures related to data utilization include the supply of diverse data, the supply of easy-to-use data, establishing rules around in order to address the concrete

[49] The Digital Services Act: ensuring a safe and accountable online environment (European Commission) https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/digital-services-act-ensuring-safe-and-accountable-online-environment_en

[50] Digital Services Act: EU's landmark rules for online platforms enter into force (European Commission) https://ec.europa.eu/commission/presscorner/detail/en/IP_22_6906

[51] Committee on AI Economy "Report 2022" https://www.soumu.go.jp/menu_news/s-news/01iicp01_02000110.html

[52] https://www.soumu.go.jp/menu_news/s-news/01iicp01_02000097.html

issues around data use. The Digital Agency is promoting efforts to realize a society in which all citizens can benefit from digitalization through the creation of services from the perspective of the people, the utilization of data assets, and the promotion of DX throughout society.[53]

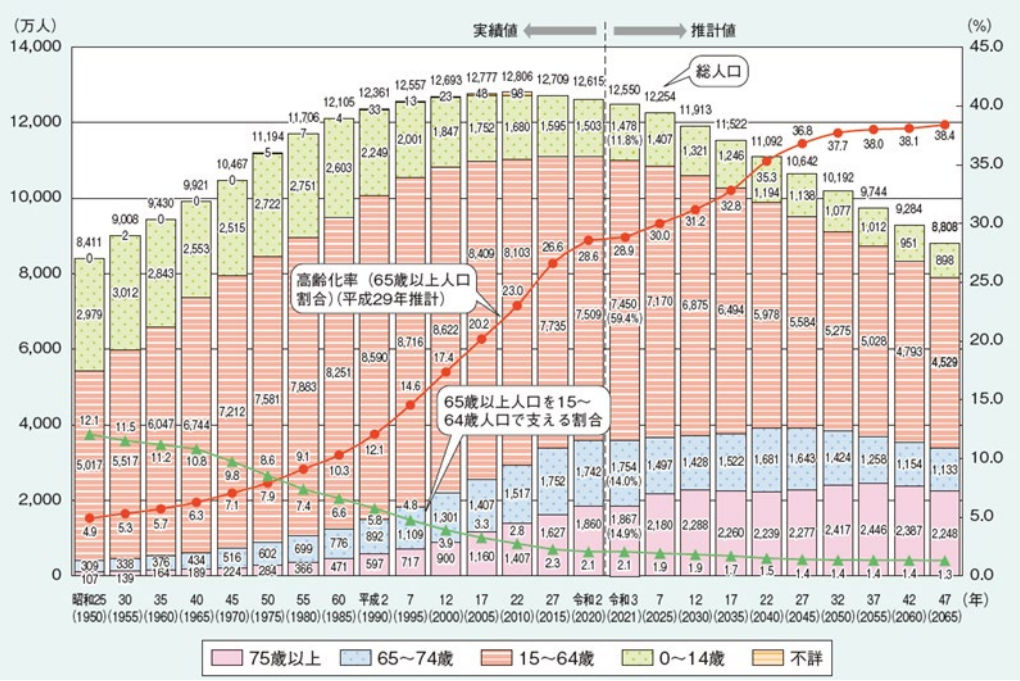
5.1.5 Discussion about Productivity regarding AI and Data

At the international symposia held by MIC on March 1, 2021 and March 1, 2022, diverse views were presented by experts on the impact of AI and data on economic growth and productivity. On one hand, positive opinions were shared such as maximizing the value of data with AI is a key to increasing enterprise value and the growth rate of AI workers exceeding that of workers with old technology skills.[54] On the other hand, ideas were expressed that the role of AI and robots in improving productivity is limited, and the intelligence of AI is limited and is limited in application.[55] However, due to the difficulty of measuring the value of data, which is an intangible asset, and the fact that societal implementation of AI is in a transitional period, there is not sufficient evidence to support these views, leaving room for discussion. It should be noted that the evidence supporting these views remains controversial.

5.2 Recommendations

Japan, with its declining birthrate and aging population, is facing major social and economic challenges ahead of the rest of the world. The working-age population (ages 15 to 64) peaked at 87.16 million in 1995 and is expected to decline to 52.75 million by 2050 (**Figure 5-9**). There are concerns about a labor shortage and a shrinking economy due to a decline in domestic demand.

