New "Biz Tech" by MGSSI
Global Trend to Watch in 2026

Mitsui & Co. Global Strategic Studies Institute
Technology & Innovation Studies Div.

Introduction

Technologies and innovations are progressing constantly, day by day and moment by moment, and their trends demand continuous attention.

As researchers, we monitor these changes from a global perspective, analyze market developments, and conduct in-depth research to determine where the Mitsui & Co. Group should make its next strategic moves.

In 2026, **New "Biz Tech" by MGSSI**, published by the Technology & Innovation Studies Div., was fully revamped.

First of all, in light of the accelerating pace of technological advancement, we have focused on technologies expected to reach the implementation stage as early as within six months, or at most within the next few years. We have carefully selected five that could serve as near-term milestones and present them as the **Top 5 Technologies to Watch in 2026**.

In addition, as a new feature this year, we have launched **Global Trend to Watch in 2026**. In light of the growing number of technologies that cut across a wide section of society and multiple industries and that cannot be fully covered by a single researcher or discipline, researchers now bring together their respective areas of expertise to jointly analyze and write on a single theme. By examining the fundamental nature and broader implications of technologies from a diverse range of perspectives, we aim to deliver new insights to our readers.

We collectively refer to these initiatives as the renewed **New "Biz Tech" by MGSSI**, for launch in 2026.

Following the "Top 5 Technologies to Watch in 2026" report released in January, this article presents "**Global Trends to Watch in 2026**."

We will continue doing out utmost to create value for society as a whole through the integration of knowledge.

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MITSUI & CO. GLOBAL STRATEGIC STUDIES INSTITUTE

Circular Economy: The Relentless Pursuit of an Ideal

— Lessons from the Automotive Industry for a Sustainable Future —

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Summary

- This report reviews the current state of the circular economy (CE) in the automotive industry, together with related technological and institutional initiatives, and outlines the challenges and prospects for achieving a sustainable society.
- Realizing CE in the automotive sector requires technical measures such as designing materials that are easy to recycle and improving vehicle design to facilitate dismantling. In Europe, regulations to reduce the environmental impact of end-of-life vehicles are under discussion, and legal measures are becoming a global trend.
- Proper dismantling and recycling of end-of-life vehicles require enforceable mechanisms and legal frameworks. While legal frameworks are advancing in developed countries, many developing countries lack them, resulting in an influx of used vehicles and the worsening of environmental problems. Small-scale, private-sector-led models, collaboration among manufacturers and trading companies, and technology transfer will be key. Expanding CE based on local production and consumption will contribute to realizing CE globally.

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1. Introduction

Since the Ellen MacArthur Foundation proposed the concept of the circular economy (CE) in 2010, the concept has significantly influenced policy, industry, and consumer behavior, including regulations on single-use plastics and mandatory use of recycled materials.

However, from a global perspective, a CE that approaches a more advanced closed-loop system while maintaining economic viability cannot yet be fully established, and functioning examples remain limited in scope. This is likely because CE efforts have largely been left to the discretion of individual national and local governments, and globally coordinated frameworks have yet to mature.

Among consumer goods, automobiles are one of the products with the greatest size and weight. Approximately 100 million vehicles are produced worldwide each year, and around 25 million are discarded. Automobiles likely represent the heaviest movable asset owned by many individuals. A typical passenger vehicle weighs about 1.5 tons and consists of up to 30,000 parts. It incorporates a wide range of materials, including metals, plastics, rubber, glass, ceramics, and lithium-ion batteries. In its long history, the automobile alone has required immense expertise and effort to make component reuse possible. It is no exaggeration to say that since the emergence of the CE concept, automobiles have served as a leading example in discussions of a more advanced CE.

Understanding and systematically organizing the state of CE in the automobile sector, together with the latest efforts undertaken by various industry players, provides important insights for realizing CE across global society as a whole and offers valuable guidance as we develop comprehensive, multi-faceted strategies moving forward.

In the past, automobiles were largely manufactured without consideration for what would happen to them at end of life. Today, efforts are underway to drive technological innovation aimed at recovery, reuse, and recycling. Across the automotive value chain, including vehicle bodies, parts, materials, and end-of-life recycling, businesses are working collectively to advance CE. Specifically, efforts are evolving across the entire vehicle lifecycle, from design and manufacturing to disposal, including the development of recycling-friendly materials, structural designs that facilitate dismantling, standardized components that can be easily replaced, the adoption of recycled materials, and the effective utilization of last remaining residual waste. The automotive industry operates global supply chains that span multiple countries. For that reason, advancing CE in this sector represents a particularly effective test case for moving closer to a globally integrated circular economy.

Automobiles are costly products and often carry a strong personal attachment, meaning that consumer awareness and behavior play a significant role in realizing CE. Listening to the requests of the municipalities and countries to which they belong, complying with applicable regulations, and advancing changes in consumer awareness all contribute substantially to achieving a more advanced CE in which waste is minimized and resources continue to circulate.

Against this backdrop, this report focuses on CE in the automotive sector. It examines the current state of technology and innovation from design through disposal, as well as the legal frameworks and required shifts in consumer awareness, with the aim of providing insights applicable to other industries.

2. Recycling-friendly Materials

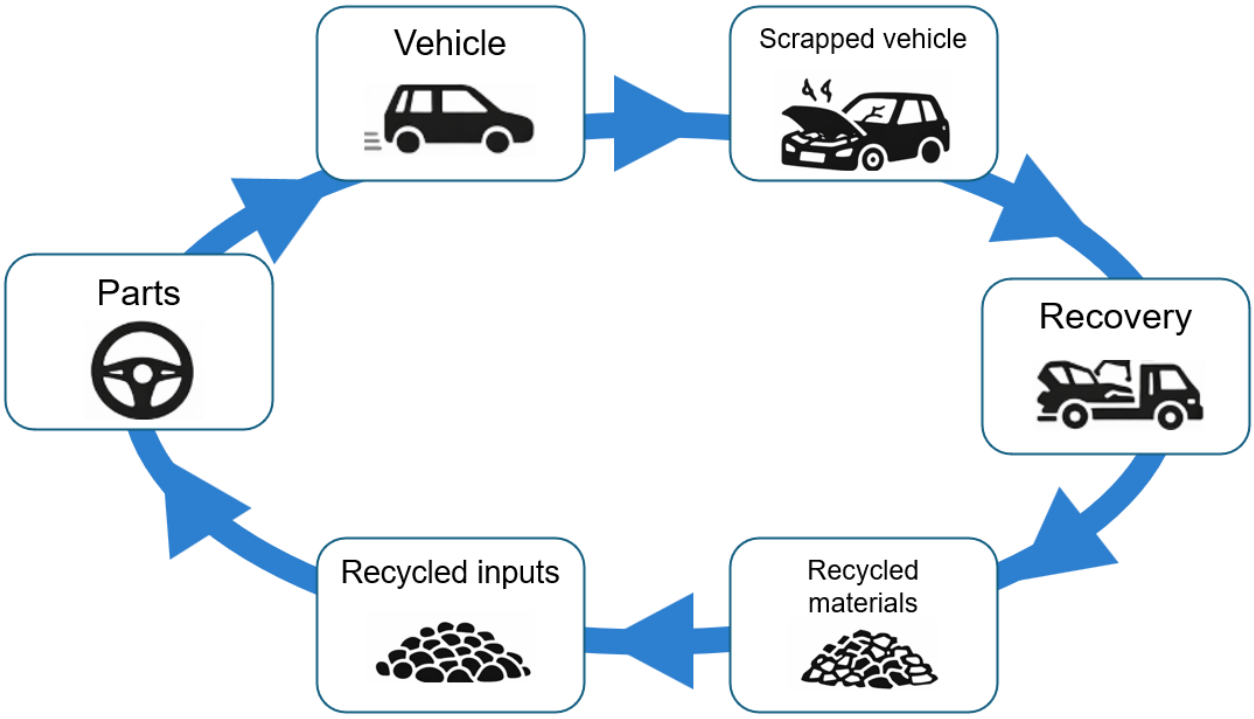
2-1. What Is Car-to-car?

Car-to-car is a circular recycling concept in which materials and components recovered from end-of-life vehicles (ELVs) are reused in the manufacture of new vehicles or new vehicle parts. Material design at the product design

stage is critical to making this cycle work. The success or failure of recycling is determined less by post-collection processing technology than by how the product was originally designed in terms of its materials and structure.

In the EU, consideration is being given to legislative revisions that would transition the ELV Directive into a regulation. [1] Specifically, the use of recycled plastics in new vehicles is expected to become mandatory, with a certain proportion required to be derived from ELVs. This signals an intention to establish car-to-car not as an aspirational concept, but as an institutional reality. As a result, products that are not designed with material circulation in mind, including material selection and component structure, may face increasing difficulty entering the market in the future. Under these circumstances, efforts are shifting beyond improvements in recovery technologies toward a transformation in design philosophy itself.

Figure 1: Car-to-car conceptual diagram



Source: Compiled by MGSSI based on various sources

2-2. Material Design for Circularity

The core of material design premised on circularity lies in the use of single materials, or monomaterialization. While layering multiple resins or combining dissimilar materials may be rational from a performance standpoint, such approaches complicate post-collection separation and hinder high-quality recycling. As a result, design thinking has recently shifted away from assigning functions to different materials and toward optimizing formulation and grade design within a single polymer to achieve the required performance. In particular, for components with high recovery volumes, such as interior and exterior parts, monomaterial design based on olefin materials, especially polypropylene (PP), has emerged as the most practical option for implementing car-to-car recycling (Figure 2).

[1] https://environment.ec.europa.eu/topics/waste-and-recycling/end-life-vehicles_en(Last accessed: January 22, 2026)

Figure 2: Case study on monomaterialization from composite materials to olefin-based materials

Source: https://tech.toyota-boshoku.com/aee2025/jp/(Last accessed: January 22, 2026)

Moves toward eliminating adhesives and standardizing fasteners are also important elements of circular design. Standardizing fasteners refers to unifying the types and positions of screws and other components used to secure parts to the extent possible. Although completely eliminating adhesives is unrealistic, circularity can be greatly improved by adopting joining methods that allow for easier disassembly, standardizing primary materials, and clearly defining disassembly procedures. The proposed EU ELV Regulation explicitly addresses the treatment of components to be removed prior to shredding, requiring a manufacturing approach that incorporates the expectation of disassembly from the design stage.

2-3. Structures That Hinder Circularity and Their Breakthroughs

Typical structures that hinder circularity include polymer composites and multi-material joining. Fiber reinforcement, a prime example of a polymer composite structure, and the integration of resins with metals or rubber through multi-material joining can enhance functionality. However, unless such materials can be separated, car-to-car recycling cannot be realized. Breakthroughs in addressing this challenge are emerging in two areas: the development of separable bonding materials and design approaches that improve sorting accuracy.

Thermally reversible crosslinked materials, exemplified by vitrimers[2], which have attracted increasing attention in recent years, enable reprocessing and rebonding while maintaining durability comparable to that of thermosetting resins. Academic research and development are progressing on reprocessable epoxy-based adhesives as "recyclable adhesives," and they are moving closer to mass-production applications as an approach that retains the advantages of bonding while ensuring dismantlability. Challenges remain, however, including cost and long-term durability.

The standardization of material labeling and dismantling information is currently being explored as a more practical solution. While the application of advanced technologies such as digital material tags[3] is also being discussed, ISO-based material labeling and dismantling information currently represent the most readily implementable approach. The proposed ELV Regulation also positions reliable material identification as a prerequisite for recycling. The consistent use of material tags, QR codes, and barcodes to ensure that material information can be easily accessed on site is regarded as the most direct path toward realizing car-to-car recycling.

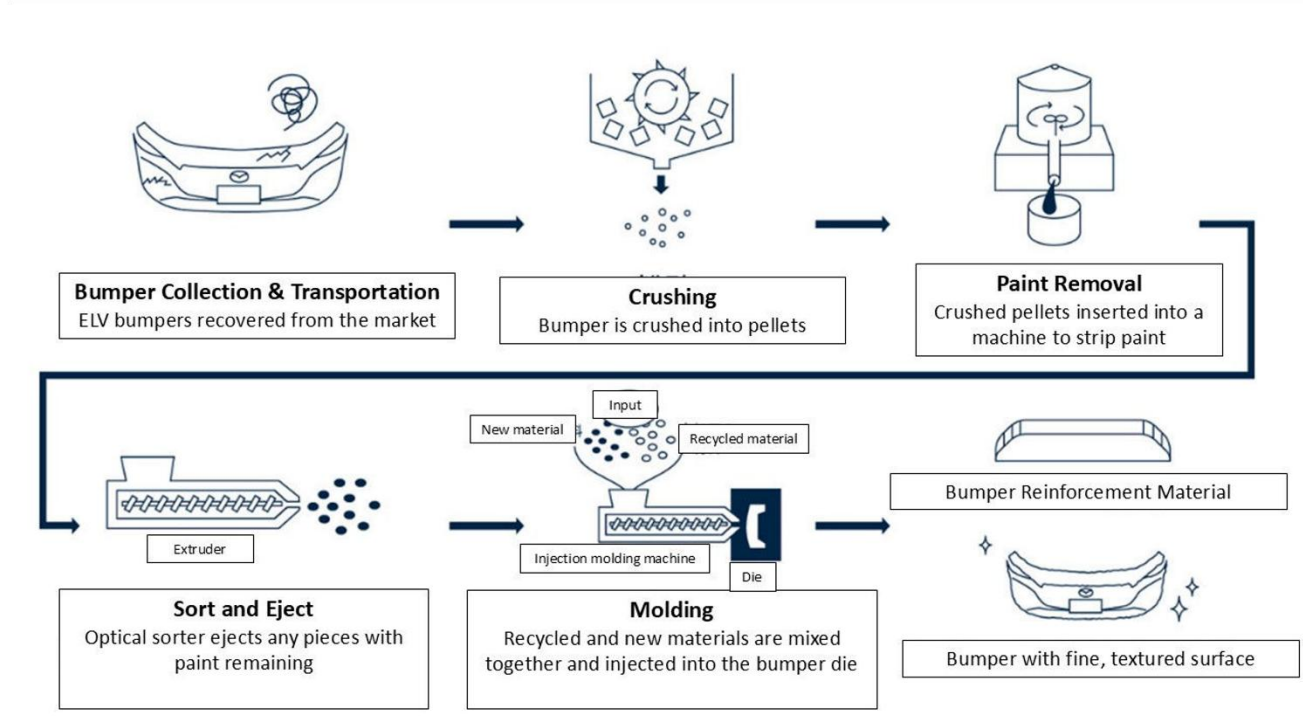
2-4. Case Study: New Materials and Designs Aimed at Car-to-car Recycling

The car-to-car initiative closest to practical implementation involves returning ELV-derived bumpers to use as automotive parts. Bumpers are leading the way because they are composed primarily of polyolefins (PP and PE), making them easier to recycle compared to many other components. The recycler MBA Polymers (UK) and automotive parts supplier OPmobility (France) launched a bumper-to-bumper recycling project in 2024 to turn bumpers recovered from end-of-life vehicles into new bumpers.[4] MAZDA (Japan) is also undertaking a similar initiative.[5] To realize this model, the companies are not only adopting single materials that are easy to recover, but are also designing material grades that incorporate the recycling process from the outset. This includes ensuring that quality remains stable even after recovered materials are remelted and reformulated, and revisiting product performance requirements accordingly. The integrated promotion of these measures makes this initiative a leading example of car-to-car recycling.

When designing bumpers manufactured from end-of-life bumpers, it is not sufficient simply to blend recycled material. Instead, it is essential to redesign component specifications on the assumption that coating residues, contamination, and variations in material properties will be present. Going forward, ease of recycling must be built into production processes from the outset. Material labeling, dismantling procedures, monomaterialization, and the applicability of recycled materials will need to be treated as core design requirements, on par with weight and cost. The proposed EU ELV Regulation seeks to institutionalize this design philosophy (Figure 3).

[2] Development of an Environmentally Conscious, High Heat-resistant Adhesive Sheet That Is Solvent-free and Suitable for Room-temperature Distribution | Nagoya Institute of Technology(Last accessed: January 22, 2026)
[3] Home - Catena-X(Last accessed: January 22, 2026)
[4] MBA Polymers launches scheme to 'directly recycle' car bumpers - letsrecycle.com(Last accessed: January 22, 2026)
[5] Mazda's Forward-looking Origins in Recycling. Overcoming Technical Barriers Through an "All-Hiroshima" Effort — The Challenge Toward the CN Series Vol. 5 —(Last accessed: January 22, 2026)

Figure 3: Bumper-to-bumper process



Source: https://www.mazda.com/en/mazda-mirai-base/articles/20251020-lca-bumper-recycle/ (Last accessed: January 22, 2026)

2-5. Future Materials Design

The key to realizing car-to-car lies not in relying on advanced post-collection recycling technologies, but in materials and structures that are designed from the outset with circulation in mind. Monomaterialization, bonding and joining methods designed for disassembly, standardization of material information, and grade design premised on the use of recycled materials are mutually complementary rather than standalone elements.

Particularly under the proposed EU ELV Regulation, car-to-car recycling is being elevated from a "best-effort target" to a formal "design requirement," and material circularity is becoming a source of competitive advantage for OEMs and Tier 1 suppliers. New initiatives are also emerging in Japan, led primarily by industry. BlueRebirth[6] was established in June 2025 with the aim of realizing CE in Japan's automotive industry and implementing car-to-car resource circulation by 2035. Approximately 30 companies are participating, ranging from automakers such as Toyota Motor Corporation (Japan), Mitsui Chemicals (Japan), and Toyota Tsusho (Japan), to material and recycled feedstock manufacturers, and have begun efforts to strengthen coordination between production and dismantling/recycling.

In future automotive material design, the key issue will increasingly be the concrete process of determining which components to simplify, with which materials, and how to recover them.

3. Automotive Design for Easy Dismantling

3-1. The Impact of the Circular Economy (CE) on Automotive Design

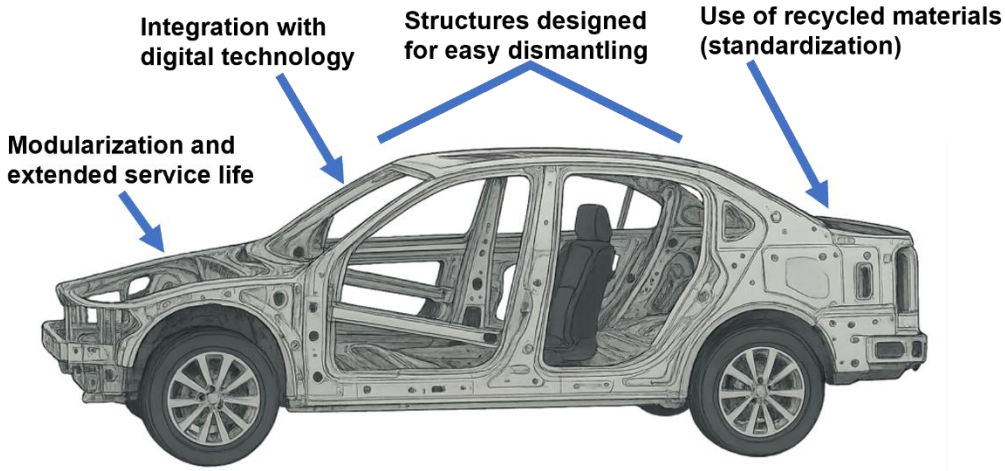
To realize the fundamental principles of CE—preventing waste generation and extending product lifespans—

[6] https://www.bluerebirth.jp/

automotive design is increasingly incorporating structural designs that facilitate dismantling and modularization to enable easier repair and component reuse, in addition to the use of recycled materials discussed in the previous section. Digital management systems that track which vehicle-specific materials and components originated from and under what usage conditions are also being incorporated, in order to ensure quality during reuse and recycling (Figure 4).

