

Penetration of Digital Technologies

Section 1 Status of use by the citizens and corporations

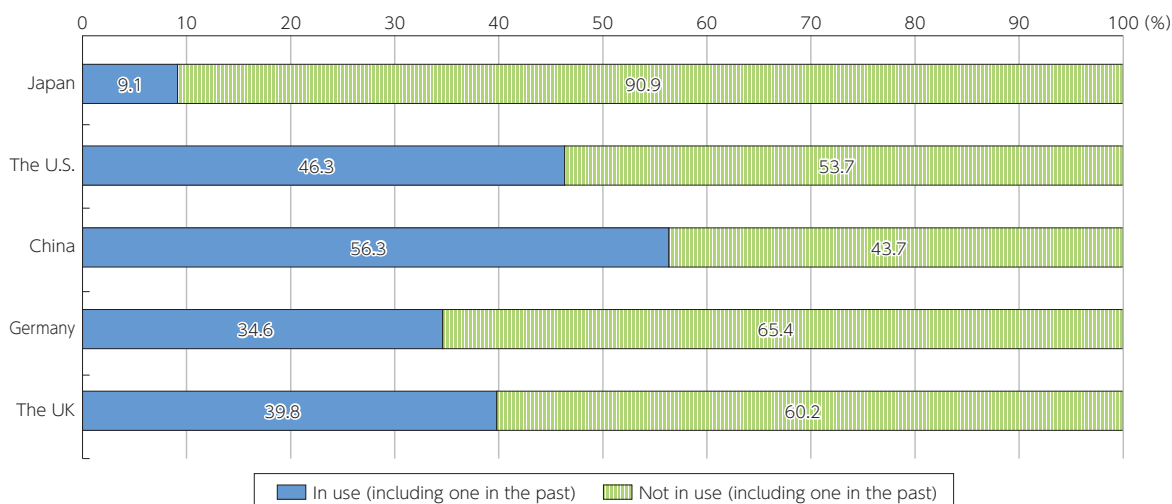
1. Generative AI

(1) Questionnaire to the general public

The penetration of generative AI services into the daily lives of citizens has been a topic of discussion both domestically and internationally. The MIC conducted a survey on the usage of “Digital Technology,” including generative AI, among citizens of Japan, the U.S., China, Germany, and the UK.

According to the survey, the percentage of respondents in Japan who reported “Using” generative AI (including those who have used it in the past) was 9.1%, which was lower compared to other countries (**Figure 1-5-1-1**).

Figure 1-5-1-1 Experiences to use generative AI

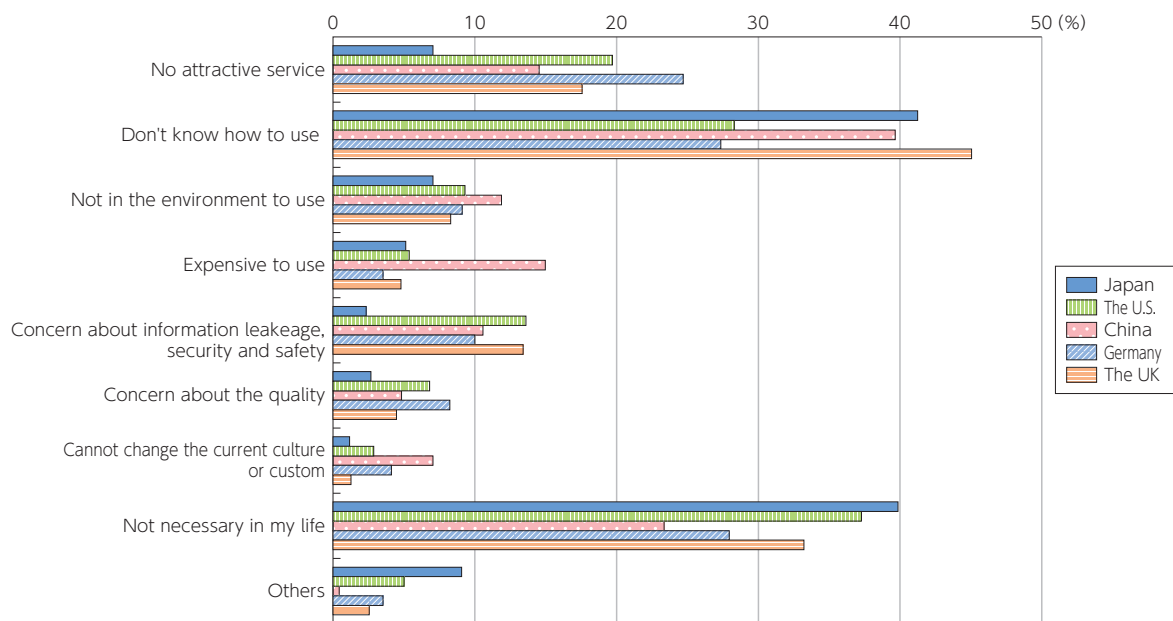


(Source) MIC(2024) “Research and study on the advancement of digital technologies and their utilization”

The reasons for not using generative AI were similar across the surveyed countries, with many citing “not knowing how to use it” and “not needing it in their daily

lives.” Concerns about “information leakage, safety, and security” were less frequently cited (**Figure 1-5-1-2**).

Figure 1-5-1-2 Reasons not to use generative AI

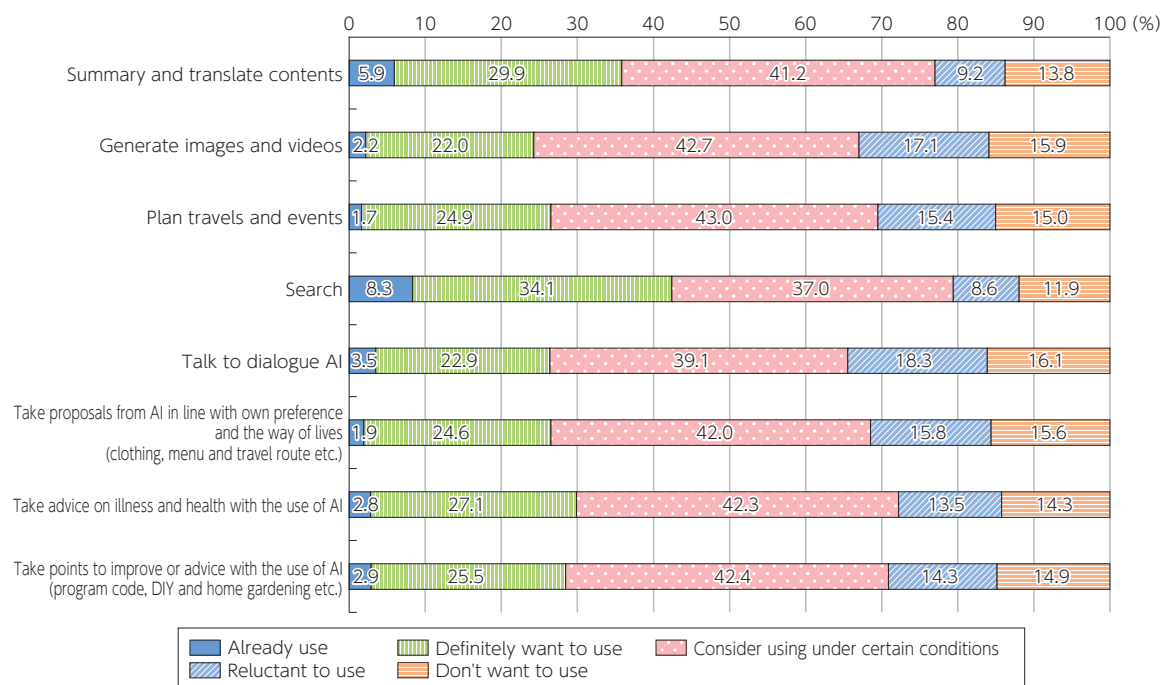


(Source) MIC(2024) "Research and study on the advancement of digital technologies and their utilization"

On the other hand, when asked about their willingness to utilize generative AI in their future lives and leisure activities, the percentage of respondents in Japan who indicated "already using it" was low. However, around 60-70% expressed an interest in using generative

AI in the future, with some stating that they would "definitely like to use it" or "consider using it depending on the conditions," indicating potential demand for such services (Figure 1-5-1-3).