Figure 5-9 Trends in Aging Population and Future Projections



[53] Digital Agency homepage, https://www.digital.go.jp/about/
[54] Excerpt from Laura VELDKAMP's keynote speech at the international symposium (held on March 1, 2022)
[55] Excerpt from Robert GORDON's keynote speech at the International Symposium (held on March 1, 2021).

Source: Cabinet Office “Whitepaper on the Aging Society 2020”[56]

It is necessary to actively work on building a decarbonized society in the context of global issues such as the Sustainable Development Goals should be addressed. In recent years, global supply chain risks due to the spread of Covid-19 and the invasion of Ukraine have emerged. Due to these economic uncertainties, it is necessary to improve Japan's productivity and ensure the sustainability of its socio-economy.

As a developed country facing these various issues, it is expected that Japan will actively incorporate the utilization of AI and data into its socioeconomic activities as a catalyst for achieving both economic development and solving social issues. As mentioned above, while Japan has a well-developed ICT infrastructure environment, it cannot be said that the effective utilization of AI and data is progressing. To begin with, private enterprises taking their own steps to continuously adopt and utilize AI and data will contribute to society and the economy.

Although there is still room for debate about the relationship between the utilization of AI and data and productivity, the results of empirical analyses conducted by this Committee and the merits of incorporating data and economics into enterprise management,[57] make it meaningful to conduct a study based on the above in working toward solving social issues**.** This is if we take a bird's eye view of the ideal environment for the utilization of AI and data as a whole, based on the premise that the utilization of AI and data has a positive effect on enterprise production activities.

Based on the above, it is important to proceed with the following initiatives.

5.2.1 Development of a Market Environment for Data Distribution

(A) Standardization for Data Sharing

As mentioned above, one issue related to data utilization is that many enterprises clearly feel uneasy about the handling of data. In addition, as described in Chapter 2, the results of empirical analysis clearly showed that "AI utilization" and "joint analysis involving other enterprises such as alliances and consortia" showed a positive significant relationship on the added value of enterprises. In light of this situation, based on the DFFT philosophy, it is important to properly protect personal data and to enhance data portability and interoperability, based on the perspective of data ownership, through efforts to ensure data security in sharing across enterprises and fields.

(B) Personal Data Trust Bank

A personal data trust bank is a mechanism that effectively promotes the distribution and utilization of personal data with the effective involvement of individuals. It manages personal data upon entrustment from individual users and provides it to third parties within the scope of consent. Its spread is expected to promote the utilization and application of personal data while ensuring the safety and security of consumers. This will lead to the creation of various new services and improved convenience. In Japan as of November 2022, five enterprises have been certified under the certification system by private organizations since certification started in June 2019.[58]

So far, MIC has selected the key operational issues and considered solutions for social implementation and dissemination of personal data trust banks, and reflected them in the review of the Guidelines on Certification of

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[56] https://www8.cao.go.jp/kourei/whitepaper/w-2022/zenbun/pdf/1s1s_01.pdf

[57] Japan Center for Economic Research (2022) “Usable! Economics: A Great Revolution Beginning in a Data-Driven Society, Nihon Keizai Shimbun Publishing

[58] Information Technology Federation of Japan List of Authorized Businesses https://www.tpdms.jp/certified/

Information Trust Functions.[59] As specific initiatives, in FY2021, it carried out a demonstration project to organize rules and requirements for the use of Special care-required personal information in the fields of health and medical care, as well as discussions about data transfer between businesses that handle personal data via a personal data trust bank. In addition, in FY2022, the utilization of personal data held by local governments in cooperation with personal data trust banks, surveys and demonstrations aimed at realizing data portability through personal data trust banks, and consideration of the use of personal data trust banks in the field of education were studied.

In the future, it will be required to promote discussions on the utilization of personal data trust banks, mainly in the quasi-public sector and the mutual collaboration areas, where there is a high need for utilization of personal data. Efforts are expected to further promote the spread of personal data trust banks so that services can be created and government administration can be made more efficient and speedy.