This reflects a shift away from conventional vehicle design, which prioritized individual design and performance within a lifecycle framework of production, use, and disposal, toward a CE-oriented approach that places the maximization of resource efficiency at the forefront.

Figure 4: Impact of the circular economy on automotive design



Source: Compiled by MGSSI based on various sources

3-2. Designing Easy to Dismantle Structures

Conventional vehicles have complex structures composed of many different materials. As a result, repairs and the recovery of high-quality recycled materials have typically required dismantling vehicles at the component level, involving significant time and cost. However, this method inevitably increases labor, time, and energy costs, leading to a deterioration in economic viability. Fundamental reform was therefore necessary. This led to the concept of designing vehicles with structures that are easier to dismantle.

As shown in Figure 5, the design for easy dismantling is guided by three principles: modularization, innovations in joining methods, and improved material identification.

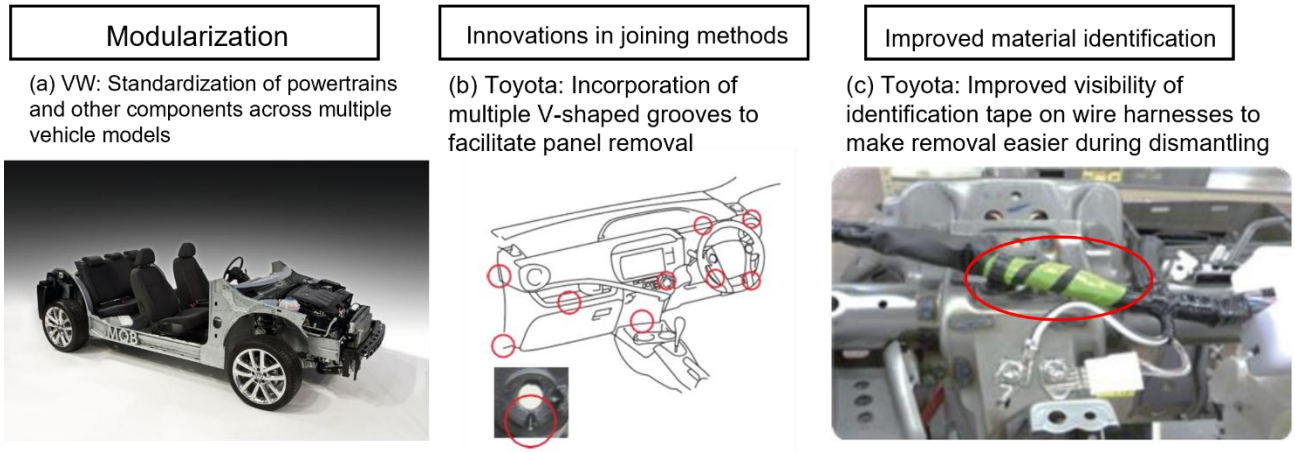
Figure 5: Design principles for ease of dismantling

Design guidelines	Details
Modularization	Components and systems are standardized and designed in modular units to enable easy separation. For example, electrical systems and interior components are unitized so they can be removed without specialized tools, thereby reducing dismantling time.
Innovations in joining methods	Since welding and strong adhesives make dismantling difficult, reusable mechanical fastening methods such as bolts and clips are adopted instead. Placement also takes tool accessibility into account.
Improved material identification	Material sorting is essential in the recycling process. Resin components are marked with material identification codes, and the use of mixed-material composites is avoided to improve recycling efficiency.

Source: Compiled by MGSSI based on various sources

Modularization is an important design principle that not only improves recyclability but also enables the use of common parts across different products through the standardization of modules, thereby enhancing development efficiency and reducing costs at the same time. For example, Volkswagen (Germany) has adopted a modular strategy known as the "VW MQB platform." By modularizing vehicle structure, the company uses common components across multiple models and enables modules to be removed as units during dismantling, thereby reducing disassembly time in the recycling process (Figure 6(a)).

Figure 6: Example of a design for easy dismantling



Source: (a) https://autoprove.net/imported-car/vw/209433/(Last accessed: January 22, 2026)
(b) (c) https://global.toyota/pages/global_toyota/mobility/technology/toyota-technical-review/TTR_Vol70-1_J.pdf

As an example of improvements in joining methods, Toyota Motor Corporation has adopted a structure for instrument panels that does not use welding or adhesive bonding. Instead, V-shaped grooves are incorporated to facilitate removal, allowing the panel to be easily dismantled by pulling firmly (Figure 6(b)). The company has also introduced detailed measures to improve material identification. For example, identification tape on wire harnesses is positioned to facilitate removal during recycling (Figure 6(c)). Design measures that improve visibility during disassembly and simplify material identification are important initiatives for increasing material reuse and recycling rates.

The mandatory use of recycled materials in new vehicles is under consideration under the proposed EU ELV Regulation, and Japanese automakers will also be expected to incorporate recycling considerations at the design stage. The time has come when taking dismantlability into account from the design stage is directly linked to corporate competitiveness.

3-3. Digital Management to Enhance Resource Circulation

Achieving a circular economy requires the use of digital technologies that enable the easy management of traceability information, including where components and materials originated. Among automotive components, lithium-ion batteries used in electric vehicles (EVs), whose sales have increased in recent years, contain critical minerals such as lithium, cobalt, and nickel. This makes it essential to ensure their efficient use, as well as thorough reuse and recycling.

To achieve a CE for EV batteries, the European Batteries Regulation entered into force in 2023. It will progressively mandate measures such as the declaration of carbon footprints (CFP), which indicate lifecycle CO_2 emissions, disclosure of recycled content, and digital registration of product information (Figure 7).

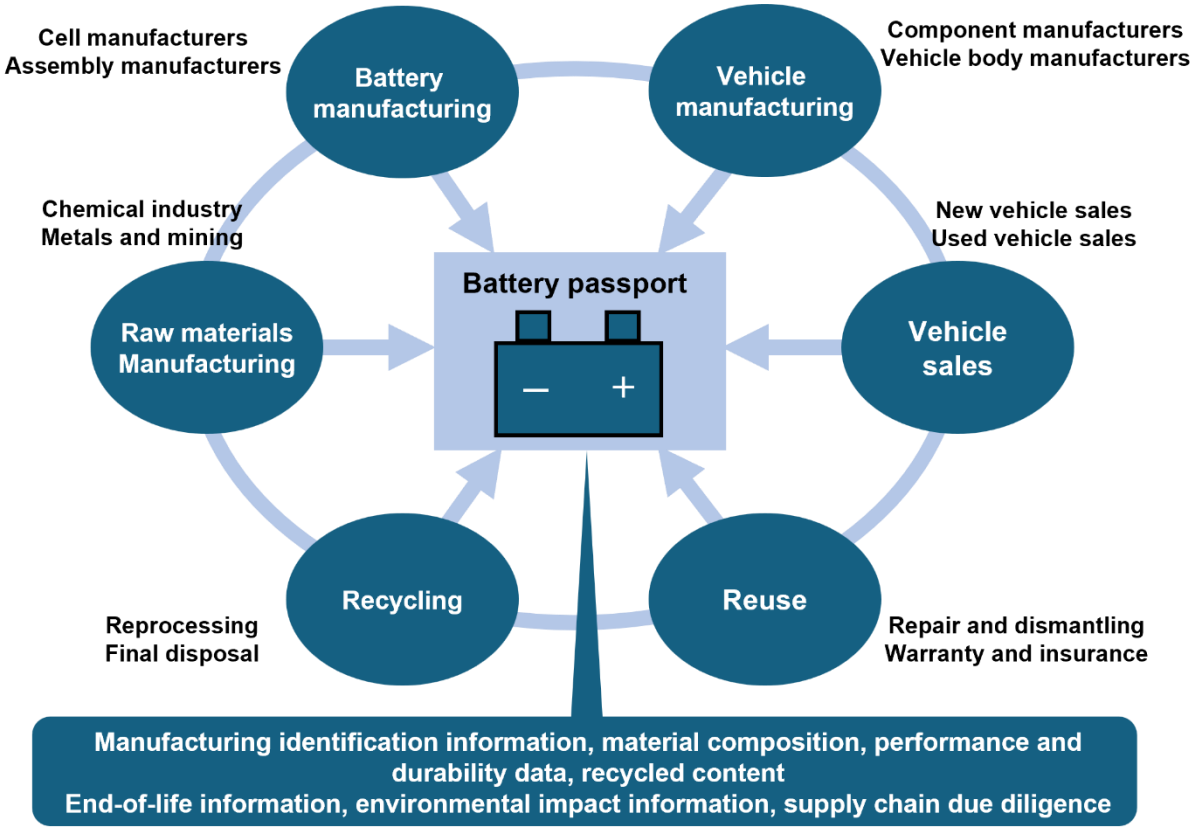
Figure 7: Digital registration of product information under the European Batteries Regulation

Registered information	Details
Manufacturing identification information	Serial number, manufacturer, model, date of manufacture, etc.
Material composition	Types and proportions of materials used (lithium, cobalt, nickel, lead, etc.) and information on sourcing
Performance and durability data	Number of charge-discharge cycles, degradation rate, safety test results
Recycled content	Proportion of recycled materials and their traceability
End-of-life information	Procedures for reuse and recycling, recovery rates of critical minerals
Environmental impact information	Lifecycle carbon footprint
Supply chain due diligence	Ethical sourcing of raw materials, and human rights and environmental due diligence (verified by third party)

Source: Compiled by MGSSI based on various sources

Data related to the manufacture, use, and disposal of EV batteries will be centrally managed through a battery passport. Prompted by the European Batteries Regulation, the introduction of similar platforms is being considered in China, the US, Japan, and other countries. As shown in Figure 8, the battery passport is established through the provision of large volumes of information from a broad network spanning the supply chain, from raw materials and battery manufacturing to EV production, sales, reuse, and recycling. Therefore, the use of digital technology is a key factor in everything from data acquisition to management and utilization.

Figure 8: Network comprising the battery passport



Source: Compiled by MGSSI based on various sources

In Japan, system development is being advanced through initiatives such as the Battery Association for Supply Chain, in which the Ministry of Economy, Trade and Industry (METI) and 249 companies involved in the battery industry participate. METI has developed a digital platform called the Ouranos Ecosystem to enable the secure sharing of CFP and supply chain information among companies. This platform aims to standardize data integration from battery manufacturing through recycling, in order to facilitate compliance with battery passport requirements, align with international regulations, and advance the realization of a resource-circulating society.

While EV batteries have been presented here as an example of digital management, the manufacture and use of recycled materials discussed in Section 2 also require the systematic organization of data, including material identification, usage history, and performance and durability information. Similar digital information management, comparable to a battery passport, is likely to play an important role for all materials and components that make up a vehicle.

4. Toward a More Advanced CE

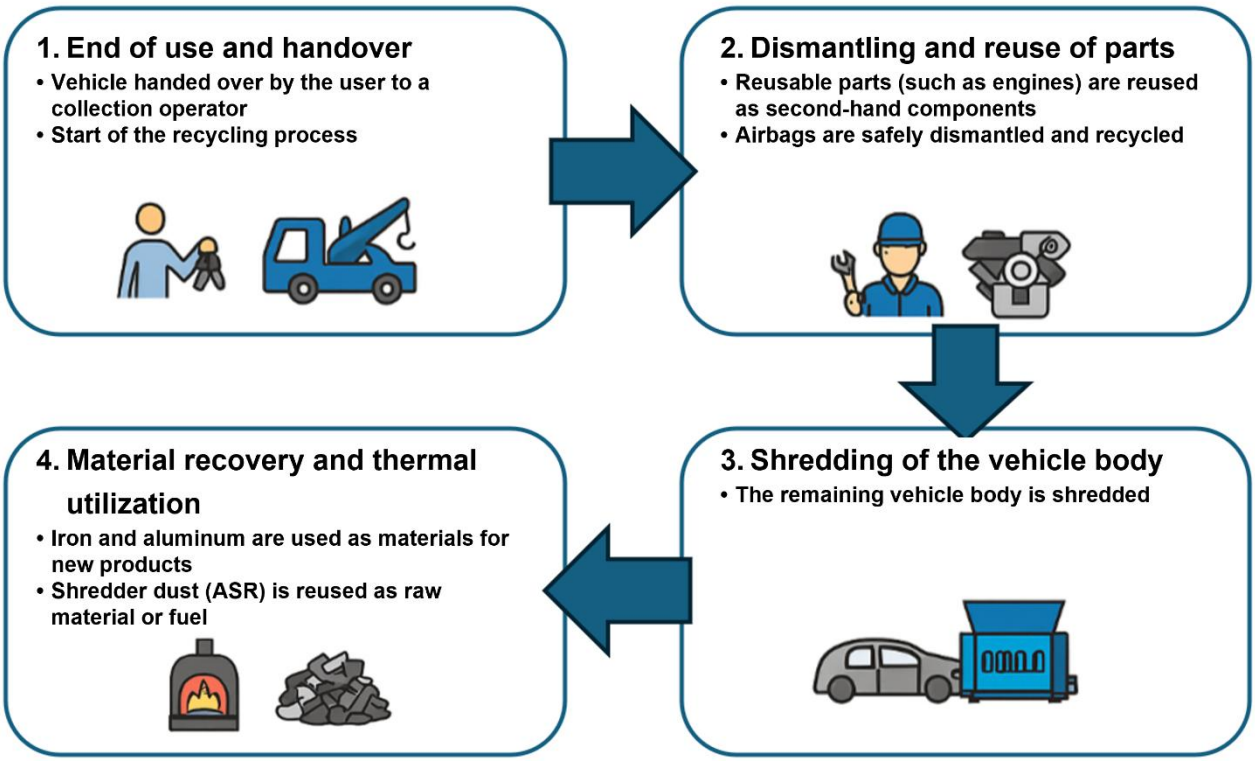
4-1. Recycling of End-of-Life Vehicles

As outlined above, the automotive industry has begun to reverse conventional thinking by adopting manufacturing approaches centered on materials that are easy to recycle and vehicle designs that facilitate dismantling, recycling, and reuse, while the past discussions of CE in the automotive sector were often about how to deal with end-of-life vehicles. In that sense, this shift represents significant progress. Nevertheless, all physical products inevitably deteriorate, become obsolete, leave the hands of their owners, and are eventually discarded. Even as society seeks to move beyond a material-intensive model toward sustainability, the automotive industry continues to produce approximately 100 million new vehicles annually on a global scale. As technology evolves, older models pass through the used vehicle market and ultimately reach the end of their lives as waste. The ongoing challenge, therefore, lies in the collection and dismantling of end-of-life vehicles, as well as the reuse of resources. Minimizing waste and improving efficiency in this process are essential for achieving a more complete CE.

4-2. Reduction of "Automobile Shredder Residue" (ASR)

After valuable materials that can be reused or recycled are removed from end-of-life vehicles by hand or heavy machinery, the remaining body typically undergoes a shredding process, where it is finely fragmented. From the resulting shredded material, metals such as iron and aluminum are recovered using advanced separation equipment based on magnetism, eddy currents, and similar technologies. These recovered metals are then sent to steel mills and aluminum smelters for recycling. However, even if valuable components are removed in advance, and most metallic fragments are extracted through advanced sorting after shredding, a certain amount of residual material inevitably remains. This consists primarily of non-metallic materials such as plastics, rubber, fibers, glass, and foamed materials. This material is referred to as shredder dust, or automobile shredder residue (ASR) (Figure 9).

Figure 9: Recycling process for end-of-life vehicles



Source: Compiled by MGSSI based on various sources

Achieving a more comprehensive CE through automotive recycling requires minimizing ASR as much as possible. Technological innovation continues to be carried out to address this challenge.

There are three principal approaches to reducing ASR. The first is to suppress its generation at the source. This involves measures taken at the vehicle design stage, as discussed earlier, such as increasing the use of single materials, reducing the number of parts, and adopting structures that are easy to dismantle so that shredding residue is minimized from the outset. The second approach is to improve sorting in the dismantling process. By carefully removing as many non-metal components as possible in advance, the volume of material that ultimately becomes ASR can be reduced. The third approach is to continue applying advanced sorting technologies even after shredding. By thoroughly recovering fine metallic residues, the overall quantity of ASR generated can be further reduced.

ASR contains a mixture of various materials and is therefore currently subject to one of three main processing options: (1) disposal in landfills, (2) thermal treatment (incineration or gasification), or (3) further advanced sorting for additional resource recovery, as described above. Option (1) raises environmental concerns and should be regarded as a last resort in countries with limited land availability. Option (2), often referred to as thermal recycling, can be viewed as a form of energy recovery and, in that sense, can be said to contribute to the circular economy. In some countries and regions, energy recovery is given greater emphasis than other approaches. Japan, for example, tends to rely more heavily on energy recovery compared with the EU. Option (3) involves further subdividing and sorting ASR, and efforts in this direction are accelerating worldwide in line with technological advances such as AI-based sorting, chemical separation, and electrostatic separation.

In addition to these processing options, a notable recent development in the industry merits attention. Changes in legal frameworks are being used to alter economic incentives in order to reduce the volume of contaminants mixed into ASR and ultimately decrease its overall quantity.

4-3. Resource Recovery Incentive System

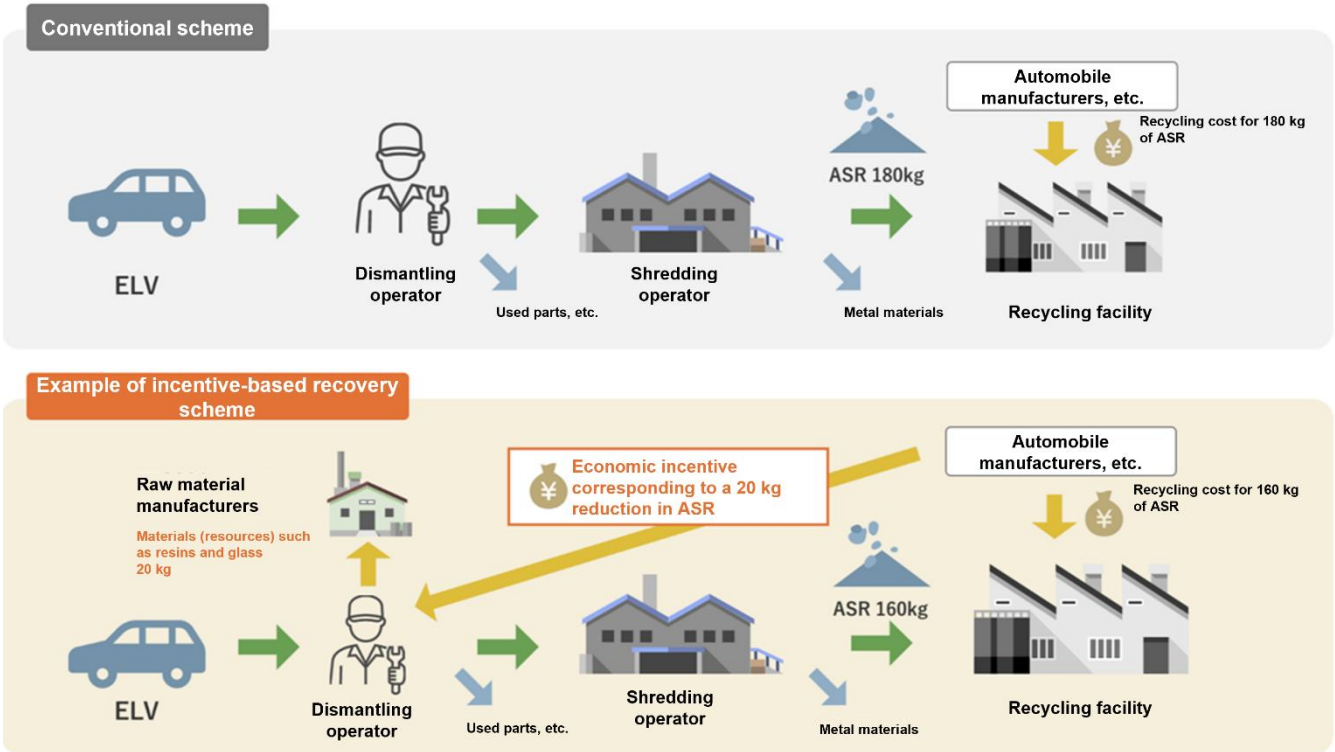
In Japan, a Resource Recovery Incentive System will be newly introduced in April 2026. Aimed at reducing ASR, the system provides economic incentives to dismantling operators who proactively recover materials such as glass and plastics prior to the shredding process.