Figure 1-5-1-3 Willingness to use generative AI



(Source) MIC(2024) "Research and study on the advancement of digital technologies and their utilization"



Figure (related data) Willingness to use generative AI (by topic)

URL: <https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00060>

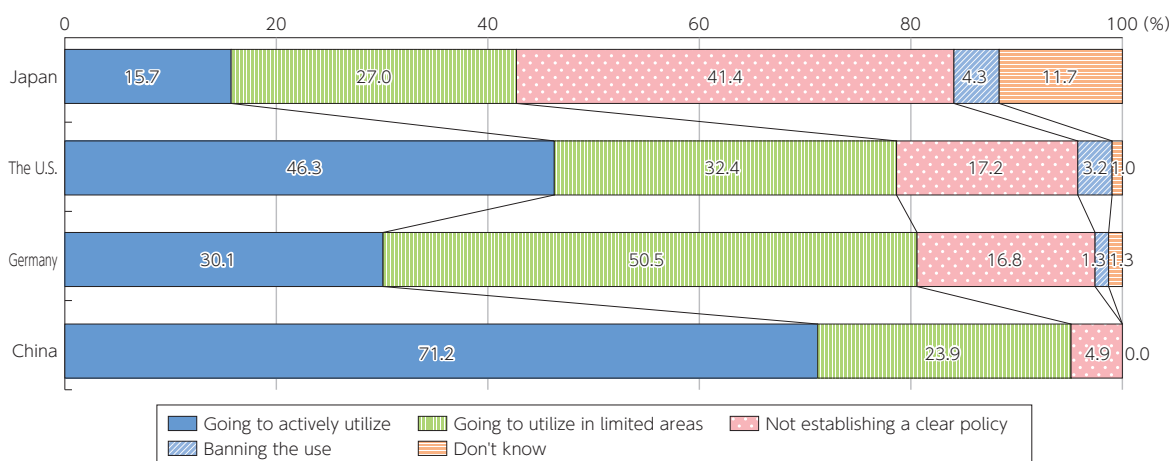
(Data collection)

(2) Questionnaire to corporates

Subsequently, a survey was conducted targeting businesses in each country to inquire about the utilization of generative AI in their operations. When asked whether they had established a policy for utilizing generative AI, 42.7% of Japanese companies responded that they had

“established a policy for utilizing it” (combining those who actively utilize it and those who use it in limited areas), which was approximately half the percentage compared to the U.S., Germany, and China, where over 80% had established such a policy (Figure 1-5-1-4).

Figure 1-5-1-4 Status to establish a policy for utilizing generative AI

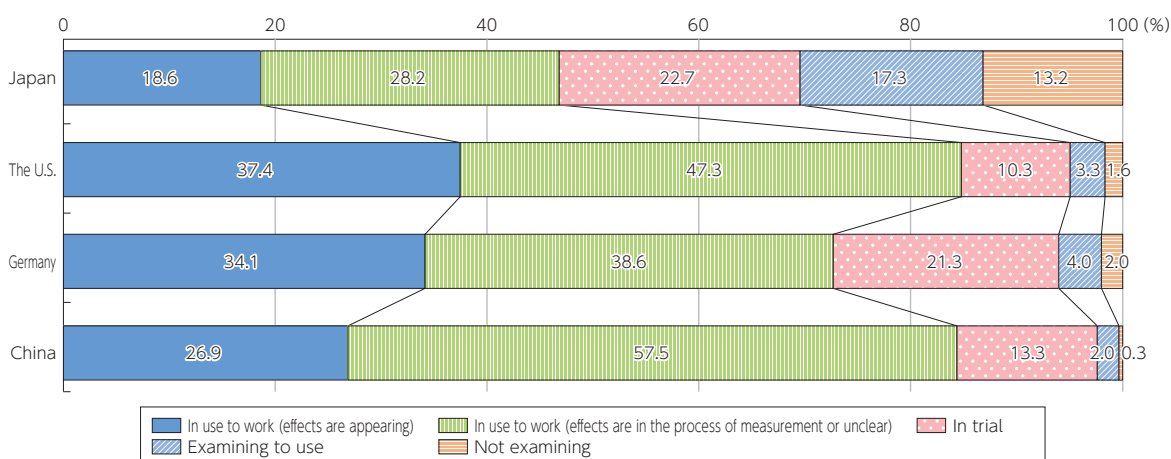


(Source) MIC(2024) “Research and study on the latest trends in information and communication technology research and development, as well as digital utilization, both domestically and internationally”

When asked about the utilization of generative AI in specific business operations, such as “assistance in email, meeting minutes, and document creation,” 46.8% of Japanese companies reported using generative AI in their operations. However, when including those in the trial phase, around 90% of companies in the U.S., Ger-

many, and China were using it, indicating that overseas, active utilization has begun in various areas, including customer support, while Japanese companies are proceeding with cautious adoption, particularly for internal operations (Figure 1-5-1-5).

Figure 1-5-1-5 Status to utilize generative AI in business operations (support for creation of mail, minutes and material)



(Source) MIC(2024) “Research and study on the latest trends in information and communication technology research and development, as well as digital utilization, both domestically and internationally”



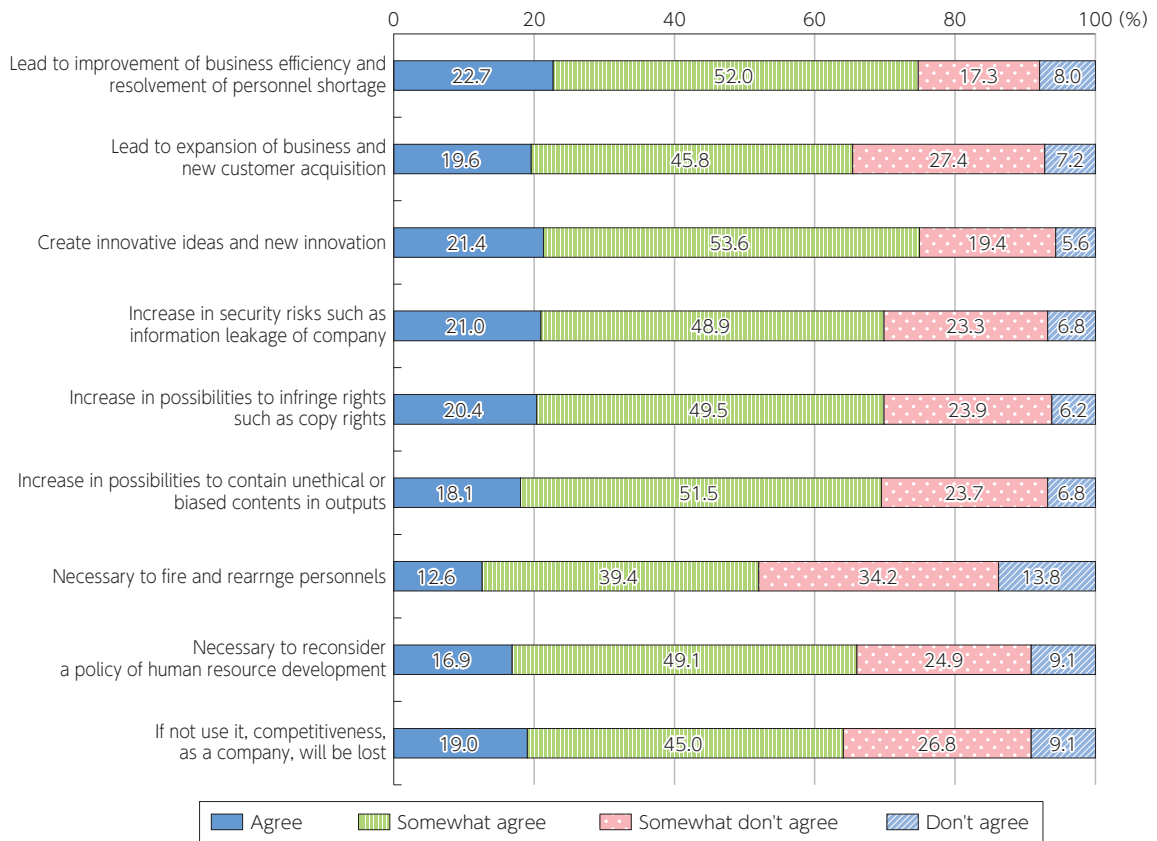
Figure (related data) Status to utilize generative AI in business operations (other business operation)

URL: <https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00063>

(Data collection)

Regarding the effects and impacts of utilizing generative AI, approximately 75% of companies believed that it would lead to “improving business efficiency and addressing labor shortages.” However, around 70% of companies also expressed concerns about the risks associ-

ated with generative AI, such as “an increase in security risks, such as internal information leakage” and “the potential for copyright and other rights infringement” (Figure 1-5-1-6).

Figure 1-5-1-6 Effects and influences by utilization of generative AI (Japan)

(Source) MIC(2024) "Research and study on the latest trends in information and communication technology research and development, as well as digital utilization, both domestically and internationally"

**Figure (related data) Effects and influences by utilization of generative AI (by topic)**

URL: <https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00065>
(Data collection)

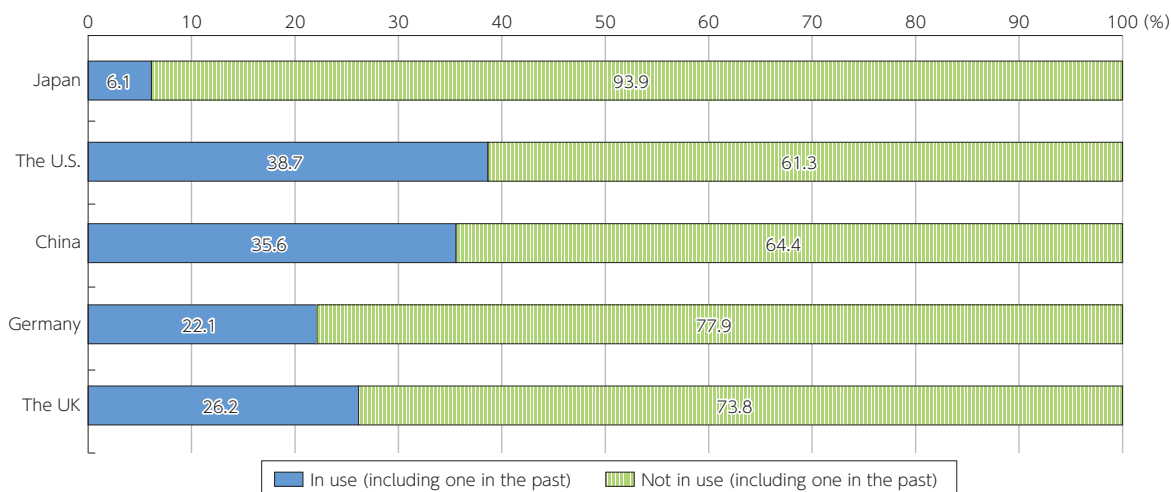
2. Metaverse

(1) Questionnaire to the general public

When asked about their experience with using the metaverse, the percentage of respondents who an-

swered “using it” (including those who have used it in the past) was low in Japan at 6.1% (**Figure 1-5-1-7**).