5.2.2 Promotion of AI Implementation in Various Sectors

(A) Promotion of AI Utilization in Enterprises

The empirical analysis results in Chapter 2 showed that elements such as company-wide environment construction and having an employee in charge of a specialized department that conducts data analysis are important for AI utilization. In the life cycle of AI utilization, there are also phases such as data collection and processing, suggesting that appropriate preparations are necessary to fully utilize AI. In the questionnaire survey of enterprises, the results showed that there were more enterprises that reduced the number of employees through the use of AI than enterprises that increased the number of employees. It is important to work on creating an environment for AI utilization that accounts for staffing needs.

Regarding the effects of AI utilization, about half of the enterprises responded that they experienced some effects, while the remaining enterprises answered that they did not see any effect or they did not see clear results, but the results of the empirical analysis in Chapter 2 show that the use of AI had a positive significant relationship to added value. In addition to creating the environment, information dissemination and education about the effects of AI utilization is also important.

(B) Human Resource Development

From the results of the questionnaire survey of enterprises, it became clear that the biggest problem in data utilization in enterprises is “Human resource barriers, e.g., lack of employees with know-how." In addition, in the 2020 Whitepaper on Information and Communications, regarding the shortage of digital human resources for enterprises in each country (leaders of digitalization such as CIOs and CDOs and experts in AI and data analysis), enterprises responded, "extremely short" and "somewhat short," exceeding 50%, in total. This is considered to be more serious than in the United States and Germany.[60] In the same whitepaper, the most common reasons for Japanese enterprises were that they have no recruitment or development systems in place for digital human resources. The whitepaper stated that about 40% are “not ready”, and that there is an urgent need to develop digital human resources who can play an active role in enterprises in order to promote DX in Japan. Regarding the

[59] The latest version is Guidelines on Certification of Information Trust Functions Ver2.2 (Revised in June 2022)
[60] https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r04/pdf/n3800000.pdf

development and securing of digital human resources, it is one of the policies in the Basic Policy for the Vision for a Digital Garden City Nation (approved by the Cabinet on June 7, 2022), and future efforts are expected. In addition, from the perspective of supporting the re-adaptation of workers, as AI and data play an increasing role, reskilling efforts to move workers to growth fields are also important.

(C) Promotion of DX in Quasi-public Fields: Medical

The Digital Agency is working on digitalization of quasi-public fields that are closely related to our lives, such as medical care and education. These are beginning to be recognized as important. Especially in medical care, as in the case of 3.1, various services are expected to become a reality, such as medical interviews using apps, online medical consultations, and the provision of personalized medicine. However, in medical care, it is difficult to connect digitalization and data utilization to the profits of medical institutions, so in promoting digitalization, it is especially important to reduce the burden on medical sites and medical staff. Equally important are the benefits for the patient and caregivers such as family members. In other countries, based on the concept of value-based health care, efforts are being made to share the objectives of maximizing patient value, maximizing outcomes, and optimizing costs. [61] These are the ones that are being paid attention to in the digitalization efforts.

In addition, regarding the sharing of data in medical care, there are high expectations for utilization in preventive medicine, provision of medical care according to life stages, and research projects done by companies and researchers that require access to data. Personal health checkup results shared with the consent of the individual, such as through a Personal Health Record, are expected to be useful for a variety of purposes. On the other hand, there are also challenges in using data in medical care. The fact that the standardization of medical institutions' systems has not progressed and the concept of data portability has hardly spread could have had an impact. In this area, patients' own intentions regarding the handling of their personal data will be further respected, and a framework for data sharing and collaboration will be developed. It will be important for people to be convinced that are benefits for both patients and healthcare providers.

In October 2022, the Medical DX Promotion Headquarters[62] headed by the Prime Minister was launched to promote infrastructure development for realizing optimal medical care for the people. This is to improve the health and medical services for citizens by improving the efficiency and quality of services through DX in medical care. This is the trend in the government as a whole.

With the review of medical fees in FY2022, institutions were required to report the status of their introduction of electronic medical records and implementation of the HL7 Fast Healthcare Interoperability Resources (FHIR),[63] a next-generation standard framework for medical information exchange created by HL7 International.[64] This is to promote standardization efforts so that efficient and effective information sharing and cooperation among medical institutions becomes possible.