Until now, dismantling operators were neither legally required nor financially incentivized to recover materials such as glass and plastics before they are mixed into ASR, whose removal entails significant labor, time, and cost. As a result, undertaking such efforts placed pressure on their economic viability. Moreover, under Japan's existing Act on Recycling, etc. of End-of-Life Vehicles, efforts to reduce ASR and promote recycling were entirely the responsibility of shredding operators. Consequently, it was common practice for dismantling operators to recover only valuable parts and metals, while allowing the remaining materials into shredders.

Under the new Resource Recovery Incentive System, a portion of the funds that the government previously paid to shredding operators for ASR recycling will be redirected as compensation to dismantling operators who recover glass and plastics in advance and supply them as recycled materials to raw material manufacturers (Figure 10). For dismantling operators, this arrangement helps offset the costs of removing glass and plastics prior to shredding, functioning as a tangible incentive if profitability can be secured as a result. By enabling the recovery of glass and plastics in high-quality form prior to shredding and returning them to the resource stream, the overall volume of ASR can ultimately be reduced.

This is one good example of how revising national and local government systems can make it possible to convert waste that was previously difficult to process from an economic standpoint into usable resources.

Figure 10: Conceptual diagram of the system overview



Source: https://www.jarc.or.jp/shigenkaisyu/login/(Last accessed: January 22, 2026)

5. Future Prospects

This report has focused on end-of-life vehicles and highlighted notable initiatives aimed at achieving a more complete closed-loop within the CE.

However, realizing such CE requires a certain degree of enforcement. Without it, individuals may continue operating aging vehicles that emit excessive exhaust and do not meet inspection standards, or dispose of them illegally in remote areas. Vehicles may also be transferred to unlicensed operators, where improper dismantling practices could result in the release of fluorocarbons or the uncontrolled discharge of hazardous fluids into the environment. Therefore, in a consumer society where large volumes of new vehicles are manufactured and sold, a framework with enforceable measures is necessary to ensure that environmentally compliant vehicles are operated. Similarly, once an owner decides to dispose of an end-of-life vehicle, enforceability is required to ensure it is dismantled in an environmentally sound manner, valuable materials are recovered, and resources are properly recycled.

Such enforceability takes the form of laws and regulations. In developed countries, legal frameworks such as automobile recycling laws tailored to the circumstances of each industry are becoming increasingly mature. In many developing and emerging countries, however, such legal systems remain underdeveloped, leading to significant environmental issues.

Another important aspect is the structure of the automotive industry, whereby vehicles produced and initially sold in developed countries are often exported as used cars to developing and emerging countries[7], where they continue to be used for many years until reaching the end of their service lives. As a result, end-of-life vehicles tend to accumulate in developing and emerging countries. Accordingly, achieving a more fully realized circular economy on a global scale requires particular attention to these countries and concerted efforts to embed CE principles within their systems and practices.

In such developing countries, it is considered particularly important to begin by initiating small-scale, private-sector-led efforts. One example of a developed country taking the lead in supporting these nations is the Japan International Cooperation Agency (JICA), which dispatches experts from private companies to developing countries to facilitate the transfer of Japanese technologies as part of its official development assistance (ODA). JICA also brings personnel from developing countries to Japan for technical training.

Even at the private sector level, if initiatives begin on a small scale with high aspirations, they may eventually serve as model cases. When national or local governments later engage more seriously, such models may be recognized as testing grounds for future legislation, and public authorities may seek collaboration.

In this context, backing from automakers is indispensable. As discussed earlier, automakers are promoting vehicle production that takes into account the entire lifecycle, from design through disposal and dismantling. It would be highly significant for automakers to provide support through their local subsidiaries and local partners in developing countries that advances the realization of private-sector-led CE. For example, if automakers share the environmentally sound vehicle dismantling practices established under their own respective standards with developing countries, it could help raise the overall standard of proper dismantling within the private sector. Furthermore, if major automakers were to assess the environmental compliance of small-scale dismantling facilities established by private operators and grant their own certification, such facilities would gain a meaningful advantage should national or local governments later move toward formal legal frameworks. For automakers as well, this

[7] Between 2022 and 2024, 54% of end-of-life vehicles (used cars) in Japan were exported overseas. (Estimated by MGSSI based on statistical data from the Automobile Business & Culture Association of Japan, Japan Carrier, etc.)

approach would allow them to demonstrate that they are contributing to the proper treatment of end-of-life vehicles in each country and region, creating mutual benefits for both automakers and dismantling operators.

In time, if a single private-sector model case grows to ten, then twenty, it will become an established reality. This could serve as a powerful driver for voluntary industry initiatives similar to Japan's BlueRebirth and for the development of legal frameworks on the local and national levels. A fundamental principle of CE is "local production for local consumption." When products are reused, recycled, and reclaimed as resources, it is preferable to minimize their physical movement. Transportation entails cost, and in CE operations, which tend to be labor-intensive by nature, it is mostly desirable to circulate resources on as small a scale as possible, limiting unnecessary movement of materials.

Even when operating such small-scale CE models, whether it is going to be sustainably successful depends on multiple stakeholders, including local private enterprises, national and local governments, and automakers, being aligned and working collaboratively. In this context, an entity capable of coordinating and connecting these stakeholders could play a decisive role. One such candidate is the global trading houses (typically called Sogo-Shosha in Japan), which are deeply rooted in various countries and regions and possess extensive networks. With the ability to integrate actors from upstream and downstream in the value chain, trading houses could serve as a central coordinating presence. It is natural that individual automakers would prioritize the realization of CE within their own brands. However, automobiles are products that cross borders, making it important to pursue a cross-brand approach to CE within each local community. In such an environment, a company with a degree of neutrality, such as a global trading houses, may be particularly well positioned to realize car-to-car circulation for all end-of-life vehicles within a given country or region, regardless of brand.

As responsible manufacturers, automakers focus on developing materials and structural designs that facilitate recycling. They also formulate dismantling methods that minimize environmental impact and blueprints for technologies that enable the recycling of waste materials. Meanwhile, global trading houses can collaborate with these manufacturers and recycling operators, and identify local partners capable of jointly shaping projects as needed. Initiatives that begin in this way may seem like small and isolated on the global landscape, however, over time, those initiatives can grow into broader areas of activity, expand into regional, and eventually into a global scale.

While this report has focused on the automotive industry as an example, the underlying approach can be applied across industries, regardless of the products involved. For instance, if globally active manufacturers and global trading houses work together and take the lead, the CE in their respective fields may hold significant potential for growth. It is possible to envision that similar initiatives will arise across many sectors and, over time, expand to a global scale, shaping the future of society.

MITSUI & CO. GLOBAL STRATEGIC STUDIES INSTITUTE

The Present State and Future of Well-being × Innovation
— An Approach to Creating a Positive Cycle of Happiness —

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Summary

- In response to the contemporary challenge of the disconnect between economic growth and individual well-being, in this report, we propose the creation of a "well-being cycle" in which the three elements of "health, social connections, and income & wealth" interact with one another.
- We will explain initiatives involving the food as/is medicine and the use of artificial intelligence (AI) for personalized nutrition and prediction of disease risk in the "Health" section; advancements in social participation through robotics and lifestyle, physical capabilities, and expansion of emotional connections in the "Social Connection" section; and the redesign of money transfer and payment infrastructure and financial access using blockchain and digital IDs in the "Income & Wealth" section.
- These technologies expand individual potential and foster a true sense of prosperity that cannot be measured by economic indicators alone. We envisage a future in which this trend spreads and circulates from the individual to the whole, thereby realizing a truly well-being society.

Table of Contents

1. Introduction

Thanks to global economic growth and advances in digital technology and artificial intelligence (AI), our lives have become richer and more convenient than ever before. However, these benefits are not equally distributed among everyone.[1] Actually, there is a growing sense of being left behind, which cannot be measured by economic indicators, such as rising living costs[2], increasing feelings of isolation and anxiety about the future across all age groups[3], and stagnating levels of happiness[4]. Furthermore, the rapid expansion of AI and automation in recent years is forcing us to redefine the roles and value of humans, raising questions such as "Who will benefit from these advancements?" and "What value can humans add?" Against this backdrop, we have decided to accurately assess the disconnect between the good performance of economic indicators observed in modern society and people's actual experiences, and to explore the approaches necessary to achieve a "well-being society."

The Organisation for Economic Co-operation and Development (OECD) defines well-being in terms of 11 key elements.[5] Among these, we focused on three key elements: "Health (physical well-being)," "Social Connections (social well-being)," and "Income and Wealth (economic well-being)." "Health" is the foundation for learning and employment, and a prerequisite for all endeavors. Furthermore, under "Social Connections," we can create the room needed to support people in their daily challenges through initiatives that expand opportunities for mobility, interpersonal relationships, dialogue, and independence. Finally, we considered "Income and Wealth" to be crucial for accessing essential services such as food, education, and healthcare, and to serve as the foundation for sustaining the outcomes of "Health" and "Social Connections" (Figure 1).

This report focuses on initiatives, technologies, and services that enhance the quality of people's lives, not limited to mere economic growth, from three perspectives: "Health," "Social Connections," and "Income and Wealth," and presents specific examples of these.

Figure 1: Three key elements underpinning a "well-being society"

Source: Compiled by MGSSI based on various sources

2. Health: A New Era of Health Made Possible by Dietary Interventions and Digital Technology

Despite advances in medical technology extending average life expectancy, issues that threaten people's lives, such as widening health disparities, the prevalence of obesity, and the rise in lifestyle-related diseases, are becoming increasingly apparent around the world. In this chapter, we examine three key concepts: (1) "Food as/is Medicine," which aims to prevent and manage diseases through dietary interventions; (2) "Personalized Nutrition,"

[1] Global Internet use continues to rise but disparities remain | United Nations
[2] Affordable housing | OECD
[3] Social Isolation and Loneliness | WHO
[4] Happiness of the younger, the older, and those in between | The World Happiness Report
[5] In Brief: How's Life? 2024 | OECD

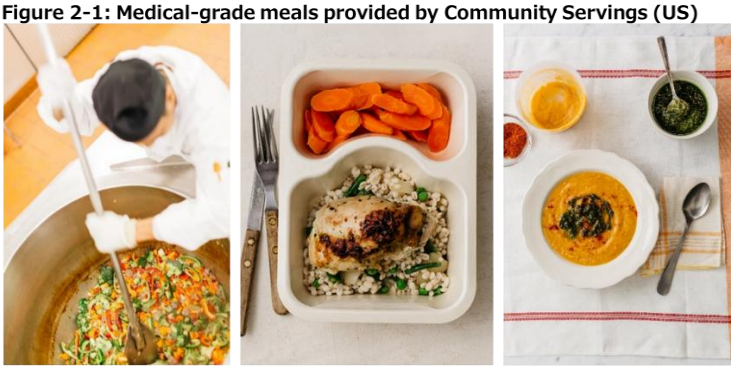
which designs optimal diets based on an individual's biological data; and (3) "Prediction of Disease Risk," which leverages AI and data. It illustrates how health management is shifting from a "passive and formulaic" approach to a "proactive and individually optimized" model.

2-1. Food as/is Medicine

There is a problem in which economic and social factors limit access to fresh, healthy foods, resulting in widespread reliance on inexpensive processed foods that are low in nutritional value. As part of the effort to address this issue, the "Food as/is Medicine" initiative has been gaining attention in recent years. "Food as/is Medicine" is a framework aimed at improving access to nutrient-rich foods and preventing and managing diseases through healthy dietary interventions. In recent years, in addition to public assistance programs designed to meet basic nutritional needs (such as SNAP[6] and WIC[7]), doctors have been prescribing nutritional interventions for patients with dietary concerns or medical conditions. These interventions include ready-to-eat meals designed by registered dietitians to address individual health conditions (Medically Tailored Meals), ingredient kits aligned with nutritional guidelines for specific diseases (Medically Tailored Groceries), and coupons for purchasing fruits and vegetables (Produce Prescriptions).[8]

For example, Community Servings, a nonprofit organization based in Boston, Massachusetts, prepares medically tailored meals for patients with chronic conditions such as diabetes, and directly delivers them to their homes (Figure 2-1). It has been reported that this initiative has improved participants' nutritional status and led to a reduction in monthly medical costs (by an average of 16%) as well as lower hospitalization rates and emergency department utilization rates.[9,10]

Figure 2-1: Medical-grade meals provided by Community Servings (US)



Source: Community Servings website (https://www.servings.org/food-health-policy/health-insurance-claims-data-study/: Last accessed November 27, 2025)

In addition, Feeding America, the largest hunger relief nonprofit network in the US, is implementing the "Food as Medicine" program in collaboration with 21 food banks and medical institutions across the country. The program provides comprehensive support to approximately 140,000 people who have visited affiliated medical institutions, combining services such as dedicated pantries within hospitals, home delivery of ingredients, distribution of coupons for purchasing fruits and vegetables, and nutritional guidance. The interim report indicates positive results, including improvements in participants' dietary habits and mental health indicators, as well as an average 1.5% decrease in HbA1c[11], one of the diagnostic criteria for diabetes.[12]

In addition to these, several other initiatives (Figure 2-2) have emerged, and the "Food as/is Medicine" initiative is beginning to function as a comprehensive approach that goes beyond mere financial support to help address health disparities through the prevention and management of lifestyle-related diseases and the containment of healthcare costs.

[6] SNAP：Supplemental Nutrition Assistance Program
[7] WIC：Women, Infants, and Children (The Special Supplemental Nutrition Program for Women, Infants, and Children)
[8] About Food Is Medicine｜Food Is Medicine Institute
[9] Association Between Receipt of a Medically Tailored Meal Program and Health Care Use｜PMC
[10] RWJF_Community-Servings-White-Paper-2019_SP_web.pdf
[11] HbA1c: An indicator reflecting average blood glucose levels over the past 2 to 3 months. As a general guideline, normal is <5.7%, prediabetes is 5.7–6.4%, and diabetes is ≥6.5% (Diabetes Testing | Diabetes | CDC)
[12] Food as Medicine 3.0 (FAM3) program Year 2｜Feeding America

Figure 2-2: Examples of food as/is medicine initiatives

Country	Company/organization	Overview
US	Community Servings	An NPO that provides free "medically tailored meals" overseen by registered dietitians for patients with chronic illnesses. In addition to improved nutritional status, effects such as a reduction in hospitalizations and medical costs (a decrease of approximately 16% per month) have been reported.
US	Feeding America	The largest anti-hunger NPO in the US. In collaboration with medical institutions, it is implementing a "Food as Medicine" program that combines the establishment of food pantries, food delivery, vouchers for fruits and vegetables, and nutritional counseling. Improvements, such as an average 1.5% decrease in participants' HbA1c levels, have been reported.
US	Mom's Meals	A leading provider of home-delivered meals supervised by registered dietitians for seniors and patients with chronic conditions through Medicare Advantage and Medicaid. Through insurance coordination, readmission rates have decreased and medication adherence (the extent to which patients continue to take their medications in accordance with the treatment plans agreed upon with their doctors and pharmacists) has improved, contributing to reduced healthcare costs.
US	Season Health	Offers a integrated solution for patients with chronic conditions such as diabetes and kidney disease, featuring meal plans developed by clinical dietitians who are registered dietitians in the US, along with nutrition education and meal delivery. It is expanding services by providing ongoing support for meals as a "prescription" and collaborating with health insurance providers.
US	FoodHealth Company (formerly Bitewell)	A platform for visualizing the impact of dietary choices on health and suggesting foods and menus that support disease prevention and health management. Its adoption is also gaining momentum in corporate wellness programs for employees (with a track record of financing).

Source: Compiled by MGSSI

2-2. Personalized Nutrition

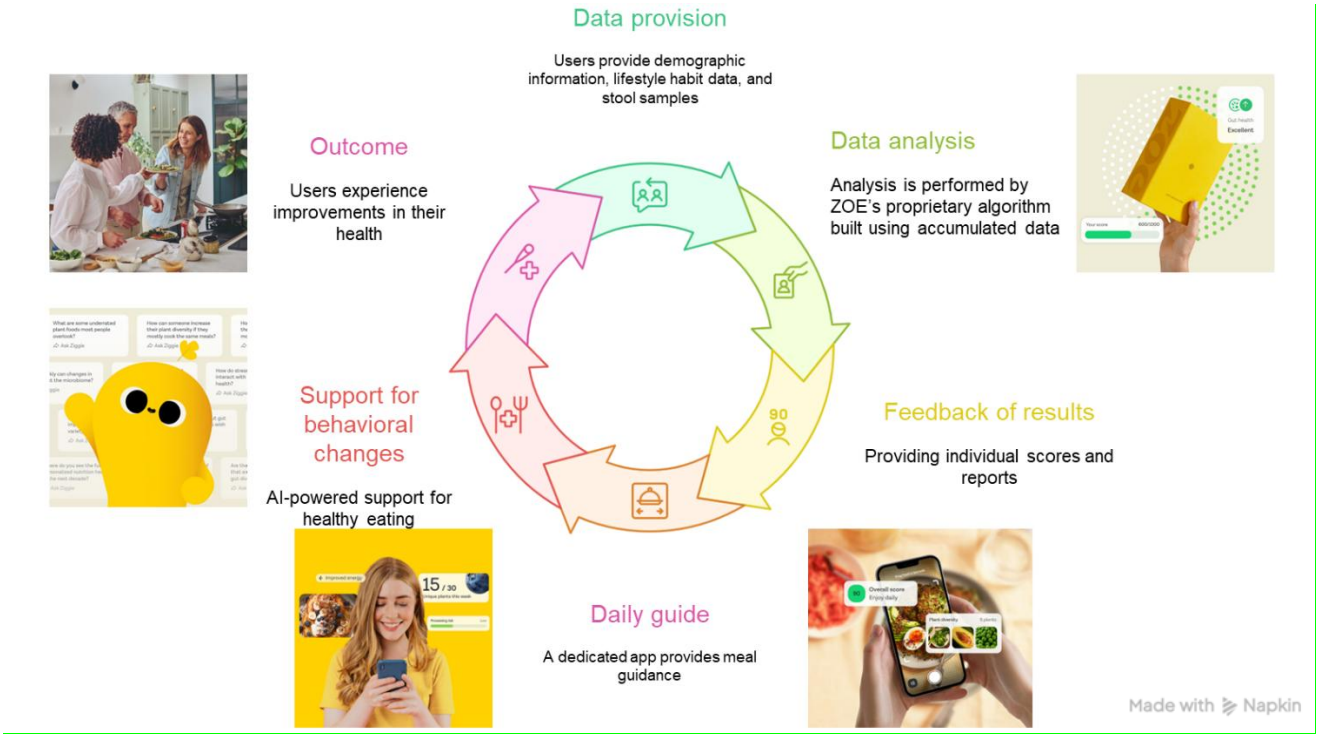
Meanwhile, the challenges facing people's health in modern society include lifestyle issues such as irregular and unbalanced diets and a lack of exercise. Conventional dietary guidelines are based on average standards, but in reality, individual responses to food vary greatly. Accordingly, the "personalized nutrition" approach, which tailors diets to an individual's genetic information, composition of gut microbiota, and lifestyle habits to optimize health management, is currently gaining attention.