Figure 1-5-1-7 Experiences to use the metaverse

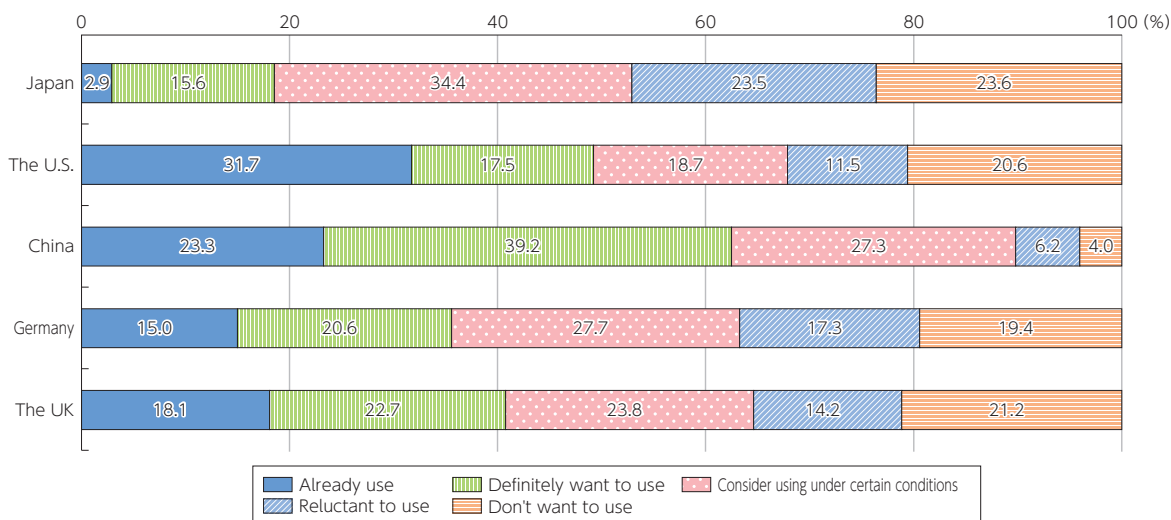


(Source) MIC(2024) “Research and study on the advancement of digital technologies and their utilization”

When asked about the usage status and intentions for specific scenarios, the percentage of respondents who answered “already using” for “communication between users in virtual space” was 2.9% in Japan, which was lower compared to other countries where the percent-

age was around 15-30%. However, when combined with positive responses for future use (“definitely want to use” and “consider using depending on the conditions”), the potential demand was 52.9%, indicating potential interest in usage (**Figure 1-5-1-8**).

Figure 1-5-1-8 Willingness to use the metaverse (communication among users)



(Source) MIC(2024) “Research and study on the latest trends in information and communication technology research and development, as well as digital utilization, both domestically and internationally”



Figure (related data) Willingness to use the metaverse (other scene to use)

URL: <https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00068>
(Data collection)

(2) Questionnaire to corporates

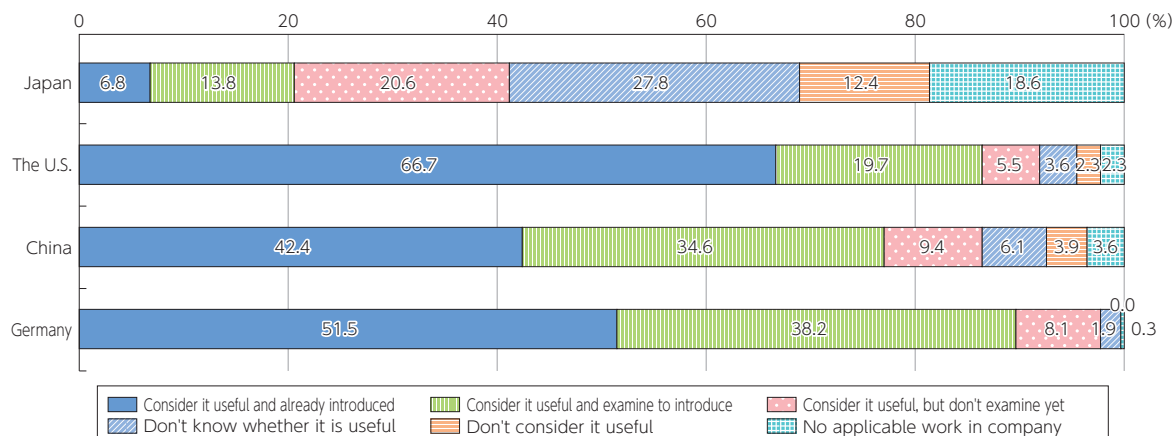
When asked about the consideration status of introducing the metaverse and digital twins in business operations such as “product development,” “manufactur-

ing,” and “logistics” among companies in various countries, the percentage of respondents in Japan who answered “consider it useful and already introduced”

was less than 10% for all operations. This is low compared to approximately 45-60% in the U.S. who answered

that they have already introduced it (Figure 1-5-1-9).

Figure 1-5-1-9 Consideration status of introducing the virtual space in business operation (merchandise development)



(Source) MIC(2024) "Research and study on the latest trends in information and communication technology research and development, as well as digital utilization, both domestically and internationally"



Figure (related data) Consideration status of introducing the virtual space in business operation (other business operation)

URL: <https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00070>
(Data collection)

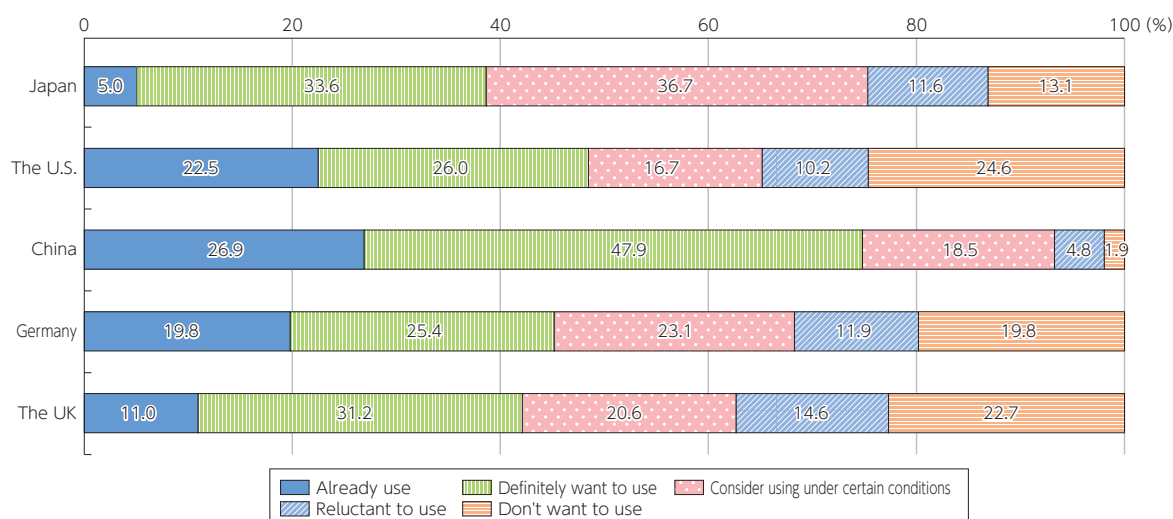
3. Robotics

To investigate the public perception of robot use in daily life and entertainment, respondents were asked about their willingness to use robots in six different scenarios. Regarding "robots performing household chores (cleaning, laundry, cooking, etc.)," 75.3% of Japanese respondents gave positive responses (already using,

definitely want to use, consider using under certain conditions). This percentage is similar to that in the U.S., Germany, and the UK (Figure 1-5-1-10).

Additionally, in the U.S., Germany, and the UK, about 30% of respondents indicated that they "do not want to use" robots in any of the six scenarios.

Figure 1-5-1-10 Willingness to use robots by scene in lives and entertainments (performing household chores (such as cleaning, laundry, cooking etc.))