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[61] Ministry of Economy, Trade and Industry Commissioned Project 2017 Medical Technology/Service Base Promotion Project (International Deployment System Development Support Project) Priority Country Survey US (basic survey) https://www.meti.go.jp/policy/mono_info_service/healthcare/iryou/downloadfiles/pdf/29fy_detailreport_VBHC_degital_U.S.A.pdf

[62] Medical DX Promotion Headquarters, https://www.cas.go.jp/jp/seisaku/iryou_dx_suishin/index.html

[63] Next-generation standard framework for medical information exchange through HL7 International. It is designed to enable the exchange of medical information, including medical visit records, as well as medical administrative data, public health data, and research data

[64] Tokai Hokuriku Bureau of Health and Welfare Overview of FY2022 Medical Fee Revision, https://kouseikyoku.mhlw.go.jp/tokaihokuriku/000231285.pdf

5.2.3 Securing the ICT Infrastructure to Support the AI Era

As described in 5.1, broadband in Japan far exceeds the OECD average and can be said to be top class in the world. This is one of Japan's current strengths when it comes to promoting AI and data utilization. Now it is important to build a sustainable ICT environment, given that technology will be more advanced and telecommunication network traffic and electricity consumption will increase.

ICT infrastructure is important to be able to support various use cases and services, considering that it will be the foundation of all industrial and social activities, while AI and IoT are being implemented in society and data is being exchanged dynamically.

5.2.4 Contribution to International Rule-making

As the use of AI and big data progresses around the world, we can see movements in many places for rulemaking in the digital field. First, as a major trend, as described in 5.1, various acts announced in the EU can be mentioned. In addition to the planned introduction of the so-called hard law, it is expected to affect enterprises outside the EU, and is attracting attention.

In the Pacific region, the Indo-Pacific Economic Framework (IPEF), a new economic zone initiative led by the United States, was launched in May 2022,[65] and currently 14 countries[66] including Japan are participating. It does not take the form of a trade agreement. It is a framework based on loose cooperation without legal binding by like-minded countries, to strengthen cooperation among participating countries for supply chain resilience and decarbonization, and to establish international rules for promoting digital trade and tax avoidance is assumed.

In June 2020, Singapore, Chile, and New Zealand signed the Digital Economy Partnership Agreement (DEPA), which entered into force on January 7, 2021 in New Zealand and Singapore and in November 23, 2021 in Chile. It covers the latest issues for the development of the digital economy, such as the use of electronic documents in goods and business transactions across borders, personal information protection, cyber security, digital identity, fintech, artificial intelligence, big-data exchange, innovation for SMEs, trade, investment opportunities, and elimination of the digital divide. In September of the same year South Korea notified New Zealand of its intention to join, China applied for membership in November, and Canada applied for membership in May 2022. This agreement has become a large tide in the Asia-Pacific area.

In such a global situation, Japan maintains a soft law stance, particularly with respect to AI, from the perspective of the need to respond flexibly to technological change. This position was expressed at such occasions as the Global Partnership on Artificial Intelligence, OECD meetings and in bilateral conversations. Sharing international values is significant in the field of information and communications, where networks with other countries are important, but actively fostering international discussions and cooperation is also important in Japan's international negotiations.

Starting with the GPAI Summit 2022 in November 2022, Japan assumed the role of the annual chair of the GPAI and will be the host country for the G7 in 2023. Taking advantage of this opportunity to make an active contribution

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[65] https://www.jetro.go.jp/biznews/2022/05/4ce04727563e0867.html

[66] The 14 countries participating in the July 2022 ministerial-level meeting are the United States, Japan, Australia, New Zealand, South Korea, seven ASEAN countries (Indonesia, Singapore, Thailand, the Philippines, Vietnam, Malaysia, Brunei), India, and Fiji. https://www.meti.go.jp/press/2022/09/20220913006/20220913006.html

to the creation of rules for AI and data utilization will lead to ensuring Japan's ideal of data ownership, portability, and interoperability. It is also important for appropriately responding to supply chain risks and achieving sustainable economic growth.