For example, ZOE (UK) provides personalized nutrition services based on a vast dataset, including information on diet, blood glucose, blood lipids and gut microbiota, collected through PREDICT, the world's largest nutritional epidemiology research project. If users undergo a gut microbiome test and a medical consultation in advance, they can simply use a dedicated app to scan photos of their meals or barcodes to instantly view the nutritional profile, processing level, and health risks of foods, enabling them to determine on a daily basis the "eating style that suits them best" (Figure 2-3). Through clinical trials, ZOE has demonstrated that "even when consuming the same meal, postprandial blood glucose and blood lipid responses vary significantly from person to person" and that "AI-driven personalized nutritional support may lead to improvements in cardiovascular risk indicators," and is providing reliable services backed by science.[13]

In addition, Levels Health (US) offers personalized nutrition services using its proprietary database, which integrates hundreds of thousands of continuous glucose monitoring (CGM) data points with lifestyle data. By wearing a dedicated CGM device on the back of the upper arm, users can monitor how their diet, exercise, and sleep affect their blood glucose levels in real time. This allows us to propose "eating habits tailored to each individual's blood sugar management," something that general nutritional guidelines cannot achieve, which is a key strength. Levels Health also utilizes blood test results from its partner medical institutions to precisely assess participants' health status through a comprehensive evaluation of a wide range of blood biomarkers beyond just blood glucose levels, providing evidence-based nutritional guidance and support services for improving lifestyle habits (Figure 2-4).

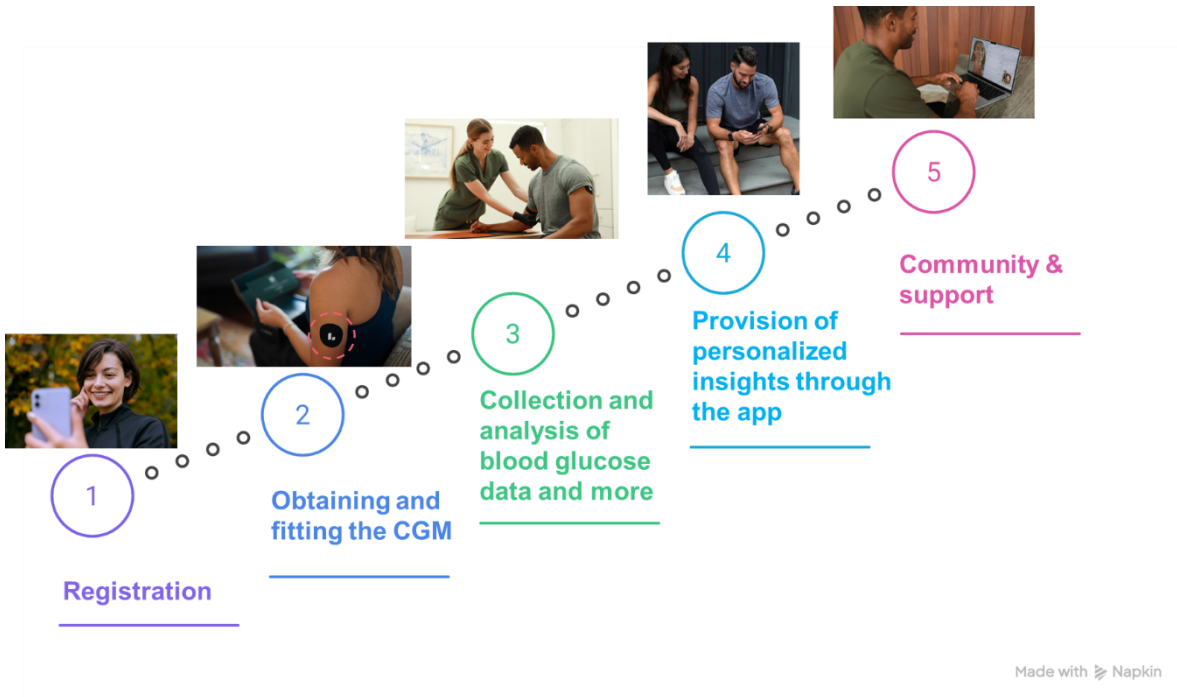
[13] Our Science | ZOE

Figure 2-3: Personalized nutrition services provided by ZOE (UK)



Source: Compiled by MGSSI based on ZOE website (https://zoe.com/en-gb/buymembership/, https://zoe.com/how-it-works: Last accessed January 16, 2026), using Napkin AI

Figure 2-4: Personalized nutrition services provided by Levels Health (US)



Source: Compiled by MGSSI based on Levels Health website (https://www.levels.com/how-it-works: Last accessed November 27, 2025), using Napkin AI

In addition to the companies mentioned above, several other companies offer personalized nutrition services tailored to individuals' physical constitutions and lifestyle habits (Figure 2-5). These services have evolved beyond mere dietary management to become a next-generation healthcare infrastructure that contributes to maintaining and improving people's quality of life.

Figure 2-5: Case studies of companies in the "personalized nutrition" area

Country	Company	Overview
UK	ZOE	Recommends personalized meal plans tailored to each user based on data accumulated through "PREDICT," the world's largest nutritional epidemiology study. Record meals using the dedicated app → Receive recommendations. Clinical trials suggest improvements in cardiovascular risk markers.
US	Levels Health	Personalized nutrition management that uses a CGM and app to visualize blood glucose trends in real time and helps provide understanding of the effects of diet, exercise, and sleep. Also provides expert advice. Plans to expand the range of metabolic indicators in the future through the integration of test data.
US	Viome	Analyzes samples such as stool and blood to provide dietary recommendations and supplements based on gut health and metabolic tendencies.
US	January AI	Provides an AI app that creates personalized metabolic models based on CGM, heart rate, and other data to predict blood glucose responses to meals in advance. Predicts blood sugar responses based on uploaded photos of meals → Encourages better meal choices.
US	Persona Nutrition	Uses online consultation to propose personalized supplement combinations tailored to lifestyle habits and goals, and delivers them on a regular basis. Also offers coaching services provided by registered dietitians.
South Korea	Algocare	Analyzes user data to automatically design and provide personalized supplements that address nutritional deficiencies (Nutrition-as-a-Service). In addition to services for households, also offers corporate health support (Algocare at Work).

Source: Compiled by MGSSI based on various sources

2-3. Prediction of Disease Risk

While many people understand the importance of health, it is not uncommon for them to make unhealthy choices due to being busy, sticking to habits, or giving in to temptation. That is precisely why it is important to recognize the risks you face as something that directly affects you and take that as an opportunity to change your behavior. In this context, innovations are advancing that use big data and AI to detect and visualize individual disease risks at an early stage.

For example, Apple (US) has incorporated an arrhythmia detection feature into its Apple Watch (Figure 2-6). According to the "Apple Heart Study" led by Stanford University, 2,161 out of 419,297 participants (0.52%) received notifications; 57% of those notified consulted a healthcare provider, and the positive predictive value was reported to be as high as 84%, suggesting the potential for early detection of patients with asymptomatic atrial fibrillation.[14]

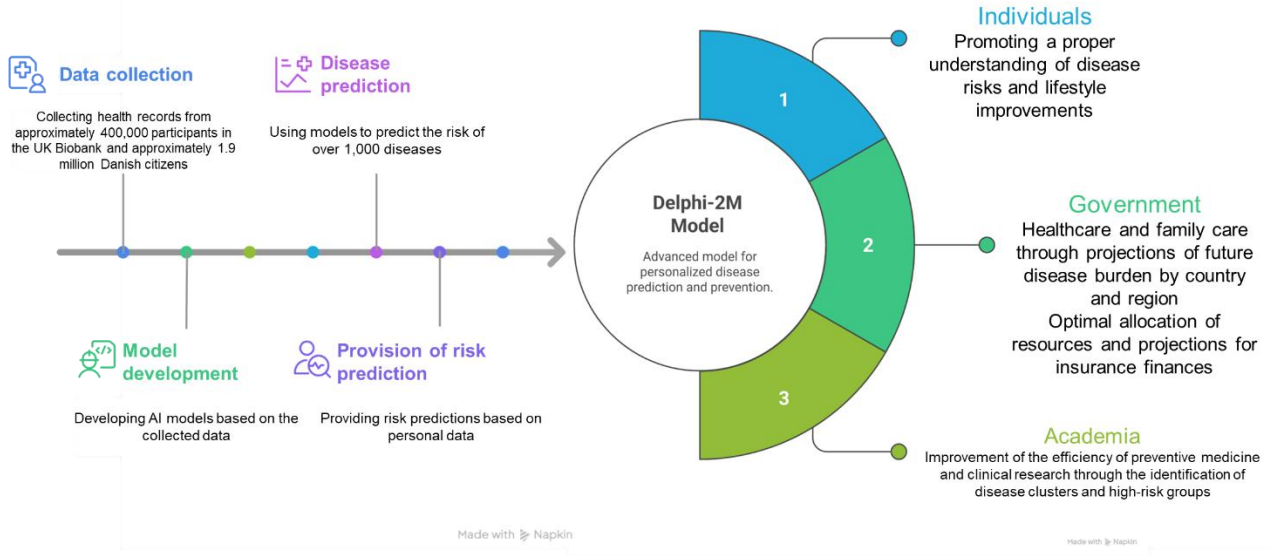
Figure 2-6: Apple Watch's arrhythmia detection and notification feature

Source: Apple website (https://www.apple.com/au/newsroom/2021/05/ecg-app-and-irregular-rhythm-notification-now-available-on-apple-watch/: Last accessed November 27, 2025)

[14] Large-Scale Assessment of a Smartwatch to Identify Atrial Fibrillation | PMC

In addition, a research team from the European Bioinformatics Institute, the German Cancer Research Center and the University of Copenhagen has developed "Delphi-2M," a generative AI model that predicts the probability of the occurrence of more than 1,000 diseases over the next 10 to 20 years, using health records from approximately 400,000 participants in the UK Biobank and approximately 1.9 million Danish citizens.[15] First, individuals are provided with specific information about their major health risks and how to manage them, making it easier for them to make lifestyle changes such as improving their diet and exercise habits, moderating alcohol consumption, and quitting smoking. Furthermore, in the field of medical research, the identification of disease clusters and high-risk groups is expected to improve the efficiency of preventive medicine and clinical research. Moreover, in the fields of public policy and health insurance, estimates of future disease burdens at the national and regional levels are attracting attention for contributing to the improvement of the accuracy of healthcare/family care resource allocation and insurance premium rate adjustments (Figure 2-7).

Figure 2-7: Overview of Delphi-2M and expected applications

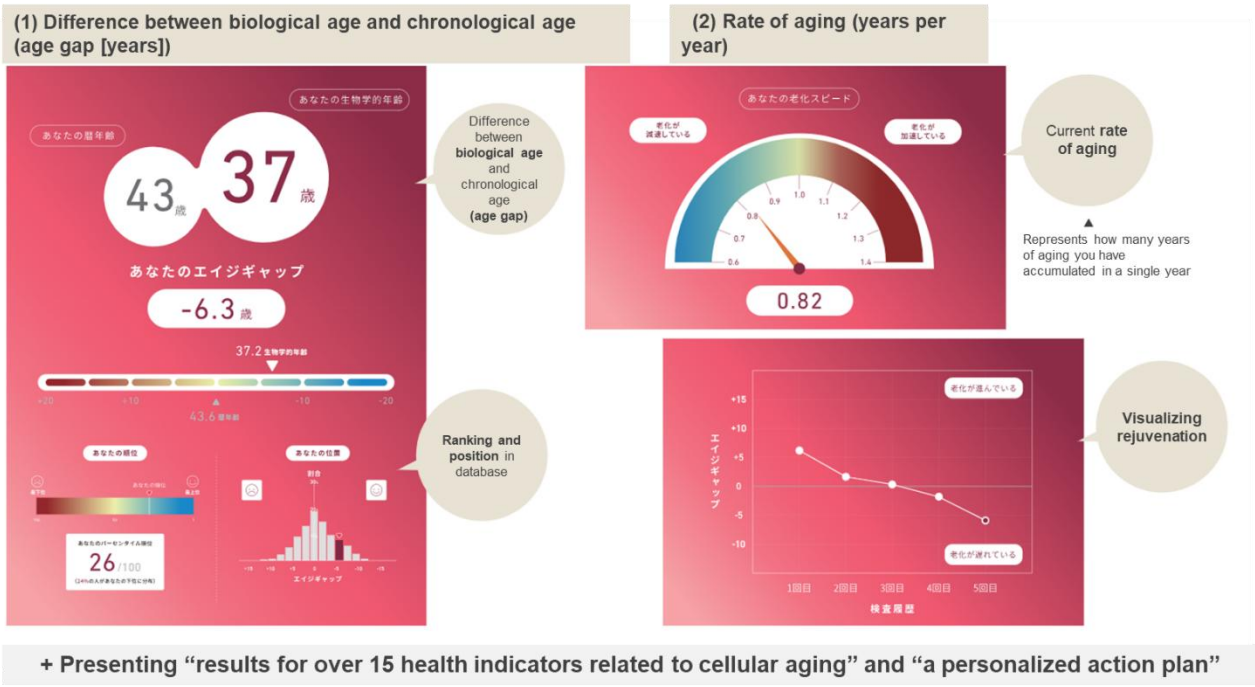


Source: Compiled by MGSSI based on Nature volume 647, pages248–256 (2025), using Napkin AI

In addition, Rhelixa (Japan) offers the "Epi Clock Test," which measures biological age using a small blood sample. Based on the level of DNA methylation, Rhelixa estimates a person's biological age, which differs from their actual chronological age, and quantifies and presents factors such as the rate of aging and the impact of lifestyle habits (Figure 2-8). Furthermore, based on the latest research on longevity, specific advice is provided on what kind of lifestyle improvements are effective in slowing down the aging process. By objectively understanding their biological age, rate of aging, and potential future risks, users can confidently work on improving their daily lifestyle habits.

[15] Learning the natural history of human disease with generative transformers | Nature

Figure 2-8: Rhelixa (Japan)'s Epi Clock Test report (image)



Source: Compiled by MGSSI based on the Rhelixa website (https://epiclock.jp/test/: Last accessed November 27, 2025)

In this way, the early detection and visualization of disease risks using AI and biometric data are gaining attention as a "starting point for behavioral change" that enables people to reflect on their own behaviors and take a concrete first step toward improving their health, and research and development in this area are intensifying (Figure 2-9).

Figure 2-9: Examples of companies in the "disease risk prediction" area

Country	Company/project	Overview
US	Apple	Apple Watch features ECG and arrhythmia detection, enabling it to detect signs of atrial fibrillation and other conditions through daily wear. Large-scale studies have shown the validity of notifications and their effectiveness in encouraging people to seek medical care, contributing to the widespread adoption of health risk monitoring.
Europe	Delphi-2M	Using generative AI trained on large-scale health records from the UK and Denmark, predicts the probability of the occurrence of diseases (over 1,000) during the next 10 to 20 years based on medical history, age, and lifestyle habits. It is expected to be applied not only to individual notifications but also to forecasting medical demand.
Japan	Rhelixa	Offers Epi Clock, a service that measures biological age from blood samples. Estimates the degree of aging based on the level of DNA methylation and provides specific advice to help improve lifestyle habits.
US	Freenome	Using multi-omics analysis and machine learning, has developed a liquid biopsy method to detect early signs of cancer in blood. Backed by large-scale clinical trials and funding, is promoting practical implementation and improvement of accuracy.
South Korea	Mediwhale	Developed AI that estimates future risks of cardiovascular and kidney diseases based on a single eye-fundus image. Aims to implement this as a low-cost, simple screening tool in health checkups and primary care settings.

Source: Compiled by MGSSI based on various sources

2-4. Summary

As the initiatives and services described above become more widespread in society, people's health management is likely to shift from a "passive (reacting after becoming ill) and uniform approach" to a "proactive (preventing illnesses before they occur) and individually optimized approach." As a result, they are expected to contribute to addressing social issues such as curbing family care and medical costs and reducing health disparities. Meanwhile, there are numerous challenges to widespread adoption, including "maintaining motivation for health management," "cost burdens," "integration with medical and health insurance systems," "building systems for data utilization," "ensuring privacy and reliability," and even "the possibility that highlighting disease risks could cause excessive anxiety among people." Going forward, the key will be building an ecosystem that encompasses not only the advancement of technology and services, but also the design of social systems based on the premise of disease prevention and mechanisms to support changes in user behavior. We hope this will lead to the creation of social infrastructure that allows everyone to naturally enjoy good health.

3. Social Connections: Robotics Expanding Human Potential

Social well-being, which encompasses positive relationships with others, a sense of belonging to a community, and a sense of purpose in one's social role, is an essential element in helping people find meaning in life.

However, in contemporary society, intractable diseases, disabilities, age-related physical decline, and geographical constraints are depriving people of social connections and roles, leading to severe social isolation. It is this very sense of isolation and loss of purpose that presents an urgent challenge, significantly lowering individuals' quality of life (QOL) and dignity.

In this chapter, we focus on cutting-edge robotics technologies that are being introduced as a means for removing these barriers to enable people to connect with society. These are not merely about automation, but rather represent an approach to "robotics expanding human potential," which extends human capabilities and enables social participation and self-actualization that people had previously given up on. In this chapter, we will examine this from three perspectives: "social participation and expanding lifestyles," "expanding physical capabilities," and "expanding emotional connections."

3-1. Social Participation and Expanding Lifestyles: Overcoming Distance and Barriers to Fulfill Roles

Difficulty going out or functioning due to intractable diseases or disabilities deprives people of contact with society and leads to feelings of isolation and psychological strain. The key here is an approach in which the robot is operated as an extension of one's own limbs, enabling interaction that transcends distance and physical barriers.

First, maintaining equality in daily life is a key issue. When daily living activities decline due to aging or disability, dependence on others increases, and relationships with family and friends tend to become fixed in the roles of "family caregiver" and "family care recipient." In contrast, Labrador Systems (US)'s "Labrador" is a robot that resembles a side table and is capable of autonomous navigation (Figure 3-1). In response to voice commands or app controls, it assists with household chores, such as fetching drinks from the refrigerator or bringing in the laundry. If you can manage your daily affairs on your own, the psychological barrier to asking others for help disappears. Labrador has lowered the barriers to adoption by offering a monthly subscription model with low upfront costs, and is implementing a B2B2C model by partnering with family care insurance providers and others to offer preventive care services.