(Source) MIC(2024) "Research and study on the advancement of digital technologies and their utilization"



Figure (related data) Willingness to use robots by scene in lives and entertainments (other scene to use)

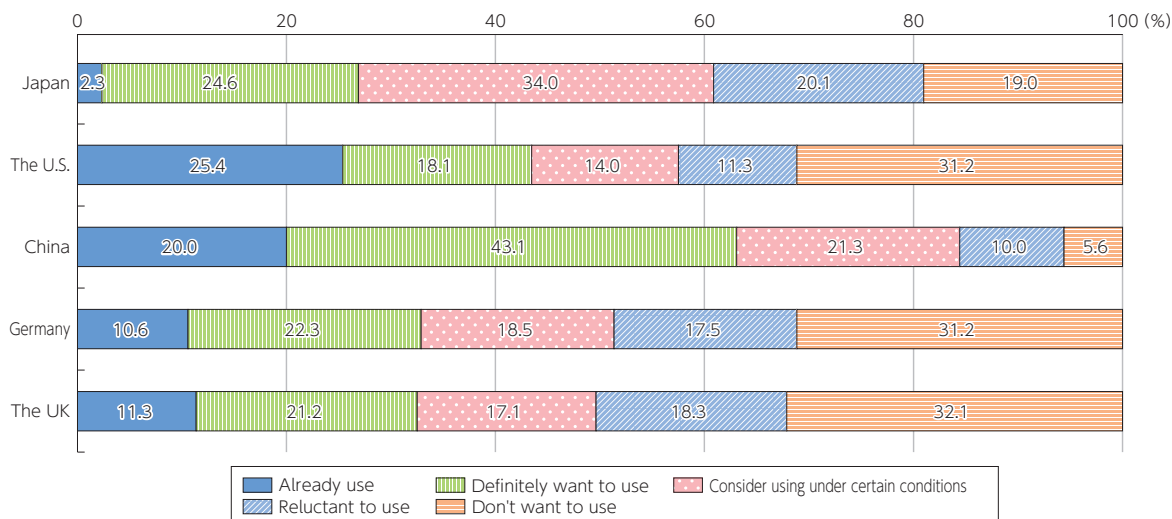
URL: <https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00072>
(Data collection)

4. Automated driving

When asked about their willingness to use fully autonomous vehicles (driverless operation), about 60% of Japanese respondents indicated a willingness to use them (definitely want to use, consider using under certain conditions) in any of the five scenarios presented.

On the other hand, about 20% of Japanese respondents said they “do not want to use” them, compared to about 30% in the U.S., Germany, and the UK, indicating a more hesitant attitude towards use in these countries (**Figure 1-5-1-11**).

**Figure 1-5-1-11 Willingness to use fully autonomous vehicles
(commuting, daily shopping and transferring family members by fully autonomous home vehicles)**



(Source) MIC(2024) "Research and study on the advancement of digital technologies and their utilization"



Figure (related data) Willingness to use fully autonomous vehicles (other scene to use)
 URL: <https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/r06/html/datashu.html#f00074>
 (Data collection)

Section 2 Current situation and new trends of utilization

As seen in the previous section, digital technologies, including generative AI, have not yet been widely adopted domestically. However, there is a latent intention to use them, and there is potential for their utilization to advance along with services and content in the future.

This section provides an overview of advanced cases that contribute to the promotion of generative AI utilization in companies and other organizations, as well as examples of digital technology applications expected to solve social issues in the future.

1. Generative AI driving business transformation

This section summarizes the actual state of introduction and utilization of generative AI in companies and

public organizations, considerations regarding risks, and efforts to promote healthy utilization.

(1) Trends in the introduction of generative AI in companies and public organizations

In companies and other organizations that actively promote the introduction of generative AI, efforts are being made to build systems and establish rules to pro-

mote utilization while evaluating and verifying AI risks and social impacts.

A NTT Data

NTT Data formulated the “NTT Data Group AI Guidelines” in May 2019 and established the “AI Advisory Board” consisting of external experts in April 2021 to consider the company’s AI governance. These activities have been conducted to create value through fair and healthy AI utilization and to contribute to the sustainable development of society. Furthermore, in April 2023,

NTT Data established the AI Governance Office as an organization to appropriately address business risks arising from the inappropriate use of AI that affects business and to provide safe AI systems to customers¹. From July of the same year, NTT Data began operating a risk management system using checklists for all projects involving AI and data utilization in its domestic business.

B Yokosuka City²

Yokosuka City began its internal efforts with the agency-wide demonstration of use of ChatGPT in April 2023. To promote the utilization of ChatGPT among staff and disseminate correct usage methods, the city launched the “ChatGPT Newsletter,” developed unique training programs for staff, held a ChatGPT utilization contest for staff, and established the “AI Strategy Advisor” to receive external advice³.

Yokosuka City also launched a chatbot for other municipalities to answer questions about their initiatives. In the same month, the city launched the “Municipal AI Utilization Magazine,” a portal site that disseminates the know-how and trial-and-error processes of municipalities that are early adopters of generative AI. The city also held a two-day training program called the “Yokosuka Generative AI Camp” for municipalities and companies nationwide.

Additionally, the city has been sharing the knowledge and know-how cultivated internally with other municipalities. In August 2023, the city started operating an in-

quiry bot for other municipalities to answer questions about their initiatives. In the same month, the city launched the “Municipal AI Utilization Magazine,” a portal site that disseminates the know-how and trial-and-error processes of municipalities that are early adopters of generative AI. The city also held a two-day training program called the “Yokosuka Generative AI Camp” for municipalities and companies nationwide.

(2) Trends in Utilization Across Various Fields and Industries

A Utilization in content creation (CyberAgent)

In the fields of media, gaming, and music content creation, generative AI is being used to assist in the creation of content itself or as a supplementary tool. This allows creators to produce content more efficiently despite labor shortages.

Furthermore, leveraging this knowledge, the city introduced the “AI Consultation Partner” for staff handling consultations at welfare consultation desks.

At CyberAgent, in May 2023, they implemented an automatic catchphrase generation feature using ChatGPT in their proprietary “Kiwami Yosoku AI,” which is used for creating advertising creatives with AI. This allows for the creation of ad copy tailored to more specific targets

by considering the content of the ad images⁴. Additionally, in December 2023, they developed an automatic product image generation feature using AI, enabling the mass automatic generation of various combinations of scenarios and product images. They aim to provide more effective product images by utilizing the generated images and predictive AI⁵ (Figure 1-5-2-1).

¹ NTT Data, “New establishment of “AI Governance Office” to strengthen AI risk management,” March 23, 2023, <<https://www.nttdata.com/global/ja/news/release/2023/032301/>>

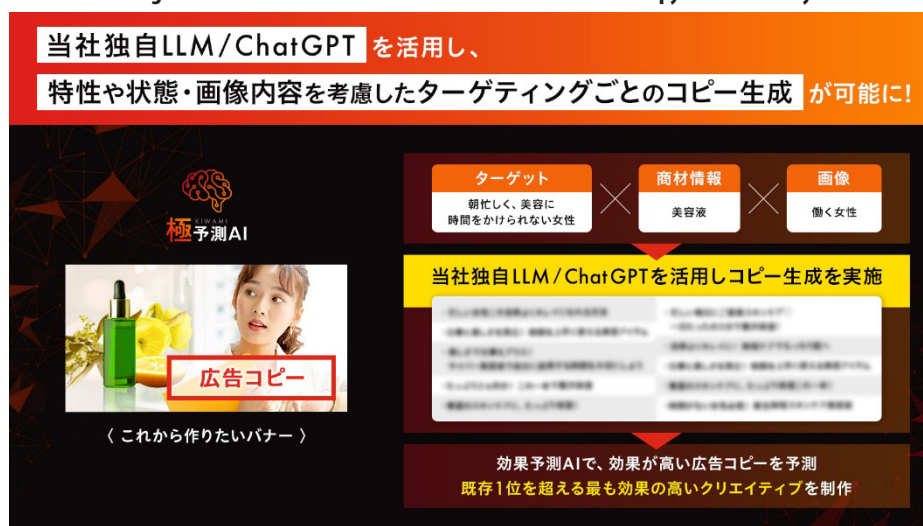
² Based on local government hearings (Yokosuka City).

³ Digital Cross “Yokosuka City Aims for Administrative Innovation Using Knowledge from Japan’s First ChatGPT Introduction,” December 12, 2023, <<https://dcross.impress.co.jp/docs/column/column20230929/003503.html>> (accessed on March 27, 2024)

⁴ CyberAgent “Kiwami Yosoku AI has a function of automatic ad copy generation with use of large-scale language models - Utilizing in-house LLMs technology and ChatGPT enables generation with more consideration to images and targets” May 18, 2023, <<https://www.cyberagent.co.jp/news/detail/id=28828>> (accessed on March 6, 2024)

⁵ Based on corporate interviews (CyberAgent).

Figure 1-5-2-1 Kiwami Yosoku AI function to create ad copy automatically



(Source) CyberAgent "Kiwami Yosoku AI has a function of automatic ad copy generation with use of large-scale language models"⁶

B Utilization in customer interaction (Aflac Life Insurance)

In the customer service sector, generative AI is being used to enhance user support, improve the efficiency and education of staff interacting with users, and detect fraud to ensure the healthy use of services. This is expected to improve customer satisfaction and maintain a consistent quality of service regardless of the individual knowledge or skills of the staff. This is particularly promising in fields like contact centers, which often face high turnover rates and labor shortages, by providing operators with appropriate knowledge and back-office

support.