In Conclusion

As the digitalization of socioeconomic activities progresses rapidly, it is expected that the areas where AI and data will play an active role will expand further, and the issues will become clearer. Based on the premise that data can be a source of value creation, promoting discussions on ownership of personal data and sharing and distributing data across organizations, fields, and borders is an urgent task for Japan in order to utilize AI and data to increase productivity.

In addition, amidst the dramatic changes in the world situation, such as the intensifying conflict between the United States and China and Russia's invasion of Ukraine, discussions on economic security are heating up. Furthermore, with the addition of new values, such as the response to the environment and human rights, the nature of the supply chain is once again being questioned. In order to properly maintain such an increasingly complex economic ecosystem, it is necessary to visualize and improve the efficiency of various activities. With this in mind, it is important to collect data through systematization, develop digital human resources to analyze that data, and promote data distribution between organizations and enterprises to coordinate operations from upstream to downstream in an integrated manner.

Considering the current situation in Japan, it is of paramount importance for solving diverse social issues to make maximum use of technologies such as AI and IoT on the basis of the DFFT philosophy, to make efforts to enhance international cooperation and appropriate data governance, and to strengthen the resilience of supply chains. It is the Committee’s sincere hope that the analyses and discussions on AI and data will contribute to the sustainable development of the Japanese economy.

Attachment 1

Conference toward AI Network Society
Committee on AI Economy Members

Chairperson	IWATA Kazumasa	(President, Japan Center for Economic Research)
Members	ATAKA Kazuto	(Professor, Faculty of Environment and Information Studies, Keio University Senior Strategist, Z Holdings Corporation)
	ISHII Kaori	(Professor, Faculty of Global Informatics, Chuo University)
	IWAMURA Arihiro	(Managing Director of Japan Business Federation)
	OHASHI Hiroshi	(Vice President, University of Tokyo, Professor of Economics)
	KITSUREGAWA Masaru	(Director General, National Institute of Informatics Project Professor, University of Tokyo)
	KUBOTA Shigehiro	(Associate Professor, Department of Business Law, Faculty of Business Law, Tohoku Bunka Gakuen University)
	KUWAZU Kotaro	(Research Director, Nomura Research Institute, Ltd.)
	JITSUZUMI Toshiya	(Professor, Faculty of Policy Studies, Chuo University)
	SUGIYAMA Masashi	(Director, RIKEN Center for Advanced Intelligence Project Professor, Graduate School of Frontier Sciences, University of Tokyo)
	TATSUMOTO Hirofumi	(Professor, Faculty of Business Science, University of Tsukuba)
	HARADA Tatsuya	(Professor, Research Center for Advanced Science and Technology, University of Tokyo)
	MORIKAWA Hiroyuki	(Professor, Graduate School of Engineering, University of Tokyo)
	YAMAGUCHI Itsuko	(Professor, Interfaculty Initiative in Information Studies, University of Tokyo)
	YAMAMOTO Isamu	(Professor, Faculty of Business and Commerce, Keio University)
Advisor	SHINOZAKI Akihiko	(Professor, Graduate School of Economics, Kyushu University)

(Honorifics omitted. In the order of Japanese syllabary, excluding the chairperson and advisor)

(As of November 25, 2022)

Conference toward AI Network Society
the Special-Interest Group on Data Members

Chief Examiner	OHASHI Hiroshi	(Vice President, University of Tokyo, Professor of Economics)
Deputy Chief Examiner	TATSUMOTO Hirofumi	(Professor, Faculty of Business Science, University of Tsukuba)
Members	ARAI Hiromi	(Unit Leader, RIKEN Center for Advanced Intelligence Project)
	IKEGAI Naoto	(Associate Professor, Business Law Faculty, Hitotsubashi University)
	ITO Banri	(Professor, Department of Economics, Faculty of Economics, Aoyama Gakuin University)
	KOGUCHI Teppei	(Professor, College of Informatics - Division of Socio-Information Studies, Shizuoka University)
	TAKASAKI Haruo	(Designated professor, Institute of Innovation for Future Society, Nagoya University)
	NAKAMURA Tsuyoshi	(Dean and Professor, Faculty of Economics, Tokyo Keizai University)
	HIRAI Yuri	(Associate Professor, College of Sports and Health Science, Ritsumeikan University)
	MATSUURA Toshiyuki	(Associate Professor, Keio Economic Observatory, Keio University)
	MIYAZAKI Takashi	(Senior Economist, Japan Center for Economic Research)
	WATANABE Tomoaki	(Research Fellow, Professor, Center for Global Communications, International University of Japan)