Next, the avatar robot "OriHime/OriHime-D," developed by OryLab Inc. (Japan) is an approach for direct social participation and the restoration of roles (Figure 3-2). OryLab operates a permanent social experiment called

"Avatar Robot Café DAWN ver.β," which uses technology that provides the sensation of being physically present through remote control. Here, people who have difficulty leaving their homes, such as those with ALS (amyotrophic lateral sclerosis), operate robots from their homes to provide customer service and other tasks, thereby regaining a sense of social purpose and experiencing the satisfaction of being appreciated through work that involves physical activity. In addition to selling and renting the devices, OryLab offers implementation consulting and job matching services as part of its "Employment Support Services for People with Disabilities" program for businesses and local governments.

These technologies not only help alleviate the burden of family care but also serve as the foundation for individuals to maintain their dignity as independent persons and build relationships with others on an equal footing.

Figure 3-1: Labrador

Source: Labrador Systems website
Introducing the Labrador Retriever Robot at CES 2022
https://www.youtube.com/watch?v=aTOyXBr9VyU
(Last accessed on January 21, 2026)

Figure 3-2: Avatar robot OriHime-D

Source: OryLab Inc. website
https://dawn2021.orylab.com/en/gallery/#gallery-3
(Last accessed on January 21, 2026)

3-2. Expanding Physical Capabilities: Regaining Voluntary Movement

The loss of mobility resulting from a stroke or spinal cord injury deprives people of opportunities to go out and interact with others in person. The focus here is on wearable robotics technology that compensates for and enhances lost functions, helping people regain the ability to move of their own volition.

CYBERDYNE (Japan)'s "HAL (Hybrid Assistive Limb)" detects the faint bioelectric signals sent from the brain when a person attempts to move their body, and assists movement according to the wearer's intentions (Figure 3-3). It is crucial that the robot does not move on its own, but rather moves in sync with the user's intention to move. This approach is also expected to promote the regeneration of neural functions (neuroplasticity). Walking on one's own feet again is not merely a matter of regaining the ability to get around, but the first step toward regaining the confidence to go out and reconnect with the community. In addition to selling medical devices and expanding its rental services to various facilities, CYBERDYNE operates Robocare Centers, establishing a model that generates recurring revenue.

This field is also advancing rapidly overseas. ReWalk Robotics (now Lifeward) (US/Israel) developed "ReWalk," a personal exoskeleton robot that enables people with lower-body paralysis due to spinal cord injury to stand up and walk again (Figures 3-4). Approved by the U.S. Food and Drug Administration (FDA) in 2014, it enables users

to move to areas inaccessible by wheelchair and to communicate while standing. Being able to converse while maintaining eye contact directly contributes to greater social confidence and improved psychological well-being. Lifeward focuses primarily on a sales model based on insurance coverage and has established a system for providing its products through public funding and insurance in partnership with the U.S. Department of Veterans Affairs and private insurance companies.

Figure 3-3: HAL

Source: CYBERDYNE website
https://www.cyberdyne.jp/products/bb04.html
(Last accessed on January 21, 2026)

Figure 3-4: ReWalk

Source: Lifeward website
https://golifeward.com/products/rewalkpersonal-exoskeleton/ (Last accessed on January 21, 2026)

3-3. Expanding Emotional Connections: Mental Health Care and Community Renewal

Emotional connections with others and a sense of belonging to a community are essential to social well-being. However, against a backdrop of chronic illnesses, disabilities, the burden of caregiving, and changes in circumstances not limited to the elderly, people may become increasingly isolated as a result of anxiety, depression, or a loss of motivation. Here, we introduce robots designed to engage people's senses and emotions, thereby creating opportunities for conversation and interaction among those at risk of social isolation.

"Paro," a seal-shaped robot developed by the National Institute of Advanced Industrial Science and Technology (AIST) (Japan), uses numerous sensors to respond to human voices and touch, thereby encouraging the formation of emotional bonds (Figure 3-5). Clinical evaluations conducted both in Japan and overseas have reported that, particularly in settings such as elderly care, medical and family care frontlines, in addition to reducing stress and increasing positive emotions, Paro facilitates increased conversation, demonstrating its role as a social mediator. Robots serve as a common topic of conversation, stimulating interaction within the community. Paro is widely recognized as the world's most therapeutically effective robot, having been certified by Guinness World Records, and is sold both in Japan and overseas. It has been certified as a medical device, particularly in Europe and the US, and its adoption as a non-pharmacological treatment is gaining momentum, with post-sales maintenance services also becoming a significant source of revenue.

Meanwhile, overseas, there is "ElliQ" from Intuition Robotics (Israel) as an active approach based on dialogue

(Figure 3-6). This is an AI companion robot designed to combat social isolation among the elderly, and rather than passively waiting for commands, it learns the user's daily routines and proactively suggests health advice and activities. By offering companionship much like a roommate, it serves as an interface that alleviates the loneliness of elderly people living alone and helps them feel connected to society. The business model is a subscription-based model consisting of an initial hardware cost and ongoing AI service fees. In addition, Intuition Robotics has partnered with US organizations that support the elderly to implement a B2G (Business-to-Government) model, distributing products to the elderly living alone at no cost or at low prices through public assistance programs.

Figure 3-5: Paro

Source: National Institute of Advanced Industrial Science and Technology (AIST) website
https://www.aist.go.jp/aist_j/magazine/20250925.html
(Last accessed on January 21, 2026)

Figure 3-6: ElliQ

Source: Intuition Robotics website
https://elliq.com/ (Last accessed on January 21, 2026)

3-4. Summary

Robotics has the potential to serve as a means of expanding human possibilities across the layers of social participation, independence, and interaction, thereby contributing to the restoration and creation of connections in response to social isolation and the loss of social roles. The cases introduced in this chapter, as well as those that could not be covered here, are summarized in Figure 3-7.

The cases in this chapter demonstrate that robots are not merely a means for labor-saving or automation, but can also expand people's agency and capabilities, and contribute to restoring their connections with society and their roles within it. Expanding operations such as remote assistance and daily living support helps overcome distance and physical limitations, augmenting physical capabilities through wearable exoskeletons and similar technologies, which helps restore independent mobility, and engaging in emotional interaction and dialogue as a therapeutic companion helps alleviate feelings of isolation and create opportunities for social interaction. These technologies directly engage with the core elements of social well-being, such as relationships, roles, and creative collaboration, and have the power to rebuild the foundation upon which people can live fulfilling and happy lives.

Figure 3-7: Summary of case studies

Category	Country	Company	Robot	Overview
Social participation and expanding lifestyles	Japan	Ory Laboratory	OriHime / OriHime-D	Uses remote control to overcome physical distance, enabling social participation and employment for people who have difficulty going out.
	US	Labrador Systems	Labrador	Autonomous operation assists with household chores and helps protect the independence and privacy of the elderly and others.
	Japan	avatarin	newme	Users can remotely "inhabit" avatars in public spaces, enabling teleportation-like sightseeing and the provision of skills.
	Israel/US	Temi	temi	Equipped with autonomous operation and AI assistant functions, it supports remote patrols, monitoring of the elderly, and video calls.
	US	Double Robotics	Double 3	A telepresence robot that can be operated in a mixed reality (MR) view. Enables remote participation in offices and schools.
Expanding physical capabilities	Japan	CYBERDYNE	HAL	Supports movement using biosignals, promoting the regeneration of nervous system function and independent movement.
	US/Israel	Lifeward (formerly ReWalk Robotics)	ReWalk	Enables people with spinal cord injuries to stand and walk, restoring dignity and allowing for eye-level communication.
	US	Ekso Bionics	EksoNR	A rehabilitation exoskeleton assisting patients who have suffered strokes or spinal cord injuries to relearn how to walk. Promotes a natural walking pattern.
	France	Wandercraft	Atalante X	An exoskeleton that enables independent walking and rehabilitation without the use of a cane (hands-free) through self-balancing technology.
Expanding emotional connections	Japan	National Institute of Advanced Industrial Science and Technology	Paro	Animal therapy effect reduces stress and stimulates conversation within the community.
	Israel	Intuition Robotics	ElliQ	AI actively engages in conversation to help alleviate loneliness among the elderly and support them in maintaining their daily routines.
	Japan	GROOVE X	LOVOT	Pursuing the idea of "useless yet beloved." It conveys a sense of life through body temperature and eye contact, fostering attachment and providing comfort.
	Japan	CASIO COMPUTER	Moflin	An AI pet with an emotion map. Its personality is shaped by how it is treated, and this approach is utilized in mental health care and character education.

Source: Compiled by MGSSI based on various sources
From top https://orylab.com/, https://labradorsystems.com/, https://avatarin.com/, https://www.robotemi.com/, https://www.doublerobotics.com/, https://www.cyberdyne.jp/, https://golifeward.com/, https://eksobionics.com/, https://en.wandercraft.eu/, http://paro.jp/, https://elliq.com/, https://lovot.life/, https://www.casio.com/jp/moflin/
(Last accessed on January 21, 2026)

4. Income & Wealth: Redesigning Financial Access Through Blockchain and Digital ID

Income and Wealth, one of the key components of well-being, rely on money transfer and payment infrastructure as the foundation for people's economic activities.[16] Recently, it has been said that this infrastructure faces three key challenges: cost and efficiency, financial inclusion (access), and security and user experience (UX).

In developed countries, the high costs and delays associated with traditional systems are a challenge, while in emerging economies, access to financial services itself is a challenge. The Financial Stability Board (FSB) is calling for improvements in the cost, speed, and transparency of international money transfers[17], while the World Bank has pointed out that a lack of identification documents is a major factor contributing to the existence of the unbanked (those without bank accounts).[18,19] In addition, there are challenges in creating a user experience that balances security and convenience for individual consumers who use financial services on a daily basis.

Against this backdrop, there are high expectations for digital technologies such as stablecoins[20] as a means of

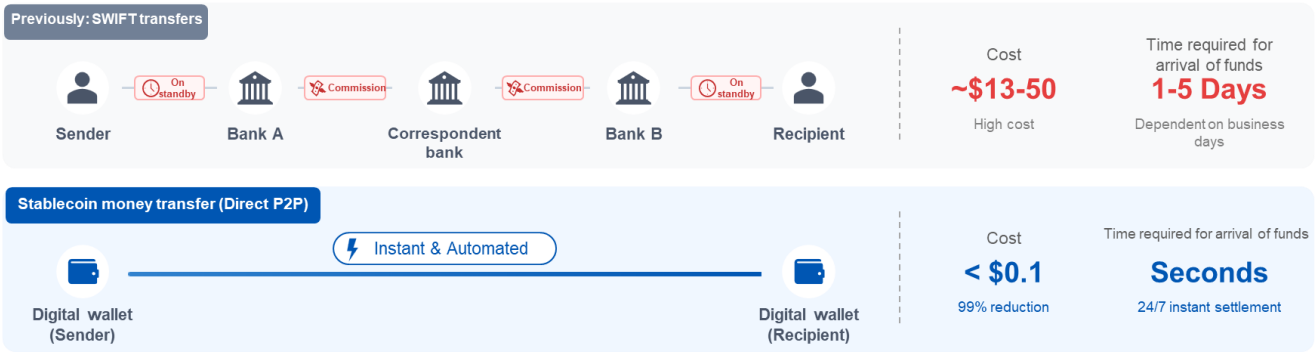
[16] OECD,「In Brief: How's Life? 2024」
[17] Financial Stability Board,「G20 Roadmap for Cross-border Payments: Consolidated progress report for 2025」Published in October 2025
[18] World Bank, "Global FinDEX Database 2021," published in June 2022
[19] World Bank ID4D（Identification for Development）"ID4D Global Dataset" 2021 estimates
[20] Stablecoins: Cryptocurrencies designed to maintain a stable value by being backed by fiat currencies such as the dollar or government bonds

addressing these challenges under appropriate legal and regulatory frameworks. The core technological foundation behind this is blockchain. Given these current conditions, this chapter focuses on three areas based on blockchain technology: (1) redesigning money transfer and payment infrastructure, (2) redesigning credit, and (3) a secure and user-friendly experience.

4-1. Redesigning the Money Transfer and Payment Infrastructure: "Moving Money"

Blockchain-based digital currencies are emerging as a means of fundamentally transforming traditional payment infrastructure. In particular, the practical use of stablecoins, which combine the stability of value with the convenience of digital currency by being backed by assets such as the US dollar and government bonds, is gaining momentum. Stablecoins issued and transferred on the blockchain possess characteristics that address the challenges mentioned above, enabling low-cost money transfers with near-instant settlements 24 hours a day, 365 days a year, without the need for a bank account (Figure 4-1).

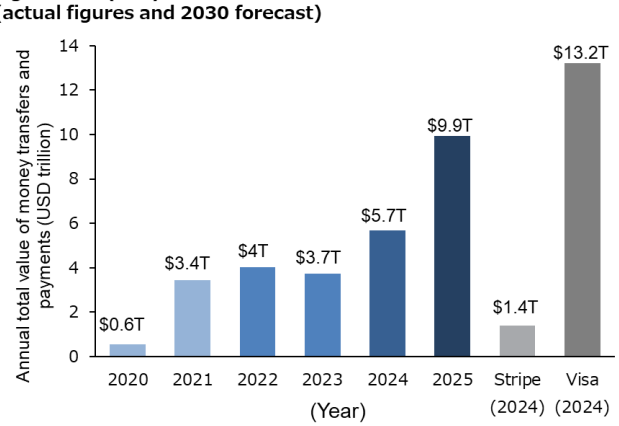
Figure 4-1: Traditional international money transfers (SWIFT) and transfers using stablecoins



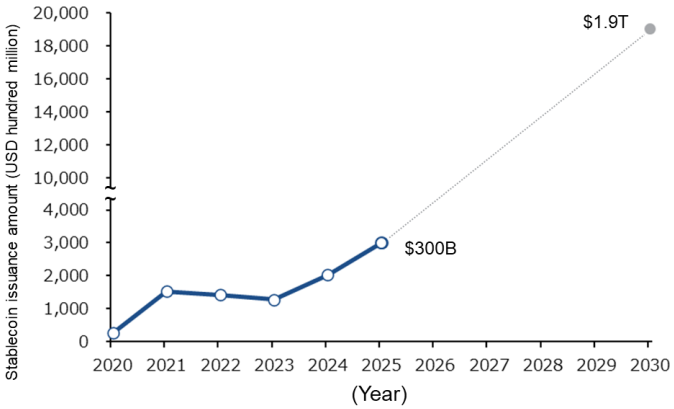
Source: Compiled by MGSSI based on various sources

This will give people who previously had limited access to financial services the "freedom to move money." Such trends are rapidly permeating the real economy. The annual volume of money transfers and payments processed using stablecoins has reached USD 9.9 trillion, growing to a scale that rivals major payment networks such as Visa (Figure 4-2).

Figure 4-2: (Left) Growth in actual demand for stablecoins and comparison of payment networks; (Right) Stablecoin issuance amount (actual figures and 2030 forecast)



Note: Stablecoin figures are based on estimated actual demand from Visa Onchain Analytics (excluding round-trip transactions and internal transfers). The figures for 2020 to 2024 are annual totals, and the figure for 2025 is the cumulative total for January to November. The figures for Stripe and Visa are the total annual transaction volume.



Note: Based on data from RWA.xyz, the issuance amounts are as of December 31 for 2020 to 2024 and December 1 for 2025. The 2030 forecast (USD 1.9 trillion) is based on the base case in Citi GPS "Stablecoins 2030."

Source: Compiled by MGSSI based on Visa Onchain Analytics, Visa 2024 Annual Report, Stripe 2024 Annual Report, RWA.xyz, Citi GPS "Stablecoins 2030" (2025)

The underlying issuance volume is also increasing rapidly, and exceeded USD 300 billion in December 2025 and is projected to reach USD 1.9 trillion by 2030, establishing itself as a new, enduring foundation of the financial system. In particular, the integration of infrastructure and the expansion of use cases are progressing beyond just business-to-business applications to include supporting individuals' economic activities (Figure 4-3).

Figure 4-3: Integration of stablecoin infrastructure and expansion of use cases by major payment and fintech companies

	Company/organization	Overview	Impact
2022			
Apr	Twitter (US) & Stripe (US)	Launched a pilot program to pay Twitter creators in stablecoins (USDC).	Creators without bank accounts can now receive payments instantly, stimulating the global creator economy.
Jun	MoneyGram (US)	Launched a global money transfer service between cash and USDC. Instant money transfers and withdrawals are now available in Canada, Kenya, the Philippines, the US, and other countries.	This enables the sending and receiving of digital dollars without requiring a bank account, promoting financial inclusion and dramatically reducing money transfer costs.
Aug	PicPay (Brazil)	The payment app PicPay launched a cryptocurrency trading service, offering its 30 million users the ability to buy, sell, and hold the stablecoin USDP.	In inflation-stricken Brazil, it provides access to the stable value of the USD and helps individuals protect their assets.
Dec	UNHCR (United Nations High Commissioner for Refugees)	Distributes humanitarian aid funds to Ukrainian refugees using USDC. Payments are received via smartphone wallet.	Even in conflict zones, funds can be safely stored and transferred via smartphone, ensuring the transparency and reliability of aid.
2023			
Mar	Stables (Australia)	Issues virtual cards that allow for direct payments using USDC balances. Can be converted instantly at time of payment.	By integrating digital currencies directly into everyday payments, it significantly enhances convenience for cross-border transactions and travel.
Aug	PayPal (US)	The in-app wallet offers features for managing, sending, and making payments with the proprietary coin PYUSD.	The entry of a major fintech company enhanced the credibility of the digital dollar. Serving as a bridge between Web3 and the traditional financial sector to accelerate adoption.
Sep	Visa (US)	Uses USDC to speed up settlement processes with merchant partners. (On Solana)	Reduced international settlement times from several days to just a few seconds, improving cash flow for merchant partners through instant fund transfers.
Oct	Flutterwave (US/Nigeria)	Flutterwave, a leading African fintech company based in Nigeria, integrated the USDC payment network into its payment services across Africa. Integrated with mobile money.	Reduces money transfer costs and processing times to boost economic activity in regions with weak financial infrastructure.
2024			
Apr	PayPal (US)	The international money transfer service Xoom enables money transfers using PYUSD (PayPal USD). It offers instant, low-cost money transfers from the US to overseas without going through the banking network.	It reduces fees and speeds up the arrival of funds to maximize the amount received by recipients of migrant money transfers and other payments.
Aug	Mercado Pago (Argentina)	Mercado Pago, a subsidiary of South American e-commerce giant Mercado Libre, offers in-app trading of "Meli Dólar," a fee-free USD-pegged digital currency, in Brazil.	By enabling access to US dollar-denominated assets starting with small amounts without going through a bank, it established a means for users in emerging markets to hedge against inflation.
2025			
Feb	Stripe (US)	Acquired Bridge, a stablecoin payment platform, to enhance its implementation APIs for merchants.	Lowered barriers to the adoption of global money transfers and wage payments for businesses, and is promoting the participation of workers in emerging economies in the global market.
Sep	MoneyGram (US)	Launched a wallet for using USDC in Colombia. Funds received can be immediately used as USDC or converted to cash, allowing users to avoid the volatility of local currencies.	Even during currency depreciation, the stable value of the US dollar ensures that living expenses are covered, enhancing household purchasing power and providing peace of mind. Achieving a substantial transfer of value to the local economy.
Nov	Visa (US)	Announced a new service that allows corporate platforms to instantly convert and transfer funds from fiat currency to stablecoins for workers and creators.	Gig workers can receive payments instantly, regardless of bank hours or national borders, improving their cash flow and ensuring fairer compensation. Stabilizes the livelihoods of people in regions with underdeveloped financial infrastructure.