For example, Aflac Life Insurance has developed a role-playing training program called "Recruitment Education AI" for insurance agents, using an AI avatar. This system analyzes and evaluates whether the sales representatives include the necessary keywords in their conversations using technologies like speech recognition. In the future, they plan to incorporate actual customer information to simulate sales activities⁷.

C Information services (NTT Data)

In the information services sector, which includes software development, generative AI is expected to be utilized in all stages of development, from requirements definition and specification generation to programming and testing. The productivity improvements brought by generative AI could help alleviate the shortage of engineers. Particularly for system integrators (SIs), there is also the potential to use AI for the modernization of COBOL assets.

NTT Data is promoting the application of generative AI across all phases of system development, from re-

quirements definition to testing. They have practical application results not only in PoC but also in commercial use, mainly overseas. Examples include reducing the manufacturing process by 70% and tripling productivity. In October 2023, they began PoC for migration in Japan. Currently, the main uses are in the manufacturing and testing phases, where AI is used to generate new source code and modernize old programming languages. In the testing phase, AI reads past design documents and test objectives to automatically extract test items⁸.

D Utilization in the construction sector (Obayashi Corporation)

In the construction sector, it is expected to be used in scenarios such as quickly creating design proposals and referencing past data like survey data, design documents, and specifications to handle specialized knowledge in construction. The industry is under pressure due to extensive overtime work, the aging workforce

leading to mass retirements, and rising material costs. AI is expected to improve efficiency in document creation, leverage the experience of veterans, and link published information with internal expertise⁹.

In March 2022, Obayashi Corporation announced that it had jointly developed an AI technology called "AiCorb"

⁶ CyberAgent, "Kiwami Yosoku AI toward development and start of operation of automatic product image generation function using polar prediction AI and generation AI," December 7, 2023, <<https://www.cyberagent.co.jp/news/detail/id=29572>> (accessed on March 6, 2024)

⁷ Nikkei Crosstech, "Insurance performance increased by more than 30%, Aflac achieved results with AI avatar sales role play" December 8, 2022, <<https://xtech.nikkei.com/atcl/nxt/column/18/01302/110800008/>> (accessed on March 6, 2024)

⁸ DATA INSIGHT "What is NTT Data's "new era system development" using generative AI? - Expanding track record of commercial applications globally! High-quality legacy assets modernized with quality and high productivity" November 16, 2023, <<https://www.nttdata.com/jp/ja/trends/data-insight/2023/1116/>> (accessed on March 26, 2024)

⁹ Akari, "Akari Co., Ltd. starts offering "AKARI Construction LLM" that specializes in large-scale language models such as ChatGPT for the construction industry" March 16th, <<https://prtimes.jp/main/html/rd/p/000000014.000083531.html>> (accessed on March 6, 2024)

with SRI International¹⁰, which can propose various building facade designs from sketches and 3D models in the early stages of architectural design. The company began internal operations of AiCorb in July 2023, and as of the end of May 2024, it has generated over 30,000 images. AiCorb consists of two AIs: the image generation AI, which can quickly output multiple facade design proposals based on hand-drawn sketches and design in-

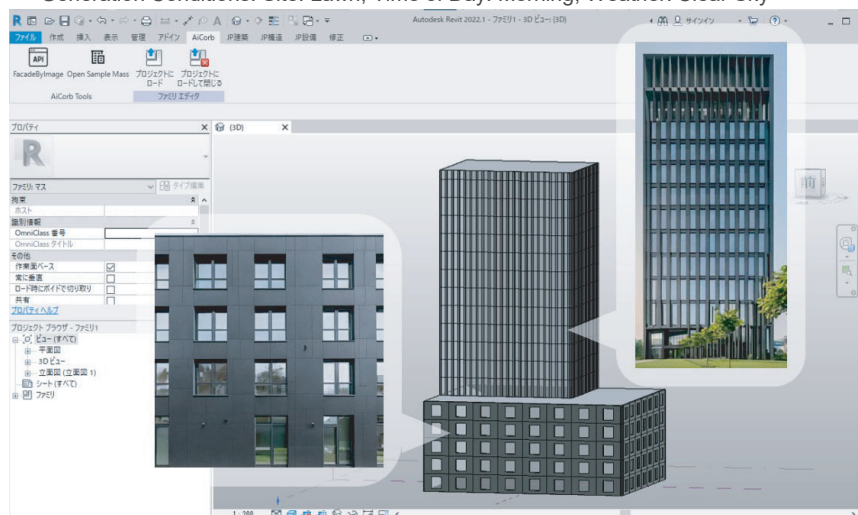
structions, and the 3D transformation AI, which assists in converting the generated designs into 3D models¹¹ (currently, a plugin compatible with Revit models has been developed) (Figure 1-5-2-2). In the future, the aim is to use the 3D data for various performance evaluations, providing a tool to support decision-making and consensus-building for designers and clients.

Figure 1-5-2-2 Design proposal for facade generated by AiCorb from a sketch (top) and examples of using 3D model assistance function (bottom)



Left) Designer's sketch, Middle and Right) Generated images

- Design Instructions: A museum with a facade featuring beautiful vertical and horizontal straight lines composed of wood and glass.
- Generation Conditions: Site: Lawn, Time of Day: Morning, Weather: Clear Sky



Creating a 3D model (center) from generated images (left and right) using a Revit plugin

(Source) Obayashi Corporation

E Utilization in the field of materials (Preferred Networks, ENEOS)

In the field of materials development, a data-driven approach known as Materials Informatics has evolved, leveraging AI's machine learning and statistical methods to analyze large volumes of experimental and computational data, thereby constructing models that lead to the development of new materials. Generative AI, including models such as Generative Adversarial Networks (GAN) and Variational Autoencoders (VAE), can be utilized to learn from existing material datasets and design theoretically new materials by automatically generating new molecular and crystal structures. Additionally, generative AI can create virtual data based on real data, ex-

panding experimental datasets and improving model learning¹².

In July 2021, Preferred Networks and ENEOS jointly established Preferred Computational Chemistry (PFCC) and began offering a cloud service called Matlantis, a general-purpose atomic-level simulator utilizing deep learning. This generative AI-powered atomic simulation aids in understanding the properties of promising materials at the atomic level, as well as in the development and exploration of new materials. Compared to traditional simulations, it accelerates the process by 100,000 to several ten million times while maintaining

¹⁰ Obayashi Corporation, "Developing "AiCorb®" to streamline work in the early stages of architectural design," March 22, 2022, <https://www.obayashi.co.jp/news/detail/news20220301_3.html> (accessed on March 6, 2024)

¹¹ Nikkei Crosstech, "Obayashi's AI tool can generate building exteriors and create 3D images; internal operation will begin in July," July 4, 2023, <<https://tech.nikkei.com/atcl/nxt/column/18/02449/062900008/>> (accessed on March 6, 2024)

¹² JST Research and Development Strategy Center (CRDS) "Development and Future Prospects of Materials Informatics" April 5, 2022, <https://www.jst.go.jp/crds/sympo/20220325/pdf/20220405_01.pdf>

accuracy. Simulations that previously took hours to months on high-performance computers can now be performed in seconds. Matlantis supports 55 types of elements and can simulate unknown molecules and

crystals, providing versatility¹³¹⁴. As of January 2024, it is used by over 80 universities and companies both domestically and internationally.

(3) Utilization in public sector

A Utilization in education (Benesse, etc.)

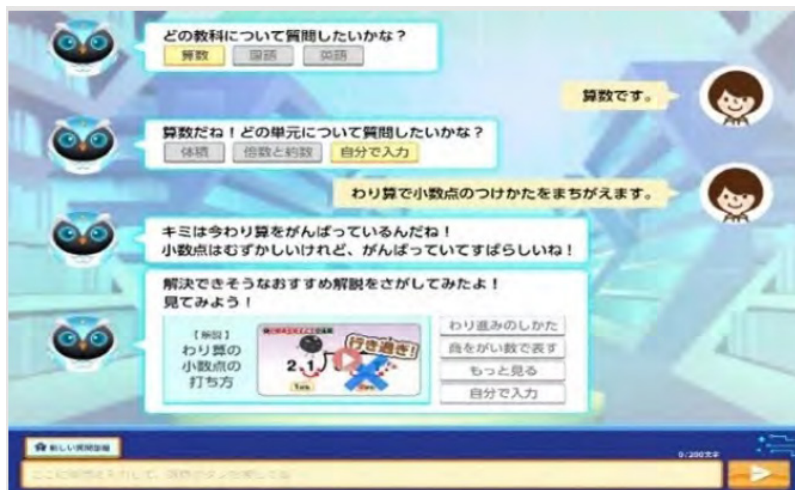
In the field of education, the use of generative AI is anticipated to support various applications such as personalized learning materials for autonomous learning through interactions between learners and AI, answering learners' questions, and assisting teachers in creating educational materials and tests. This is particularly significant in addressing the severe "Teacher Shortage"¹⁵ where the number of teachers actually deployed in schools does not meet the numbers designated by the boards of education in various prefectures and designated cities, resulting in vacancies. By leveraging generative AI, it is possible to create an environment where learners can ask questions without hesitation at any time, receive autonomous educational support, and reduce the workload of teachers in creating educational materials.