(Honorifics omitted. In the order of Japanese syllabary, excluding the chief and deputy chief)

(As of November 25, 2022)

Attachment 2

Committee on AI Economy History (from the 17th meeting onwards)

17th (Dec. 3, 2021) Joint meeting with Data Expert Subcommittee (16th)

- ○ Announcement from Digital Agency
  - "Promoting the Comprehensive Data Strategy" (HIRAMOTO Kenji, Head of Data Strategy)
- ○ Topics to examine by the Committee on AI Economy and the Data Expert Subcommittee and the path forward

[Questionnaire survey on data utilization in companies (January 25 to February 28, 2022)]

Committee on AI Economy Chairman Hearings (1st and 2nd) (March 10 and 22, 2022)

- ○ Presentations at the 1st meeting
  - "Current Status and Issues of Financial API Utilization"
    TAKI Toshio, Representative Director, Association of Electronic Payment Service Providers
    Money Forward, Inc., Group Executive Officer
  - "Why is there no progress in sharing and utilizing medical information, based on the 50-year history of dealing with medical information?"
    ASANUMA Motohiro,
    Juntendo University Information Center Headquarters Visiting Professor
    Cabinet Office National Strategic Special Zones WG Member and Super City Concept Expert
  - "SIP 'Advanced diagnosis and treatment system by AI hospital'"
    OHIRA Hiroshi
    President & Representative Director, Information and Communications Research Institute
    Sub-theme A Research Director, "Advanced diagnosis and treatment system by AI hospital"
    Cabinet Office Strategic Innovation Promotion Program (SIP)
- ○ Presentation at the 2nd meeting
  - "Using technology to guide people to the right medical care"
    SATAKE Junko, Public Affairs, Ubie Discovery, Ubie, Inc.
  - "SMBC Group's initiatives to realize a digital society"
    MIYAUCHI Hisashi, Director of Digital Strategy Department
    SUZUKI Atsuyuki, Director of Digital Strategy Department
    Sumitomo Mitsui Financial Group, Inc.
  - "The future of ICT on construction sites"
    MURAKAMI Kazuya
    Senior Manager, Planning Department, Smart Construction Promotion Headquarters
    Komatsu, Ltd.

18th（Sep. 20, 2022） ※Joint meeting with Data Expert Subcommittee (18th)

- ○ Report on the Global Forum on AI Network Society 2022
- ○ Report on deliberations by the Data Expert Subcommittee
- ○ Committee on AI Economy 2022 Outline (Draft)

19th（Nov. 25, 2022） ※Joint meeting with Data Expert Subcommittee (19th)

- ○ Committee on AI Economy 2022 Outline (Draft)

20th (E-mail discussion) (Dec. 7~14, 2022) ※Joint meeting with Data Expert Subcommittee (20th)

- ○ Committee on AI Economy 2022 Outline (Draft)

Committee on AI Economy Data Expert Subcommittee History (15th and later)

15th (Nov. 21, 2021)

- ○ Topics to examine and the path forward for the Committee on AI Economy / Data Expert Subcommittee

16th (Dec. 3, 2021) ※Joint meeting with the Committee on AI Economy (17th)

[Questionnaire survey on data utilization in companies (January 25 to February 28, 2022)]

17th (Aug. 4, 2022)

- ○ Questionnaire survey results and analysis related to data value measurement

18th (Sep. 20, 2022) ※Joint meeting with the Committee on AI Economy (18th)

19th (Nov. 24, 2022) ※Joint meeting with the Committee on AI Economy (19th)

20th (E-mail discussion) (Dec. 7~14, 2022) ※Joint meeting with the Committee on AI Economy (20th)