Source: Compiled by MGSSI based on various sources

Stripe (US) and PayPal (US) enable instant payments to freelancers and provide access to digital payment services, and MoneyGram (US) offers a money transfer service that does not require a bank account. The UNHCR (United Nations High Commissioner for Refugees) has achieved rapid and transparent humanitarian aid by providing cash assistance directly to displaced people via digital currency. These examples illustrate that the foundation for financial inclusion, which allows everyone to access the financial system quickly and affordably, is steadily being established.

4-2. Redesigning Credit: "Granting the Right to Use"

Even if the payment infrastructure is renewed, true financial access cannot be achieved unless credit (such as identity verification and payment history), which is a prerequisite for using the service, can be proven. Traditionally, an individual's credit has relied heavily on bank account histories and official identification documents. Consequently, there has been a challenge in that the unbanked population and people engaged in informal economic activities, who lack access to these, have been unable to fully reap the benefits of technological advancements. The solution to overcoming this barrier lies in redesigning credit through digital ID technology based on blockchain. It will transform individuals' previously unrecorded activities, achievements, and qualifications into verifiable credit (the right to use) that is difficult to tamper with. Concrete efforts toward social implementation are also accelerating. In developed countries, distributed IDs (DID[21]/VC[22]) provided by companies such as Microsoft (US) enable the instant verification of graduation certificates and professional qualifications, thereby reducing the

[21] DID（Decentralized Identifier）
[22] VC（Verifiable Credential）

costs associated with hiring and administrative procedures.

Meanwhile, in emerging markets, global companies such as Binance have leveraged SBT[23] to accumulate and visualize transaction histories on the blockchain as credit scores, thereby enabling people to access loans and services even without a bank account. Furthermore, with the widespread adoption of AI, protocols that provide proof of personhood (PoP[24]), such as Worldcoin (US), are becoming increasingly important as a foundation for equitable distribution of benefits and access to services (Figure 4-4).

Figure 4-4: Redesigning credit: An approach using digital ID technology

Technology and concepts	Mechanism and features	Value proposition and impact	Major user companies
DID / VC decentralized ID / verifiable credentials	Digitization of information such as educational background, certifications, and licenses, and presenting it in a **format that can be verified instantly** without the need for a third-party organization.	Cost reduction and efficiency improvement Dramatically reduces the costs associated with verifying educational backgrounds and certifications during the hiring process.	Microsoft (US)
Soulbound Token (SBT)	**Activity logs and transaction records** are permanently stored on the blockchain as tokens that cannot be transferred to others.	Building new "credit" Even people without bank accounts (the unbanked) can obtain loans and other financial services based on their credit history.	Binance
PoP Proof of Personhood	A platform that uses biometric authentication and other technologies to verify that a user is a "**real, unique person**" rather than an AI bot.	Ensuring fairness in the age of AI Prevents identity theft and ensures fair distribution of benefits such as basic income.	Worldcoin (US)

Source: Compiled by MGSSI based on various sources

These technologies do not function in isolation but complement each other. PoP serves as the foundation that guarantees the existence of a unique individual, upon which educational background and qualifications (DID/VC) and activity records (SBT) are built. By translating this multi-layered digital credit into a simple user experience that can be presented as a QR code on a smartphone, we can remove barriers to entry for all economic activities and promote seamless social participation.

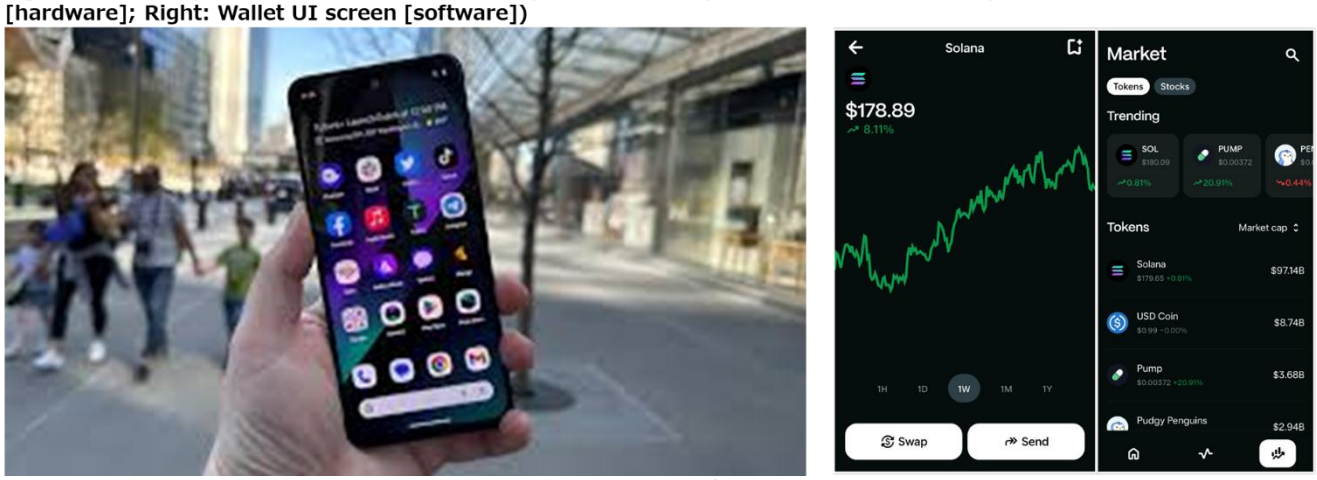
4-3. "A Secure and User-Friendly Experience" That Is the Key to Widespread Adoption: An Approval System Anyone Can Use

Implementation and widespread adoption are just as important as resolving infrastructure and access issues, and in the exchange of digital information, the security of final payment approval by ensuring that the transaction was authorized by the individual is particularly crucial. It is important to build this secure authentication experience (UX) from both the hardware (device) and software (account) perspectives. An example of hardware-based protection is the Seed Vault function of Solana Mobile (US) (Figure 4-5).

This handles the information required for payments and authorizations within a secure area that is isolated in a device (TEE: Trusted Execution Environment). Users make payments using the same process they use to unlock their devices via facial recognition or fingerprint. This frees users from the burden of managing complex passwords and allows businesses to benefit from the high level of trust provided by user authentication. Another approach is to improve the user experience on the software side, specifically through account abstraction[25]. This is a technology that lowers the high barrier associated with traditional password management. The technology has been widely

[23] SBT（SoulBound Token）
[24] PoP（Proof of Personhood）
[25] Account Abstraction (AA): A technology that eliminates the inconvenience inherent in traditional digital assets, where losing your keys means you can never retrieve your assets again. It is a system that can be used by anyone securely and conveniently by enabling features such as password reset and automatic payments, similar to bank accounts and social media.

Figure 4-5: Examples of "a safe and user-friendly UX" enabled by hardware and software (Left: Solana Mobile device [hardware]; Right: Wallet UI screen [software])



Source: Solana Saga Review: The Web3 Smartphone Has Arrived（https://decrypt.co/126218/solana-saga-review-web3-smartphone-arrived）、Understanding Solana Seeker's Seed Vault Wallet（https://solanafloor.com/news/understanding-solana-seeker-s-seed-vault-wallet）Last accessed February 12, 2026

employed by established major payment companies, such as Visa (US), implementing automated gas bill payments and merchant payment solutions, and Stripe, introducing a wallet for merchants. Furthermore, account abstraction is closely linked to the rapid evolution of AI.

In the future, it is believed that AI agents will conduct economic activities autonomously on behalf of individuals and businesses. To ensure that AI agents function safely, it is essential to design systems that enable automated payments based on predefined conditions, and account abstraction is expected to serve as a core technology in this regard.

4-4. Summary

The three approaches outlined in this chapter will be implemented in society incrementally, in a coordinated manner. First, the adoption of stablecoin transfers and digital IDs in business operations will lead to lower money transfer costs and shorter identity verification times. This will enable a wide range of needs, including daily payments and cross-border money transfers, to be met. In the medium to long term, autonomous economic activities, such as conditional automated payments by AI agents, are becoming a realistic possibility. The convergence of these technologies will transcend mere efficiency gains and pave the way for an inclusive economic foundation that is affordable, accessible, and secure for everyone.

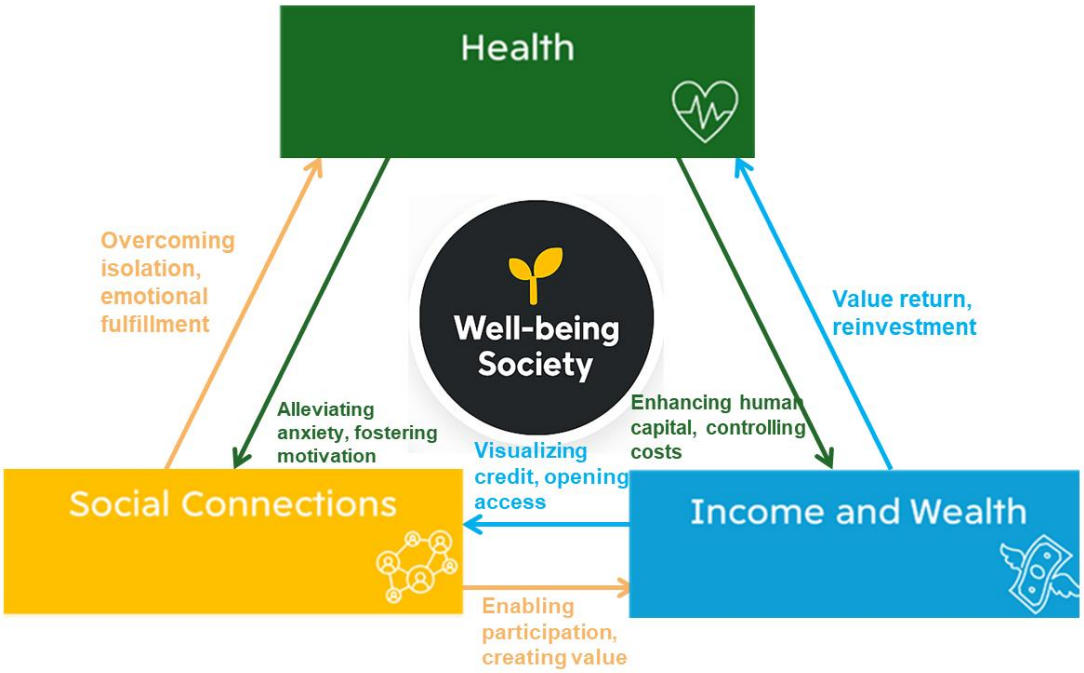
5. Future Prospects

In this report, we have discussed approaches to achieving "true well-being," which cannot be measured by economic indicators alone, from three perspectives of health, social connections, and income & wealth. In the chapter on "Health," we outlined the overall vision of a new health ecosystem, ranging from the use of food as medicine to personalized nutrition and AI-driven disease risk prediction, that empowers consumers to take ownership of their health and take steps toward behavioral change, while also highlighting its potential and challenges. In the chapter on "Social Connections," we demonstrated the potential of robotics to overcome physical and geographical constraints, thereby enabling isolated individuals to reconnect with society and reclaim their "role" and "embodiment." In the chapter on "Income and Wealth," we confirmed that blockchain and digital IDs will serve as a new infrastructure for achieving financial inclusion and transforming individuals' activities and achievements into legitimate credit.

These three areas do not form a hierarchical structure above one another. It is an ecosystem in which each element possesses its own independent value while interacting with others to create a single "cycle" (Figure 5). For example, improvements in health can lead to reduced anxiety and increased motivation, thereby encouraging social participation (Health -> Social Connections). These activities lead to the creation of value (Social Connections -> Income & Wealth), and the resulting economic stability enables reinvestment in better food and preventive healthcare, leading to improved health (Income & Wealth -> Health). In this way, a closed loop is formed in which health drives social connections, social connections generate income & wealth, and income & wealth in turn support health, resulting in well-being evolving into a virtuous cycle where its value continues to grow with each iteration, rather than being transitory. Of course, the reverse of this cycle is also possible, and there may be other ways to keep the cycle going.

Also, this cycle does not end within the individual. When each individual revitalizes their own cycle of health, social connections, and income & wealth, this becomes a source of vitality for the organization and eventually contributes to the well-being of society as a whole. The upward spiral in which the enhancement of individual well-being boosts community resilience, leading to economic growth and increased happiness across the entire nation, is the vision of society we strive to achieve. In this cycle, companies are expected to play a role in designing the interfaces between these areas. Until now, business has primarily focused on optimization within a single area. However, going forward, solutions that seamlessly connect previously fragmented elements and eliminate bottlenecks in the cycle will offer the greatest business opportunities.

Figure 5: The well-being cycle



Source: Compiled by MGSSI

MITSUI & CO. GLOBAL STRATEGIC STUDIES INSTITUTE

Value Creation Driven by Intangible Assets
— Forms of Value That Grow Alongside Society —

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Summary

- As globalization and digitalization continue to advance, sources of competitive advantage are shifting from tangible assets to the intangible domain. Amid these developments, the Intellectual Property Strategic Program 2025, formulated by the Intellectual Property Strategy Headquarters headed by the prime minister, positions value creation through investments in intellectual properties and intangible assets as one of its key priorities.
- The value of intangible assets develops alongside society through the processes of co-creation, cultural inheritance, and visualization.
- In this era of intangible assets, the role of companies is to create an environment in which value forms on a sustained basis. Externalizing intellectual properties and making use of digital technologies are ways of providing society with access to intangible assets and accelerating value creation, and the means by which companies pursue these will shape their future competitiveness.

Table of Contents

1. Introduction

Innovation refers not merely to the creation of new technologies, but to the very changes that generate new value in response to social and industrial challenges. In the past, corporate competitiveness depended heavily on tangible assets such as capital investment, production capacity, and the securing of resources. However, this value creation model centered on tangible assets is reaching its limits as globalization and digitalization continue to advance, awareness of environmental impact continues to grow, and the rapid imitation of products and technologies becomes the norm.

As a result, intangible domains—such as people, culture, nature, and knowledge—are growing in importance. A survey[1] by the World Intellectual Property Organization (WIPO[2]) reported that investments in intangible assets are expanding at a rate more than three times that of investments in tangible assets between 2008 and 2024. While intangible assets can serve as sources of competitive advantage and innovation, they are difficult to represent in corporate accounting and traditional KPIs, and this lack of visibility has itself become a management challenge.

This increase in investments in intangible assets is driven by a shift in where the center of market value lies—from products themselves to brands, experiences, and relationships. With the proliferation of social media, consumers are no longer merely recipients of information and products. They have become actors who participate in value creation through posting, evaluating, and sharing content. Furthermore, the proliferation of generative AI is significantly expanding each individual's ability to create content and influence others, accelerating the formation of a structure in which consumers participate in the market as "producers."

In light of these changes, the key to understanding modern value creation lies in identifying how the intangible domain operates and how the intangible transforms into business value. This report examines key aspects of the intangible economy—comprised of intangible assets—in terms of four core themes: culture, natural resources, co-creation, and the externalization of knowledge.

2. The Value and Management of Co-Created Assets (Matsuura)

2-1. The Well-Known Phenomenon of *Oshikatsu*（推し活）

The term "*oshikatsu*" refers to the practice of supporting one's favorite celebrity, actor, anime or game protagonist, character, architectural structure, animal, or any other favorite thing in a variety of ways. The term was nominated for the 2021 New Words and Buzzwords Awards in Japan and has since become widely used in society. It is also attracting attention as a key driver of consumer activity.

The practice of supporting "*oshi*"（推し）—one's favorite person or thing—has existed since around the 1980s, but at that time it was a relatively private matter, largely confined to live venues and events or to limited close-knit communities. The proliferation of social media was a major driver behind the evolution of *oshikatsu* into a widely recognized buzzword. The practice of *oshikatsu* developed into a culture as fans began to loosely connect with each other via social media, and it grew to encompass participants posting, demonstrating, and sharing their emotions and experiences with others.

As a result, fans have become more than merely consumers. They now play an important role in presenting the value of their favorites to society as a whole through posting and sharing photos and videos, creating derivative works based on existing characters and settings, and offering interpretations of their favorite fictional worlds. Contemporary *oshikatsu*

[1] WIPO, Measuring Investment in Intangible Assets, 2025. A research report presenting a comparative analysis of investment trends in tangible and intangible assets based on country-level data.
[2] A specialized agency of the UN responsible for intellectual property matters. It works to harmonize systems between nations, and conducts statistical and policy analyses.

has evolved through these shifts—from consumption to participation, and from support to value creation.

2-2. The Fandom Economy and Co-Created Assets

The economic sphere generated by such fan communities is referred to as the "fandom economy." This section examines its formation using the example of MYAKU-MYAKU (Figure 1), the official character of Expo 2025 Osaka, Kansai, Japan.

MYAKU-MYAKU is based on the official logo, and its design was finalized in March 2022. When it was first announced, many had adverse reactions and felt that it was too scary or creepy. However, after the name MYAKU-MYAKU was decided in July of the same year, people began to refer to "MYAKU-MYAKU-sama" on social media, and many posted derivative works and fan art. Subsequently, as the character gained more exposure, perceptions shifted, and people began to have more positive reactions, seeing the character as cute and popular.

Once the Expo opened, the increased enthusiasm became apparent in actual consumer behavior, such as long lines forming for the MYAKU-MYAKU Plush Toy Lottery. The buzz and sense of participation grew even further as people posted and shared their individual experiences on social media, such as their time waiting in line for the lottery or whether they won. This created a cycle prompting new groups of interested people who saw these posts to take action. This is a clear demonstration of the fandom economy, in which sharing experiences can inspire further participation and consumption, and the process itself amplifies value.

As this example indicates, fandoms are no longer merely marginal hobbyist groups. They now have the potential to function as actors that drive culture and the economy. Moreover, any value generated through these activities over time can be considered a sustainable co-created asset.

Figure 1: MYAKU-MYAKU, the official character of Expo 2025 Osaka, Kansai, Japan

Source: City of Osaka press release (Last accessed on December 26, 2025)
(https://www.city.osaka.lg.jp/hodoshiryo/banpakusuishin/0000662900.html)

2-3. Co-Created Assets and Management

As noted in the previous section, some of the value created in the modern era is generated outside the operational sphere of companies and government agencies, specifically through the activities of fandoms. Conventionally, the intangible assets that companies have emphasized—such as brands, characters, content, and designs—have been defined and managed by the companies themselves, based on the premise that their value could be consistently controlled. The core message and overarching concept were designed in advance, and any deviations were considered something that should be corrected. This framework was effective in providing a stable supply of highly refined value.

However, co-created assets do not necessarily fit within this premise. The value of co-created assets is not derived solely from the core message or overarching concept provided by the company. Rather, it is formed over time through participation, sharing, and dissemination by fandoms. As this value creation process extends beyond the company's sphere of control, it is more accurate to describe co-created assets as something that exists between the company and society, rather than as something that the company exclusively owns.