In July 2023, the Ministry of Education, Culture, Sports, Science and Technology (hereinafter referred as to MEXT) published "provisional guidelines on the use of generative AI in primary and secondary education". These guidelines provide a framework to help schools determine the appropriateness of using generative AI.

Additionally, based on these guidelines, the MEXT designated 52 schools in 37 municipalities as generative AI pilot schools to thoroughly address concerns related to AI and to evaluate the outcomes and challenges of using AI in educational settings.

Furthermore, Benesse Corporation has been integrating generative AI into its educational services, such as "Jiyu Kenkyu Otasuke AI," "AI Shimajiro," and "Challenge AI Learning Coach" (Figure 1-5-2-3). The "Challenge AI Learning Coach," launched in March 2024, is a service for elementary and junior high school students that utilizes generative AI to allow them to ask questions about their "Shinken Zemi" studies and school homework until they understand the material. To address the concern that students might directly ask for answers, which is one of the challenges of using generative AI in education, the "Challenge AI Learning Coach" is designed to support students by engaging with their questions, broadening their perspectives through dialogue with AI characters, and helping them arrive at answers on their own.

Figure 1-5-2-3 Challenge AI Learning Coach¹⁶



(Source) PR TIMES, "Shinken zemi" will start offering "Challenge AI Learning Coach," a new service that utilizes generative AI, from late March. You can ask questions about subjects at any time until you are satisfied"

¹³ KAWAGUCHI Masateru "Lecture report_The future of materials and material development brought about by the general-purpose atomic level simulator "Matlantis"™ ~ AI-driven ultra-high-speed calculation changes the world of material development ~" April 10, 2024, <<https://matlantis.com/ja/news/oilchemistrydx202404>>

¹⁴ Nikkei Crosstech "Matlantis, a general-purpose atomic-level simulator using AI," August 10, 2021, <<https://xtech.nikkei.com/atcl/nxt/mag/rob/18/00007/00041/>>

¹⁵ MEXT, "Survey on the actual situation regarding "Teacher Shortage"" January 2023, <https://www.mext.go.jp/content/20220128-mxt_kyoiku-jinzai01-000020293-1.pdf> (accessed on March 25, 2024)

¹⁶ Benesse Holdings, "Shinken zemi" will start offering "Challenge AI Learning Coach," a new service that utilizes generative AI, from late March. You can ask questions about subjects at any time until you are satisfied," PR Times, February 2, 2024, <<https://prtimes.jp/main/html/rd/p/000001239.000000120.html>> (accessed on May 26, 2024)

B Utilization in healthcare and nursing care (CDI)

In the healthcare and nursing care sectors, generative AI is expected to optimize care plans tailored to individual users, automate business reports, improve communication with users, and serve as training and educational tools¹⁷. This is anticipated to not only supplement the specialized knowledge required by staff but also improve operational efficiency. In this field, where the demand is increasing due to the aging population and labor shortages are becoming a challenge due to the rapid decline in the working-age population, generative AI holds the potential to become a natural language consultation partner for staff.

C Utilization in administrative services (minutes search)

In administrative services, generative AI is expected to be utilized for policy examination, information collection, policy proposal formulation, collection and drafting of past bills, drafting responses for bill deliberations, information dissemination, inquiry responses, form creation, checking and judgment, result issuance, and meeting implementation²⁰.

For example, Automation co.,ltd released the Chat

In June 2023, CDI began integrating its AI-powered care management support tool “SOIN” with ChatGPT. Based on user attribute information, diseases, and physical conditions already input by care managers, the SOIN server automatically creates command prompts for ChatGPT, which then provides personalized support content to care managers¹⁸. Additionally, in December 2023, CDI released “SOIN AI Chat,” adding a function that allows it to act as a consultation partner for care managers, considering the individual circumstances of each elderly person¹⁹.

GPT Plugin to search the national diet minutes in June 2023. This tool allows users to search for discussions in the National Diet minutes that are similar in meaning to texts such as news, trends, proposals, requests, and complaints, along with the source information. This enables anyone to easily investigate and compile the discussions held in the National Diet²¹ (Figure 1-5-2-4).

Figure 1-5-2-4 Searching the national diet minutes for GPTs

国会議事録検索 for GPTs

You
国民の給料向上について国会でどう議論されているか概要と出典を6件調べて、表形式で表示してください

国会議事録検索 for GPTs
Talked to the-diet-record.automation.jp

国民の給料向上に関する国会での議論の概要は以下の通りです：

議員名	議論の概要	出典
斎藤鉄夫	技能労働者の賃金水準の上昇につながる好循環を官民一体となって推進する決意を表明。	国会議事録
玉木雄一郎	選挙公約として給料が上がる経済を実現することを目指し、与野党共に賃金を上げることに重点を当てるべきだと提言。	国会議事録
大塚耕平	約30年間実質賃金が上がっていない現状を踏まえ、名目賃金上昇率が物価上昇率プラス2%に達するまでの積極財政での支援を提唱。	国会議事録
松本敬司	民間の賃金水準の引き上げについて、経済対策を通じて取り組むと述べ、国家公務員の給与水準も改善されることを期待している。	国会議事録
岡本三成	賃金の持続的な上昇を目指すべきであり、国民が前向きに取り組めるようなメッセージを政府に求める。	国会議事録

これらの議論は国会議事録から抽出されたもので、それぞれの議員が国民の給料向上に関してどのような立場や提案をしているかを示しています。

Message 国会議事録検索 for GPTs...

ChatGPT can make mistakes. Consider checking important information.

(Source) PR TIMES, “Automation co., ltd. developed and released the Diet Minutes Search for GPTs, using the function announced today by OpenAI to develop its own ChatGPT!”

¹⁷ pipon “Improving the efficiency of nursing care work using generative AI and ChatGPT: How to use it to transform the industry,” February 4, 2024, <<https://bigdata-tools.com/aisolutions-for-caregiving-challenges/>> (accessed on March 25, 2024)

¹⁸ CDI “Releasing new version of “AI Care Plan SOIN” to enhance “Compatible with generative AI” and “Compatible with appropriate care management methods”” June 29, 2023, <<https://www.cd-inc.co.jp/wp-content/uploads/2023/06/20230629.pdf>> (accessed on March 6, 2024)

¹⁹ CDI, “AI Care Plan SOIN releases new function “SOIN AI Chat.” Through the fusion of SOIN and ChatGPT, personalized care for each elderly person is provided.” December 20, 2023, <<https://www.cd-inc.co.jp/wp-content/uploads/2023/12/20231220.pdf>> (accessed on March 6, 2024)

²⁰ Boston Consulting Group, “How Generative AI Will Change Public Administration – Case Studies and Future Challenges,” July 13, 2023, <<https://www.bcg.com/ja-jp/publications/2023/how-generative-ai-can-be-used-in-public-sector>> (accessed on March 25, 2024)

²¹ Automation co.,ltd, “First in the nation! Automation co., ltd. released the Chat GPT Plugin to search the national diet minutes!” PR Times, June 16, 2023, <<https://prtimes.jp/main/html/rd/p/000000042.000067480.html>> (accessed on March 6, 2024)

D Utilization in back-office operations (ExaWizards)

In the field of back-office operations, it is expected that AI will be utilized for referencing past data for management and personnel purposes, as well as for coordinating with legal-related information for contract modifications.

In May 2023, ExaWizards announced the “exaBase IR Assistant powered by ChatGPT,” which supports the

creation of anticipated Q&A for shareholder meetings and financial results briefings²². In December 2023, they entered the field of recruitment business efficiency services using AI technology, and as their initial effort, they released the beta version of the “exaBase Recruitment Assistant,” a service that leverages AI technology for streamlining recruitment operations²³.

2. Expectations for solving social issues through advanced technology utilization

The evolving technologies such as the metaverse, robotics, and autonomous driving hold the potential to contribute to the realization of an inclusive society and

address labor shortages. In the medium to long term, the combination of these technologies with generative AI is expected to further solve social issues.

(1) Metaverse

Even for those who find it difficult to go outside, such as recluses and children who refuse to attend school, the metaverse allows everyone to communicate. Communication in the metaverse, transcending distance and location, can serve as a catalyst for social participation, potentially realizing an inclusive society.

Moreover, the advancement of generative AI has

made it easier to construct metaverse spaces and enabled natural conversations with characters. Generative AI is also being developed to automatically generate the necessary elements for creating non-player characters in the metaverse space, even without specialized knowledge, contributing to the vibrancy of the metaverse²⁴.

A Learning support (Katariba, NTT SmartConnect, and NTT Data NJK)

Since 2021, Katariba has been using the metaverse for an online support program for children who refuse to attend school. In collaboration with public and private sectors, they have introduced the program named “room-K” to municipalities. In FY2022, they conducted classes in the metaverse space in collaboration with eight municipalities, including Toda City in Saitama Prefecture, Bunkyo Ward in Tokyo, and Daito City in Osaka Prefecture^{25,26}.