It should be noted, however, that co-created assets do not grow autonomously, independent of corporate activities. The content, venues, and opportunities for participation are still provided through corporate efforts. Whether the process of co-creation continues in a healthy manner depends largely on how closely companies engage with fandoms. Excessive intervention would undermine the motivation driving the creation of value, while neglect could invite confusion and friction.[3]

Under this approach, corporate management of co-created assets does not involve directly managing or controlling value, as with conventional intangible assets. Rather, it involves creating an environment in which fandom participation and diverse interpretations can naturally emerge, which in turn leads to further value creation. In other words, this refers not to a process of unilaterally determining the direction of co-creation, but rather to a form of engagement that maintains and supports the conditions necessary for co-creation to continue to occur.

This point is also evident in the example of MYAKU-MYAKU. The Japan Association for the 2025 World Exposition, responsible for managing Expo 2025 Osaka, Kansai, Japan, permits and welcomes derivative works related to MYAKU-MYAKU under certain conditions. The guidelines established by the Association permit creating works with designs similar to MYAKU-MYAKU for personal enjoyment and sharing them on social media and other platforms, while forbidding commercial use and representations that damage the reputation of MYAKU-MYAKU or the Expo.

From a legal perspective, derivative works could constitute copyright infringement and are, in principle, unlawful. However, when viewed as an aspect of a co-created asset, derivative works represent spontaneous acts of value creation by fans, and as such, they are able to boost recognition and promote content. Companies should pay close attention to co-created assets because they contain value that is difficult to identify using conventional metrics, but which should nonetheless be addressed strategically.

2-4. How to Evaluate Co-Created Assets

While co-created assets can serve as sources of corporate value in much the same way as conventional intangible assets, their nature makes certain aspects difficult to identify using conventional evaluation axes. Indicators such as revenue, brand recognition, and follower counts represent only a portion of the outcomes generated by co-created assets and do not directly reflect the full scope of their value. This is because the value of co-created assets is not fixed at a specific point, but rather formed and updated over time. Therefore, in evaluating them, it is

[3] The Yukkuri Chabangeki trademark issue is an example of confusion caused by the acquisition of trademark rights by an unrelated third party. For details on the background of this case and its institutional context, see "Impact of Technological Advancements and Social Change on Intellectual Property Rights" (2024).

necessary to focus on the process of how the value is growing, instead of on short-term or momentary outcomes.

Under this premise, the degree of maturity of co-created assets can be assessed based on multiple factors. First, whether engagement by fandoms goes beyond a transient reaction and develops into sustained participation. Second, whether the content of co-creation remains unfixed and gives rise to a diverse range of interpretations and representations. Third, whether the company's engagement avoids hindering the spontaneous activities of fandoms. While all of these elements are difficult to quantify, they are important indicators of whether co-created assets are gaining depth within their relationship with society.

In light of the above, evaluating co-created assets is not a matter of definitively determining outcomes, but could rather be considered a process of observation and understanding aimed at discerning what forms of engagement and decision-making will be desirable going forward. The value of co-created assets cannot be fully determined using short-term outcomes or clear numerical indicators. The best way to evaluate co-created assets in order to ensure their sustained use in corporate activities is to continuously monitor their development and evolution, and adjust the manner of engagement in response to those changes.

2-5. Corporate Strategies for Engaging with Co-Created Assets

While the value of co-created assets is formed through the voluntary participation and creative activities of fandoms, they cannot be sustainably maintained without the engagement of companies and rights holders. Derivative works stand as a prime example of this. As noted earlier, while derivative works may legally constitute copyright infringement, in the context of co-created assets, they also contribute to value creation by boosting recognition and promoting content. Companies are required to engage with an understanding of this dual nature.

While excessive control can provoke backlash from fandoms, paying too little attention could also invite third-party appropriation and confusion. Managing co-created assets is not a matter of promoting or restricting their use, but rather a matter of creating an environment in which participants can continue co-creating with confidence.[4]

For companies, benefiting from the value of co-created assets is not a matter of reaping short-term rewards. The basic approach to engaging with co-created assets as intangible properties is to monitor the process by which co-creation grows and continues to evolve within society, and to engage in ways that do not disrupt this cycle.

3. The Value of Intangible Cultural Heritage Elements as Intangible Assets and the Utilization Thereof (Asada)

3-1. Japan's Cultural Heritage System and the Challenges in Leveraging the System for Regional Revitalization

Chapter 2 discussed new value in the form of co-created assets and how companies should engage with them. At the same time, rather than focusing on the co-creation process itself, it is more effective to dig deeper into and further explore the sense of values that people have already established, quantify each piece of content through digitization, and identify ways for one's company to leverage such assets. As one such example, this section explains the growing movement to assess and leverage intangible cultural heritage elements as intangible assets.

The UNESCO Intangible cultural heritage system was established to protect humanity's cultural diversity and focuses on our "living heritage," such as performing arts, festivals, and traditional craftsmanship that have been

[4] In December 2025, the Japan Association for the 2025 World Exposition filed a trademark application for one of the Expo's ID elements—which had spontaneously come to be referred to online as "Co-MYAKU" and further developed through derivative works—with the aim of protecting Co-MYAKU culture from malicious third parties and preserving a culture of participation and co-creation for the future. (Reference: To Everyone Who Loves Co-MYAKU — Regarding the Co-MYAKU Trademark — | Hikichi Kouta)

passed down within local communities without a tangible form. Unlike the World Heritage system[5], it is characterized by the fact that the community associated with a particular intangible cultural heritage takes the lead in safeguarding it. In Japan, multiple heritage elements have been registered under both systems (Figure 2). In addition, Japan has introduced the Japan Heritage system, which aims to revitalize local communities through cultural properties and aspects of traditional culture by categorizing tangible and intangible cultural assets under narratives that reflect their traditions and customs (Figure 3).

[5] World Heritage sites are inscribed on the UNESCO World Heritage List upon approval by the World Heritage Committee, based on the criterion of Outstanding Universal Value, following evaluations by organizations such as ICOMOS or IUCN.

Figure 2: List of registered intangible cultural heritage elements and world heritage sites

Intangible cultural heritage	
Year of registration	Name
2008	Nogaku theater
2008	Ningyo Johruri Bunraku puppet theater
2008	Kabuki theater
2009	Gagaku
2009	Ojiya-chijimi, Echigo-jofu
2009	Oku-noto no Aenokoto
2009	Hayachine Kagura
2009	Akiu no Taue Odori
2009	Dainichido Bugaku
2009	Daimokutate
2009	Traditional Ainu dance
2010	Kumiodori
2010	Yuki-tsumugi
2011	Mibu no Hana Taue
2011	Sada Shin Noh
2012	Nachi no Dengaku
2013	Washoku, traditional dietary cultures of the Japanese
2018	Raiho-shin, ritual visits of deities in masks and costumes
2022	Furyu-odori
2024	Traditional sake-making
2025	Washi, craftsmanship of traditional Japanese hand-made paper
2025	Yama, Hoko, Yatai, float festivals
2025	Traditional techniques for the conservation and transmission of wooden architecture

World heritage			
Year of registration	Name of heritage site	Type	Location
1993	Buddhist Monuments in the Horyu-ji Area	Cultural	Nara Prefecture
1993	Himeji-jo	Cultural	Hyogo Prefecture
1993	Yakushima	Natural	Kagoshima Prefecture
1993	Shirakami-Sanchi	Natural	Aomori Prefecture, Akita Prefecture
1994	Historic Monuments of Ancient Kyoto	Cultural	Kyoto Prefecture, Shiga Prefecture
1995	Historic Villages of Shirakawa-go and Gokayama	Cultural	Gifu Prefecture, Toyama Prefecture
1996	Hiroshima Peace Memorial (Genbaku Dome)	Cultural	Hiroshima Prefecture
1996	Itsukushima Shinto Shrine	Cultural	Hiroshima Prefecture
1998	Historic Monuments of Ancient Nara	Cultural	Nara Prefecture
1999	Shrines and Temples of Nikko	Cultural	Tochigi Prefecture
2000	Gusuku Sites and Related Properties of the Kingdom of Ryukyu	Cultural	Okinawa Prefecture
2004	Sacred Sites and Pilgrimage Routes in the Kii Mountain Region	Cultural	Wakayama Prefecture, Nara Prefecture, Mie Prefecture
2005	Shiretoko	Natural	Hokkaido
2007	Iwami Ginzan Silver Mine and its Cultural Landscape	Cultural	Shimane Prefecture
2011	Hiraizumi – Temples, Gardens and Archaeological Sites Representing the Buddhist Pure Land	Cultural	Iwate Prefecture
2011	Ogasawara Islands	Natural	Tokyo
2013	Fujisan, sacred place and source of artistic inspiration	Cultural	Yamanashi Prefecture, Shizuoka Prefecture
2014	Tomioka Silk Mill and Related Sites	Cultural	Gunma Prefecture
2015	Sites of Japan's Meiji Industrial Revolution	Cultural	Eight prefectures
2016	The Architectural Work of Le Corbusier	Cultural	Tokyo
2017	Sacred Island of Okinoshima and Associated Sites in the Munakata Region	Cultural	Fukuoka Prefecture
2018	Hidden Christian Sites in the Nagasaki Region	Cultural	Nagasaki Prefecture, Kumamoto Prefecture
2019	Mozu-Furuichi Kofun Group	Cultural	Osaka Prefecture
2021	Jomon Prehistoric Sites in Northern Japan	Cultural	Hokkaido, Aomori Prefecture, Iwate Prefecture, Akita Prefecture
2021	Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island, and Iriomote Island	Natural	Kagoshima Prefecture, Okinawa Prefecture
2024	Sado Island Gold Mines	Cultural	Niigata Prefecture

Note: For intangible cultural heritage elements, only the year of the most recent inscription is shown.
Source: Compiled by MGSSI based on various sources

Figure 3: Types of heritage registrations

	Intangible cultural heritage	World heritage	Japan Heritage
Certification	UNESCO	UNESCO	Agency for Cultural Affairs (of Japan)
Year issued	2006	1975	2015
Scope	Culture and community	Real estate (Cultural and natural heritage)	Tangible and intangible cultural properties
Characteristics	Cultural aspects of local communities	Important heritage sites of universal value to humanity	Packaging tangible and intangible cultural properties together through a narrative
Number of registrations	23	26	105

Source: Compiled by MGSSI based on various sources

At the core of the intangible cultural heritage framework stands the principle of supporting and safeguarding aspects of indigenous and regional cultures that are at risk of decline amid globalization and social change. Accordingly, these are not inherently assets for business purposes, and overt efforts to monetize them should be avoided. Other issues, such as overtourism—in which excessive commercialization leads to an increase in the number of tourists—have also emerged. That being said, in practical terms, the people who inherit and preserve culture, as well as the funds that support their activities, are indispensable aspects of the process, and completely separating culture from economic activities may make it difficult to sustain. In particular, in recent years, there has been a severe shortage of people involved, heightening the need to secure a stable economic foundation. Therefore, it is necessary to regard these elements of intangible cultural heritage and Japan Heritage as assets to be leveraged in a manner that makes their value apparent as they are applied. Furthermore, there have been reports of cases in which the rise in popularity of certain World Heritage sites proved short-lived, with visitor appeal declining just a few years after inscription.[6] For elements of intangible cultural heritage and Japan Heritage to serve as foundations for cultural transmission and promote sustained regional revitalization, mechanisms are needed to maintain their attractiveness to visitors long after inscription.

This report positions elements of intangible cultural heritage and Japan Heritage as intangible assets, provides an explanation of their economic effects, and explores potential applications of digital technologies such as NFTs, VR, and AR as means of generating sustained economic benefits.

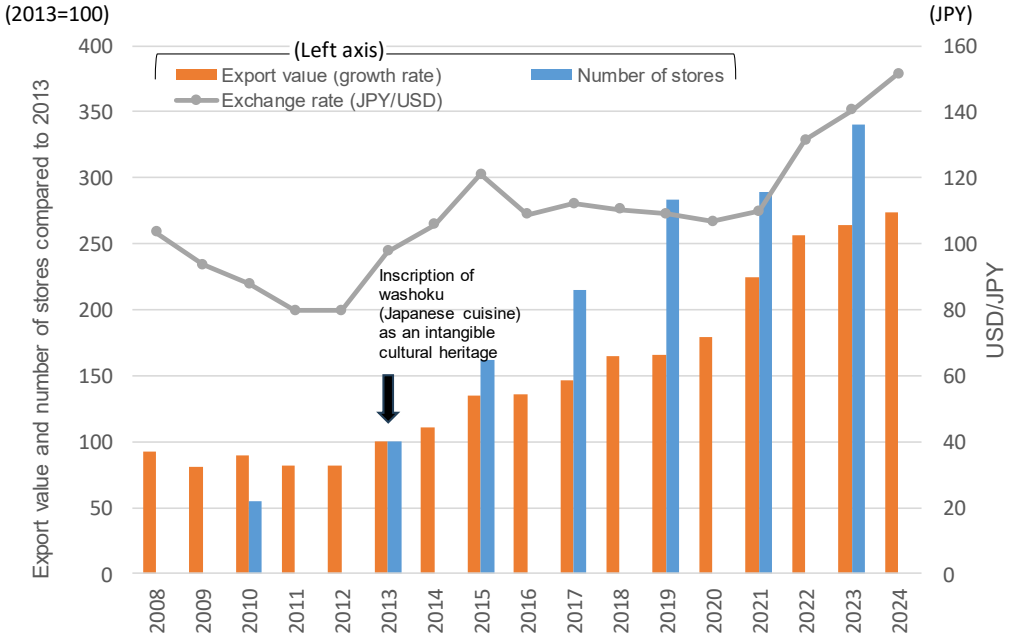
3-2. Intangible Cultural Heritage and the Economic Effects Thereof

While inscription as an element of intangible cultural heritage can successfully generate economic benefits, there are also cases in which doing so has failed to attract the expected number of visitors, underscoring the need for appropriate utilization.

A representative example of successful registration is Japan's washoku, which was inscribed in 2013. It has gained international recognition as a culture unique to Japan characterized its use of dashi broth and expressions of the four seasons, and this is thought to have contributed to an increase in the export value of agricultural, forestry, and fishery products both before and after official inscription, as well as to an increase in the number of washoku restaurants overseas (Figure 4). While the expansion of exports is likely the result of multiple factors—such as the weak yen and initiatives by the Ministry of Agriculture, Forestry and Fisheries to promote exports of Japanese food products—the increased recognition resulting from this inscription may have played a certain role in the rise in the number of washoku restaurants.

[6] Mitsuhiro Komuro, "A Study on Tourism Promotion by World Heritage Sites," Institute for Transport Policy Studies, 35th Research Report Meeting

Figure 4: Changes in export value of Japanese agricultural, forestry, and fishery products following intangible cultural heritage inscription



Note: The number of stores is shown only for the years for which data is available: 2010, 2013, 2015, 2017, 2019, 2021, and 2023.
Source: Compiled by MGSSI based on Ministry of Agriculture, Forestry and Fisheries materials

On the other hand, as recognition increased following the inscription, a negative consequence also emerged—a rise in the number of restaurants that purport to be "washoku" while serving food that does not align with its standards for authenticity. In response, the Ministry of Agriculture, Forestry and Fisheries has established a certification system for Japanese culinary skills to protect washoku culture. This suggests that, when making use of intangible cultural heritage elements, it is necessary to establish institutional frameworks to safeguard the culture while capitalizing on the benefits of increased recognition.

Another international example is Mongolia's traditional technique of making Airag in Khokhuur and its associated customs, inscribed in 2019. The efforts leading up to inscription inspired support for traditional production methods that were at risk of being lost, leading to the resumption of Airag production using traditional leather containers (Khukhuur). Following the inscription, more than 20 groups of nomadic peoples became involved in production, simultaneously transmitting cultural traditions and reconstructing livelihoods.[7] This suggests that intangible cultural heritage elements are not merely records of traditional culture. They also contribute to the revitalization of local community identity and the formation of a foundation for sustainable economic activity.

Furthermore, inscribing an element as intangible cultural heritage and constructing related facilities does not necessarily guarantee success. The Cité Internationale de la Gastronomie, which opened in Lyon to showcase France's dietary culture—inscribed as an intangible cultural heritage element—was a large-scale facility housed in a historic building. However, admission fees were high, and the visitor experience was largely limited to viewing exhibits and dining.[8] It is believed that one factor behind its closure in less than a year was that, due to the insufficiently designed experiential elements and narrative, visitors found it difficult to understand and share in the cultural significance, making it hard to justify the high admission fee for repeat visits.[9] The facility reopened in 2022, redesigned to focus on traditional French cuisine with new exhibits and a greater emphasis on participatory and

[7] International Development Center of Japan, Study on "Overseas UNESCO Intangible Cultural Heritage (Alcoholic Beverages)"
[8] https://www.saveur.com/story/travel/food-museum-in-france/
[9] https://lyon-saveurs.fr/lyon-coup-de-tonnerre-la-cite-de-la-gastronomie-ferme-ses-portes/

hands-on experiences.[10] It has also been reported that Belgian Beer World, which opened in Brussels following the inscription of Belgian beer culture as an intangible cultural heritage element, has struggled to operate since opening in 2023.[11] However, as exports of Belgian beer increased significantly both before and after inscription,[7] it is clear that the beer culture itself is not lacking in popularity or recognition. These examples demonstrate that simply establishing museums for exhibits and dining makes it difficult to fully convey the appeal and value of intangible cultural heritage elements, and it does not motivate visitation or consumption. It is therefore important to develop approaches that enable visitors to actively experience the appeal and value for themselves, encouraging repeat visits.

3-3. Further Utilization of Intangible Cultural Heritage Elements

An aspect of culture cherished by the people of a country can also serve as a source of profound experiential value for visitors from other countries. An overseas public opinion survey[12] on Japan conducted by the Ministry of Foreign Affairs also shows a high level of interest in Japanese cuisine, lifestyle, mindset, and architecture (Figure 5). It is important to link different cultural elements together—such as elements of intangible cultural heritage related to Japanese cuisine and lifestyle, and World Heritage sites related to architecture—and the utilization of Japan Heritage is expected to play a role in this. Japan Heritage packages together tangible and intangible cultural properties under narratives that reflect their historical context as well as traditions and customs rooted in the local region. Intangible cultural heritage elements and World Heritage sites can also be incorporated into this framework (Figure 6). Connecting the dispersed World Heritage sites and elements of intangible cultural heritage together through a shared narrative makes it possible to deepen understanding of the heritages' value and of Japanese culture, enhancing the experiential value. This requires designing routes that enable visitors to easily understand the narrative (such as multilingual explanations, maps, recommended sequences, and explanations of the connections between related resources).

In addition, the primary reasons that tourists make purchases are for souvenirs[13] to preserve memories of their trip or to have proof of their visit, or for gifts to present to others. Items such as photographs, postcards, and paintings of the local landscape are particularly popular, and these souvenirs function as aids in recalling memories and are highly valued for their authenticity—the fact that they are genuine.[14] Furthermore, surveys on what tourists look for in souvenirs conducted within Japan have shown that they place importance on memories and on experiences that help preserve those memories, and that they particularly value regional authenticity within the broader concept of authenticity.[15] These studies suggest that, in tourism, not only are the experiences themselves important, but the ability to retain memories of those experiences and share them with others in an authentic manner is also highly valued. Accordingly, when making use of intangible cultural heritage elements, it is of utmost importance to preserve the memory of the experience and provide verification of its authenticity.

In addition, as many elements of intangible cultural heritage are limited to specific locations or times of the year, tourists may not have the opportunity to come into contact with them. It is therefore important to consider ways to compensate for these lost opportunities. Digital technologies are considered an effective means of addressing these two issues.