NTT SmartConnect and NTT Data NJK have started providing a 3D metaverse service for educational institutions called “3D Education Metaverse.” (Figure 1-5-2-5) This service offers spaces similar to actual educational settings, such as classrooms and assembly halls, within the metaverse. It also provides diverse communication spaces for avatars, equipped with text chat functions with NG word filters to prevent trouble²⁷.

²² Nikkei Crosstech, “ExaWizards to support the creation of anticipated questions and answers for the general meeting of shareholders using ChatGPT and a scheme to increase accuracy,” May 24, 2023, <<https://xtech.nikkei.com/atcl/nxt/column/18/02423/052200024/>> (accessed on March 6, 2024)

²³ ExaWizards, “ExaWizards enters recruitment efficiency service using generative AI, accepting pre-orders for the beta version of “exaBase Recruitment Assistant” which will gradually provide an automatic recruitment form creation, scout email automatic generation, document selection support functions, etc.” December 18, 2023, <<https://exawizards.com/archives/26301/>> (accessed on March 6, 2024)

²⁴ NTT DOCOMO “World’s first! Developing a generation AI that automatically generates non-player characters in the metaverse” January 16, 2024, <https://www.docomo.ne.jp/binary/pdf/info/news_release/topics_240116_01.pdf> (accessed on March 6, 2024)

²⁵ KATARIBA Magazine Editorial Department ““What is truancy support using metaverse space through public-private collaboration?” Front-line seminar report inviting partner local governments” on January 27, 2023, certified NPO Katariba, <<https://www.katariba.or.jp/magazine/article/report230127/>> (accessed on March 6, 2024)

²⁶ Sankei Shimbun, “Online support spreading to local governments to locate children who are not attending school in the metaverse,” July 12, 2023, <<https://www.sankei.com/article/20230712-3ZOIWEMAR5OYPEAHULO3WRA2BQ/>> (accessed on March 6, 2024)

²⁷ NTT SmartConnect “Starts offering “3D Educational Metaverse” that contributes to the diversity of children’s learning” August 28, 2023, <<https://www.nttsmc.com/news/2023/20230828.html>> (accessed on March 6, 2024)

Figure 1-5-2-5 3D Education Metaverse, lessons in classroom



(Source) NTT SmartConnect “Starts offering “3D Educational Metaverse” that contributes to the diversity of children’s learning”

B Employment support (Fukuoka Prefecture)

Fukuoka Prefecture has established the “Fukuoka Virtual Support ROOM,” where people who are shut-ins or have concerns about working can operate avatars in a virtual space on the Internet to interact and consult with third parties (Figure 1-5-2-6). It is available for residents of the prefecture aged 16 and over who are not

employed, providing a discussion space for people with concerns, skill improvement programs, and job training²⁸. As a demonstration project in FY2022, dedicated support spaces were constructed in the metaverse, and utilization was conducted at two locations within the prefecture. Full-scale operation began in FY2023²⁹.

Figure 1-5-2-6 Fukuoka Virtual Support ROOM. job training



(Source) Labor Policy Division, Labor Bureau, Welfare and Labor Department, Fukuoka Prefecture “Fukuoka Virtual Support ROOM”

C “Metaverse Ward Office” (Edogawa Ward, Tokyo)

Edogawa Ward, Tokyo, has been working towards the establishment of a “Metaverse Ward Office” where all procedures and consultations can be conducted in the metaverse, aiming to achieve a “ward office that does not require a visit” by advancing electronic applications and online services. As part of this effort, they have been conducting demonstration experiments with the cooperation of disability groups within the ward since

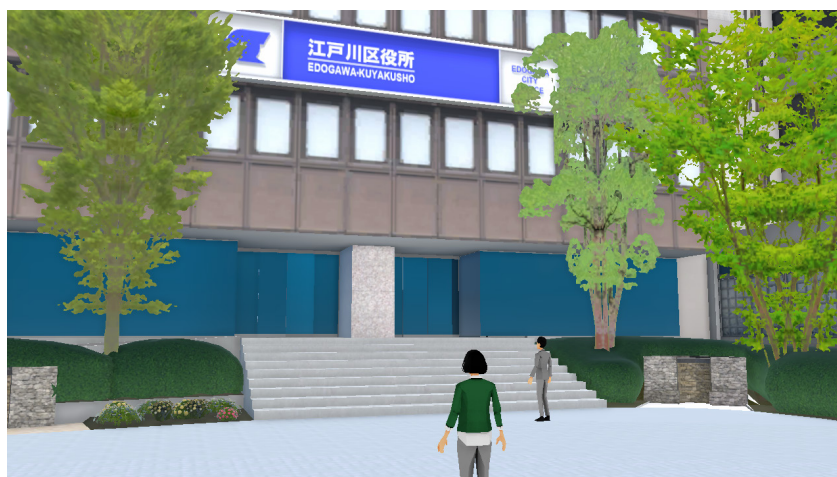
September 2023. In April 2024, they established a project team in collaboration with the Tokyo Information Design Professional University to accelerate efforts to solve technical challenges, and from June 2024, they plan to start providing consultation and procedural support services for general ward residents utilizing the metaverse³⁰ (Figure 1-5-2-7).

²⁸ Fukuoka Fukabori Media Sasatto - “A virtual space for employment support in Fukuoka Prefecture, a step towards the outside world” February 2, 2024, <<https://sasatto.jp/article/entry-5235.html>> (accessed on March 6, 2024)

²⁹ AIS Online “February 2024 Topics: Long-term unemployed employment support using the metaverse” February 1, 2024 <https://www.iais.or.jp/ais_online/20240201/202402_02/> (accessed on March 6, 2024)

³⁰ Edogawa Ward, Tokyo “Inauguration ceremony of metaverse ward office project on April 26, 2024” April 26, 2024, <<https://www.city.edogawa.tokyo.jp/e004/kuseijoho/kohokocho/press/2024/04/0426-2.html>>

Figure 1-5-2-7 Metaverse ward office



(Source) Edogawa Ward

(2) Robotics

The utilization of robotics is anticipated to address labor shortages across various sectors.

For instance, in critical fields such as healthcare and construction, remote-controlled robots can enable skilled professionals to deliver their expertise to distant locations without being physically present. In the future, a single expert might be able to commit to multiple sites

simultaneously. Additionally, robots performing household chores can reduce the burden of domestic tasks. In educational and caregiving settings, robots can play a role in enhancing communication, improving students' communication skills, and supporting interactions between residents and caregivers.

A Telemedicine (Kobe University, NTT DCOMO, NTT Communications, Mediaroid)

In February 2023, Kobe University, NTT DCOMO, NTT Communications, and Mediaroid successfully conducted a demonstration experiment using commercial standalone 5G to support robotic surgery performed by young doctors from a remote location, approximately 500 km apart, between Tokyo and Kobe. By securely and in real-time transmitting high-definition surgical im-

ages, audio, and large volumes of robot control data, experienced doctors in Kobe were able to monitor the surgery performed by young doctors in Tokyo, provide guidance, and even remotely control the robot, thus realizing remote surgical support and instruction³¹ (Figure 1-5-2-8).

Figure 1-5-2-8 Image of demonstration experiment

(Source) Kobe University³²

³¹ National University Corporation Kobe University, NTT DCOMO, NTT Communications, Mediaroid, Kobe City “Successful demonstration of supporting remote robotic surgery using commercial 5G SA over a distance of approximately 500km between Tokyo and Kobe” February 1, 2023, <https://www.docomo.ne.jp/binary/pdf/info/news_release/topics_230201_01.pdf> (accessed on March 6, 2024)

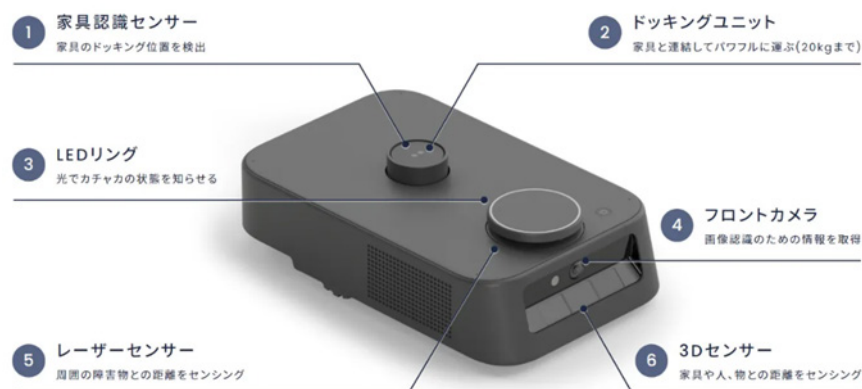
³² National University Corporation Kobe University, “Successful demonstration of supporting remote robotic surgery using commercial 5G SA over a distance of approximately 500km between Tokyo and Kobe” February 1, 2023 <https://www.kobe-u.ac.jp/ja/news/article/2023_02_01_01/index.html> (accessed on March 28, 2024)

B Household robots (Preferred Robotics)

In February 2023, Preferred Robotics announced “Kachaka,” a household robot that autonomously transports a dedicated caster-equipped shelf. The autonomous mobile robot “Kachaka” can dock under the caster-equipped shelf (wagon), move it to the desired location, and return it to its original position. It supports voice recognition, allowing users to give commands verbally³³ (Figure 1-5-2-9). Besides household use,

“Kachaka” is increasingly being utilized in businesses such as dental clinics, factories, and restaurants. For example, in dental clinics facing severe labor shortages, “Kachaka” can transport used equipment to the sterilization room, allowing dentists to focus more on high-value tasks and patient communication. In factories, the “Kachaka Pro,” which is tailored for industrial use with enhanced durability and sensors, is used for transporting parts.

Figure 1-5-2-9 Kachaka



(Source) Preferred Robotics, “Kachaka, a smart furniture platform that moves furniture according to human instructions, will be released on Wednesday, May 17, 2023”³⁴

C Communication enhancement (MIXI, etc.)

MIXI has introduced the autonomous conversational AI robot “Romi,” aiming to be a comforting and understanding presence, and conducted a test introduction in

classrooms of elementary and junior high schools at Shibuya Honmachi Gakuen in November 2021³⁵ (Figure 1-5-2-10).

Figure 1-5-2-10 Autonomous conversational AI robot “Romi,” a test introduction in classrooms of elementary and junior high schools



(Source) note “What happened after introducing Romi to elementary and junior high schools? What was the reaction of children and students?”³⁶

The test results revealed that 89% of children engaged in conversations with Romi, indicating its potential to

³³ Impress Watch “Carrying and cleaning shelves. Introducing the new household robot “Kachaka”” February 1, 2023, <<https://www.watch-impress.co.jp/docs/news/1475076.html>> (accessed on March 6, 2024)

³⁴ Preferred Robotics, “Kachaka, a smart furniture platform that moves furniture according to human instructions, will be released on Wednesday, May 17, 2023” May 12, 2023, <<https://www.probotics.jp/news/fYD7X2FW>> (accessed on March 28, 2024)

³⁵ Nikkei Electronic Edition “MIXI test-introduces autonomous conversation robot “Romi” to elementary and junior high schools” November 8, 2021, <https://www.nikkei.com/article/DGXLRS621153_Y1A101C2000000/> (accessed on March 28, 2024)

³⁶ Conversation AI robot Romi, “What happened after introducing Romi to elementary and junior high schools? What was the reaction of children and students?” March 9, 2022, <https://note.com/romi_ai/n/n0bd54c3186f4> (accessed on March 28, 2024)

contribute to the development of children's conversational and communication skills. Feedback from students through surveys included statements such as "increased communication during break times."³⁷

Furthermore, the introduction of communication robots in caregiving settings is progressing. GROOVE X, which provides the home communication robot "LOVOT," conducted a demonstration experiment in a care facility, revealing that residents living with the communication robot could expect a suppression effect on the decline of their cognitive functions³⁸. Additionally, through generated AI, it is possible to issue natural language instruc-

tions to the robot, enabling flexible responses.

Pepper, a humanoid robot for caregiving known as "Pepper for Care," supports communication with residents and promotes communication among residents in caregiving settings³⁹ (Figure 1-5-2-11). SoftBank Robotics released a conversation app targeting the caregiving model of the humanoid robot "Pepper" in February 2024 which is equipped with ChatGPT to provide a natural conversation experience. "Pepper for Care" offers a wide range of recreational activities such as games, singing, and exercises, as well as language and upper limb training tailored to individuals through facial recognition.

Figure 1-5-2-11 Pepper for Care



(Source) Softbank Robotics⁴⁰

(3) Autonomous Driving

Autonomous driving is expected to provide transportation solutions for those with limited access to necessary mobility options, such as transportation-disadvantaged individuals and areas facing taxi and truck driver shortages. With autonomous driving, transportation can be ensured with fewer or no drivers, making access to various locations easier. Generative AI is utilized in the development, testing, and verification stages of autonomous vehicles, facilitating improvements in autonomous

driving technology towards achieving Level 5 autonomy⁴¹. In the U.S. and China, commercial use of autonomous taxis has already begun. While unmanned technology continues to advance, challenges such as safety concerns, including vehicles becoming immobile on the road, causing traffic congestion, and accidents, as well as concerns about job displacement, need to be addressed for widespread adoption.

A Ensuring mobility for transportation-disadvantaged individuals (Sakai Town in Ibaraki Prefecture, BOLDLY, Macnica, etc.)

In Sakai Town in Ibaraki Prefecture, three autonomous buses have been introduced to operate on fixed routes and schedules as a means of public transportation⁴². In Sakai Town, where cars are the primary mode of transportation for residents and the nearest train station is about 40 minutes away by car, the public transportation infrastructure is weak. This poses a challenge for

elderly residents who wish to surrender their driver's licenses but cannot due to their daily needs. To establish a transportation network not reliant on human drivers, autonomous buses were introduced. Currently, the buses operate at Level 2, with a driver on board for monitoring, aiming for Level 4 operation in the future⁴³ (Figure 1-5-2-12).

³⁷ Conversation AI robot Romi, "What happened after introducing Romi to elementary and junior high schools? An interview on teachers," March 9, 2022, <https://note.com/romi_ai/n/n28b1011eb1ad#eb1b4e24-43fd-473b-b716-1b03fba76eef> (accessed on March 28, 2024)

³⁸ GROOVE X, "LOVOT accelerates efforts in the nursing care field after receiving promising results in suppressing cognitive decline" April 27, 2022 <<https://prtimes.jp/main/html/rd/p/000000151.000055543.html>> (accessed on March 29, 2024)

³⁹ SoftBank Robotics, "pepper" <<https://www.softbankrobotics.com/jp/product/pepper/caregiver/>> (accessed on March 28, 2024)

⁴⁰ Nikkei Electronic Edition "SoftBank Robotics releases conversation app for nursing care model of humanoid robot "Pepper"" February 13, 2024, <https://www.nikkei.com/article/DGXZRSP668323_T10C24A2000000/> (accessed on March 28, 2024)

⁴¹ NVIDIA "Generative AI opens a new era for the automotive industry, from design and engineering to production and sales," August 15, 2023, <<https://blogs.nvidia.co.jp/2023/08/15/generative-ai-auto-industry/>> (accessed on March 6, 2024)

⁴² Sakai Town "Self-driving buses are operating regularly in Sakai Town [first in local government!]", <<https://www.town.ibaraki-sakai.lg.jp/page/page002440.html>> (accessed on March 6, 2024)

⁴³ Softbank "Self-driving bus operations have begun [Sakai Town in Ibaraki Prefecture]" May 29, 2023, <<https://www.softbank.jp/biz/blog/business/articles/202305/self-driving-bus-BOLDLY/>> (accessed on March 6, 2024)

Figure 1-5-2-12 Autonomous driving bus introduced in Sakai Town in Ibaraki Prefecture



(Source) Softbank “First in Japan, Sakai Town in Ibaraki Prefecture introduces self-driving EV “MiCa”⁴⁴

Additionally, Eihei Town in Fukui Prefecture established a third-sector company and began Level 4 autonomous driving services under specific conditions in May 2023⁴⁵. The service operates on a limited 2-kilometer

section at a maximum speed of 12 km/h, with the operator monitoring the operation for emergencies. Acceleration, deceleration, and steering are entirely managed by a dedicated system installed in the vehicle⁴⁶.

B Addressing driver shortages (JR West Japan, Higashihiroshima City in Hiroshima Prefecture, Hiroshima University, etc.)

Starting in November 2023, JR West Japan began a demonstration experiment of a bus rapid transit (BRT) system with autonomous platooning on public roads. The experiment involves dedicated lanes for buses connecting JR Saijo Station and Hiroshima University's Higashihiroshima Campus. The system is expected to make buses more reliable and user-friendly while ad-

ressing driver shortages. During platooning, a driver will be on board the lead vehicle to handle tasks such as ensuring the safety of boarding and alighting, opening and closing doors, making announcements, and emergency stops in case of unforeseen circumstances. Under normal conditions, the driver will not operate the vehicle but will take manual control in case of abnormalities⁴⁷.

⁴⁴ Softbank, “First in Japan, Sakai Town in Ibaraki Prefecture introduces self-driving EV “MiCa”” December 6, 2023, <https://www.softbank.jp/drive/press/2023/20231206_02/> (accessed on March 28, 2024)

⁴⁵ Eihei Town “Autonomous Driving “ZEN drive””, <<https://www.town.eiheiji.lg.jp/200/206/208/p010484.html>> (accessed on March 6, 2024)

⁴⁶ NHK “Autonomous Driving “Level 4” begins operation in Fukui for the first time in the country. Savior of depopulation?” May 22, 2023, <<https://www3.nhk.or.jp/news/html/20230522/k10014074841000.html>> (accessed on March 6, 2024)

⁴⁷ Toyo Keizai Online, “Issues Observed in JR “Autonomous Driving/Platooning BRT” Running in Public Road Driving,” January 22, 2024, <<https://toyokeizai.net/articles/-/728920>> (accessed on March 6, 2024)