[10] https://traveltrade.lyon-france.com/en/discover-lyon/activities-and-leisure/culinary-visits/the-international-city-of-gastronomy
[11] https://www.thebulletin.be/disappointing-start-belgian-beer-world
[12] https://www.mofa.go.jp/mofaj/gaiko/culture/pr/yoron.html
[13] While "omiyage" is often translated as "souvenir," in English-speaking contexts the term "souvenir" strongly connotes a personal memento or keepsake, and unlike the Japanese term "omiyage," it is not used when an item is intended as a gift for others. Therefore, this translation makes use of both terms: "souvenir" and "gift."
[14] Wilkins Hugh, "Souvenirs: What and Why We Buy", Journal of Travel Research. 50(3), pp.239-247(2011)
[15] Ryotaro Suzuki, Tomomi Hanai, Kim Jinman, "What Do Tourists Require for Omiyage? —Clarification of Basic Elements by Web Survey— "The Tourism Studies: Journal of Japan Institute of Tourism Research, Vol.35, No.1, pp.65-78 (2023).

Figure 5: Summary of overseas public opinion survey results on Japan

Q: Which of the following topics related to Japan interest you?

	Indonesia	Cambodia	Singapore	Thailand	Philippines	Brunei	Vietnam	Malaysia
Ikebana, tea ceremony, calligraphy	43%	26%	19%	33%	41%	16%	50%	30%
Traditional performing arts, traditional music	56%	40%	19%	35%	45%	43%	41%	39%
Literature, haiku	37%	34%	17%	30%	50%	34%	25%	27%
Sumo, martial arts	52%	36%	22%	33%	37%	26%	41%	33%
Bonsai	39%	33%	17%	24%	38%	41%	35%	40%
Anime, manga, games, cosplay	78%	47%	48%	64%	69%	60%	62%	55%
Pop music (J-pop)	41%	27%	26%	25%	31%	22%	19%	31%
Fashion (including kimono)	52%	34%	25%	47%	38%	51%	39%	46%
Films, television dramas	59%	36%	45%	39%	50%	49%	45%	52%
Japanese cuisine	82%	63%	83%	83%	87%	69%	82%	83%
Architecture	45%	52%	23%	44%	63%	57%	51%	45%
Lifestyle, mindset	62%	49%	52%	57%	76%	82%	64%	63%

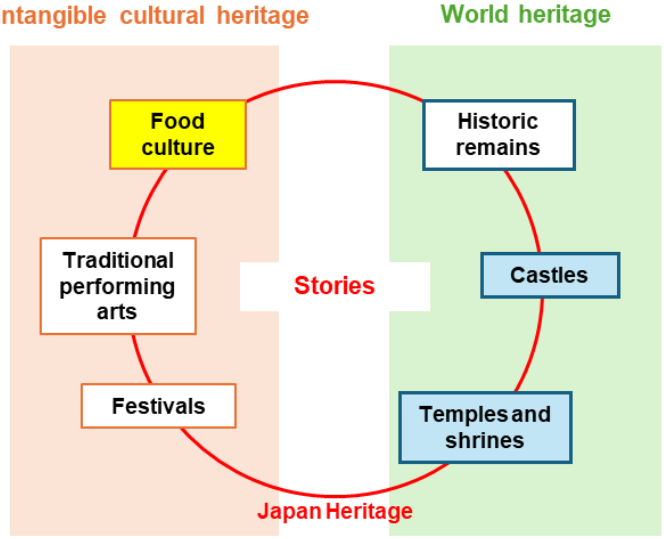
	Laos	India	Australia	UK	France	Germany	Italy	Hungary
Ikebana, tea ceremony, calligraphy	33%	52%	29%	32%	34%	24%	37%	30%
Traditional performing arts, traditional music	37%	49%	28%	31%	20%	22%	32%	23%
Literature, haiku	15%	42%	24%	27%	22%	19%	31%	24%
Sumo, martial arts	32%	54%	28%	28%	25%	28%	21%	20%
Bonsai	15%	39%	46%	32%	32%	34%	38%	41%
Anime, manga, games, cosplay	37%	63%	29%	37%	41%	29%	36%	23%
Pop music (J-pop)	24%	34%	16%	18%	13%	14%	8%	11%
Fashion (including kimono)	29%	47%	29%	37%	26%	27%	22%	24%
Films, television dramas	20%	54%	31%	31%	28%	22%	26%	26%
Japanese cuisine	57%	64%	81%	73%	79%	74%	59%	69%
Architecture	16%	47%	43%	43%	30%	44%	41%	43%
Lifestyle, mindset	50%	58%	69%	65%	57%	73%	65%	72%

	Egypt	Jordan	Saudi Arabia	Tunisia	United Arab Emirates	Iran	Turkey	Average
Ikebana, tea ceremony, calligraphy	44%	39%	57%	52%	51%	69%	62%	28.3%
Traditional performing arts, traditional music	44%	25%	42%	46%	42%	53%	35%	26.5%
Literature, haiku	41%	39%	55%	45%	45%	49%	34%	24.0%
Sumo, martial arts	51%	45%	62%	73%	56%	68%	71%	29.5%
Bonsai	31%	31%	30%	36%	26%	71%	37%	25.2%
Anime, manga, games, cosplay	53%	50%	63%	64%	63%	75%	52%	37.5%
Pop music (J-pop)	35%	23%	29%	35%	28%	30%	23%	17.6%
Fashion (including kimono)	45%	42%	57%	61%	54%	51%	41%	28.9%
Films, television dramas	50%	45%	58%	57%	57%	67%	54%	31.4%
Japanese cuisine	56%	45%	56%	50%	58%	51%	49%	48.6%
Architecture	58%	63%	80%	85%	78%	82%	75%	37.8%
Lifestyle, mindset	62%	67%	77%	82%	77%	79%	70%	47.9%

Note: This applies to respondents who selected "Culture" in response to a question about the areas in which they would like to learn more about Japan (with multiple answers allowed). Data for ASEAN, India, and Australia is from the FY2023 survey, and data for all other regions is from the FY2024 survey. Yellow indicates the highest figure for each country, and blue indicates the second-highest figure.

Source: https://www.mofa.go.jp/mofaj/gaiko/culture/pr/yoron.html Compiled by MGSSI (Last accessed on December 5, 2025)

Figure 6:Relationship between intangible cultural heritage elements, World Heritage, and Japan Heritage



Source: Compiled by MGSSI based on various sources

First, it is necessary to consider the preservation of memories of experiences and the verification of authenticity. As intangible experiences remain in memory only, items such as photographs, postcards, and landscape paintings—as noted earlier—have traditionally served as proof of such experiences. NFTs, which leverage blockchain technology to enable the verification of authenticity, are an effective means of replacing and further evolving this function in the digital domain. For instance, if experiences can be represented in a visual format through the issuance of commemorative coins after participation—as in ECHIZEN Quest (Figure 7)—it will become possible to record and verify the specific narratives that tourists have experienced. Furthermore, if such items can be acquired in a standardized format used everywhere in Japan, their collectible nature will likely serve as an incentive for visitors to tour nearby attractions.

Figure 7: Overview of ECHIZEN Quest

NFT coins designed to support traditional crafts (support coins) are charged to your wallet at the start of the tour.

Support coins can be used to send any amount to each business operator in the form of a tip during traditional crafts workshops.
*The monetary amount of the coins sent will be used to support the operations of the relevant business operator.

Receive a commemorative coin after the traditional crafts workshop!

A coin related to Murasaki Shikibu, who has ties to Echizen City, will be awarded.

Source: https://www.jtbcorp.jp/jp/newsroom/2025/10/07_jtb_nft_dx.html (Last accessed on January 14, 2026)

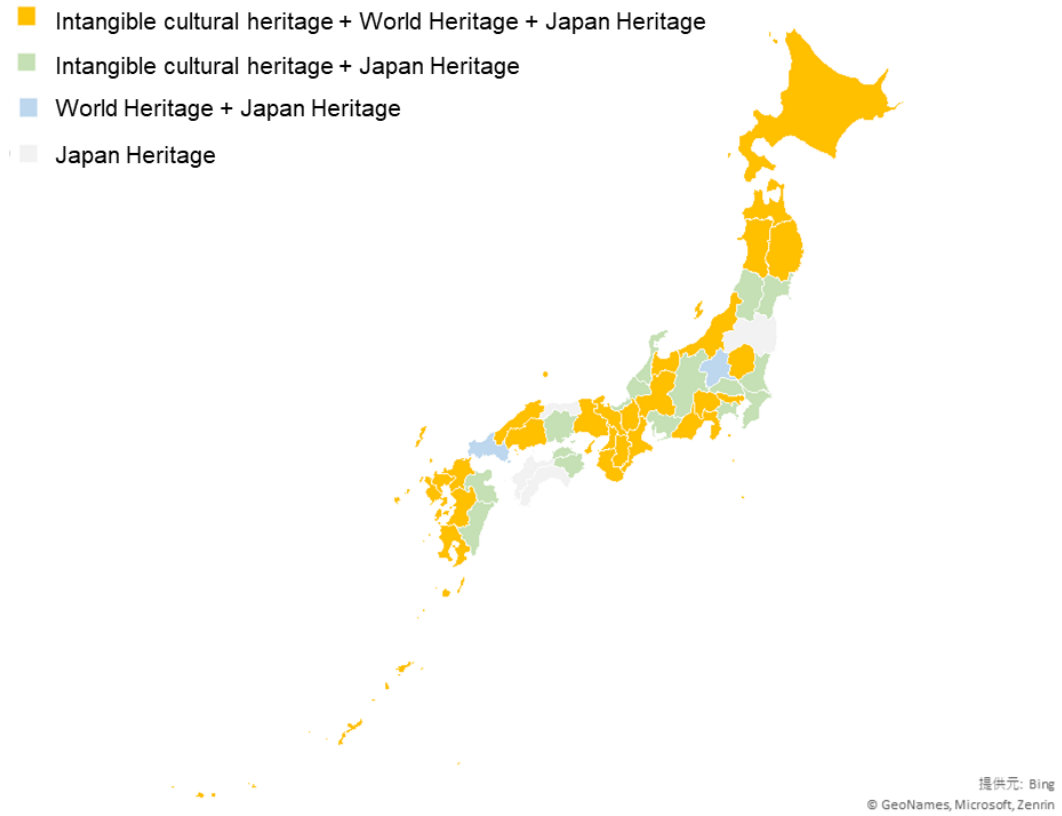
Second, it is necessary to consider how to compensate for lost opportunities. While Japanese cuisine and traditional performing arts can be experienced throughout the year, festivals and similar events are held only during specific periods, meaning that tourists often miss the opportunity to experience them. To compensate for this, it is important to leverage technologies such as VR and AR. For instance, Aomori City has established a system that allows visitors to experience the Nebuta Festival in VR (Figure 8), and making use of these technologies makes it possible to offer the experience at any time during the year. Moreover, these technologies are effective for both pre-trip learning and post-trip recollection, and are expected to contribute to enhancing the value of the experience. In the future, the realization of fully immersive VR will drastically increase the sense of immersion, further improving the quality of the experience.

Figure 8: Aomori Nebuta Festival in VR

Source: https://www.youtube.com/watch?v=AXfP97hmGbQ(Last accessed on January 14, 2026)

When examining the aforementioned issues, it is thought that effectively leveraging internationally recognized World Heritage sites and elements of intangible cultural heritage can serve as a compelling entry point. Therefore, during the initial stages, targeting regions that contain intangible cultural heritage elements along with World Heritage and Japan Heritage sites will make it easier to connect with narratives that align with the interests of individuals, enabling greater impact (Figure 9).

Figure 9: Distribution of various types of heritage in Japan



Note: Items not tied to a specific region, such as Japanese cuisine, are excluded from this list of intangible cultural heritage elements.
Source: Compiled by MGSSI based on various sources

3-4. Future Prospects

The increase in recognition resulting from the inscription of an element of intangible cultural heritage has the potential to revitalize local economic activity. To date, elements of intangible cultural heritage and Japan Heritage have faced the challenge of being more difficult to promote compared to more tangible World Heritage sites. However, advances in new technologies such as NFTs and VR are gradually opening up new avenues for their utilization. Going forward, integrating intangible cultural heritage elements along with World Heritage and Japan Heritage sites through narratives and leveraging them to promote tourism and regional development is expected to further revitalize local communities and aid in preserving their cultures.

In addition, the use of AI agents is also seen as a promising means of leveraging intangible assets. If they can generate narratives and propose travel itineraries based on an individual's interests and preferences, they will likely not only enhance the quality of experiences through a deeper understanding of the culture, but also promote wider visitation by guiding people to nearby areas. Furthermore, by making suggestions that avoid crowded locations and peak periods, AI can help mitigate the concentration of visitors at certain destinations, thereby contributing to efforts to address overtourism.

Currently, efforts are underway to inscribe new elements such as kagura music, hot spring culture, and calligraphy as examples of Japan's intangible cultural heritage, as well as to expand the scope of existing inscriptions, and it is hoped that advanced utilization of intangible assets by combining these new inscriptions with technology will aid in preserving and further developing Japanese culture.

4. Co-creation with Consumers with Regard to Biodiversity as an Intangible Asset (Nozaki)

4-1. What Are the Challenges?

Chapter 4 discusses biodiversity, a component of natural capital, as an intangible asset. According to a report[16] released by the World Economic Forum (WEF) in 2020, more than half of the global GDP is reliant on nature, and transitioning to a nature-positive[17] economy has the potential to generate USD 10 trillion in business value annually. As the WEF's recommendation suggests, given that many businesses are reliant on nature, it may seem commonsensical to promote a transition toward nature-positive business practices. However, in reality, some consider biodiversity initiatives to be in conflict with business opportunities.[18] On the other hand, according to a Cabinet Office public opinion survey[19] of general consumers, a high proportion of respondents—70.8%—expressed the opinion that environmental conservation efforts either contribute to economic development or do not hinder it. As it is expected that the respondents likely differ in their positions and levels of knowledge, the two survey results cannot be directly compared. However, a gap can be inferred to exist between companies' perception that such efforts are not profitable and consumer perceptions. Companies that see this gap as a business opportunity and seek to promote a transition toward nature-positive business practices will need to consider how they should engage in co-creation with consumers.

From a technical standpoint, biodiversity is inherently difficult to quantify. This is because it encompasses everything from the diversity of ecosystems, such as forests and grasslands, through to their functions, and even to elements invisible to the naked eye, such as genes (Figure 10). It is therefore not realistic to attempt to identify all living organisms involved in a company's supply chain or business operations. At the same time, consumers also find it difficult to understand the concept of biodiversity due to its lack of concreteness.

The challenge then lies in how to translate the value of conserving and restoring biodiversity—a concept that is difficult to comprehend—into value for consumers and to create conditions for co-creation.

Figure 10: Overview of biodiversity and related challenges

	Composition	Structure	Function
Ecosystem	Types and distribution of ecosystems Ex. Forests, grasslands, wetlands, oceans, deserts, etc.	Arrangement and relationships of biotic and abiotic components within ecosystems Ex. Habitat size, food chains, nutrient cycles, etc.	Roles and services provided by ecosystems Ex. Climate regulation, water supply, soil formation, production of biological resources, etc.
Species	Classification of organisms Ex. Animals, plants, fungi, microorganisms, etc.	Morphology and characteristics of a species Ex. Body color, reproductive capacity, adaptability, etc.	Ecological roles of species and interactions between them Ex. Pollination, predator-prey relationships, decomposers, etc.
Genes	DNA base sequences Ex. Types, number, order, and mutations of genes, etc.	Genetic structures and lineage Ex. Genetic differentiation by region, etc.	Adaptive capacity Ex. Tolerance to drought, salinity, and other hazards

Challenges (1) Developing technologies to visualize the complexity of biodiversity
(2) Transforming the value of biodiversity into value for consumers

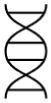
Source: Compiled by MGSSI based on various sources

[16] World Economic Forum
[17] The term "nature-positive" refers to halting the loss of and restoring natural environments negatively affected by economic activities and other factors. Ministry of the Environment, Nature-Positive | ecojin: Ministry of the Environment
[18] "Questionnaire survey on corporate biodiversity actions in Japan <FY2024 Survey>" In a survey conducted by Keidanren in 2024 on the activities of the Japan Business and Biodiversity Partnership, 54 out of 334 companies cited "Not contributing to profit" as a challenge in their biodiversity initiatives, a higher proportion than those citing "Indifference by the management" (12 companies), "No request from investors" (22 companies), or "No request from customers" (35 companies).
[19] *Overview of the Public Opinion Survey on Environmental Education* [in Japanese] (September 2025)

4-2. Advancements in Visualization Technologies

Efforts to visualize biodiversity are making gradual progress. Figure 11 presents the major technologies for visualizing biodiversity. The application of advanced technologies such as biotechnology, AI, and robotics in this field is making it possible to visualize biodiversity more efficiently.

Figure 11: Major technologies for visualizing biodiversity

Technology name	Overview	TRL*
Environmental DNA (eDNA) 	• Environmental DNA (eDNA) refers to DNA fragments of biological origin (such as scales) found in rivers, oceans, and soil. • Analyzing DNA present in the environment provides information on the distribution of organisms.	5～7
Soil met agenomics 	• DNA analysis of microbial communities inhabiting specific environments • Soil microorganisms are involved in the nitrogen, phosphorus, potassium (NPK) cycle, making them important in the agricultural sector.	5～7
Bioacoustics 	• Analyzing sounds captured by microphones placed in the environment over long periods to identify species-specific vocalizations of animals • Advances in AI technology enable rapid analysis of acoustic data.	5～7
Remote sensing 	• Enables observation of environmental changes using satellites, drones, and other technologies. • Enables low-cost monitoring of changes in land use patterns, etc.	7～9

*TRL stands for Technology Readiness Level; the closer the level is to 9, the more the technology has been demonstrated in a real-world environment.

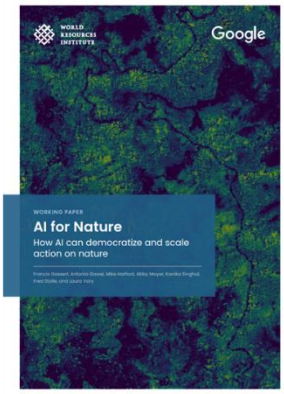
Source: Compiled by MGSSI based on various sources

In 2025, Google published a report titled "AI for Nature"[20] in collaboration with the World Resources Institute (WRI). The report discusses how AI can contribute to monitoring nature and related efforts amid the rapid decline of biodiversity (Figure 12). For instance, bioacoustics is the process of recording sounds emitted by various organisms, such as birds and amphibians, to identify their species. It used to be necessary to analyze audio data with multiple overlapping sounds, but the use of AI makes it possible to identify species more efficiently.[21] In 2024, Microsoft announced SPARROW[22], a satellite-based biodiversity monitoring service. Solar-powered cameras and microphones collect biodiversity data, which is analyzed within the satellite using on-board AI and then transmitted to the cloud via low-Earth orbit satellites. This provides researchers seeking to monitor biodiversity with access to valuable data even when they are in remote locations.

[20] AI for Nature. How AI can democratize and scale action on nature - Google Sustainability
[21] https://deepmind.google/blog/mapping-modeling-and-understanding-nature-with-ai/
[22] "SPARROW" announcement: An Innovative AI Tool for Measuring and Protecting Biodiversity in the World's Most Remote Areas – Japan News Center

Figure 12: Application of AI by Google (left) and Microsoft (right)

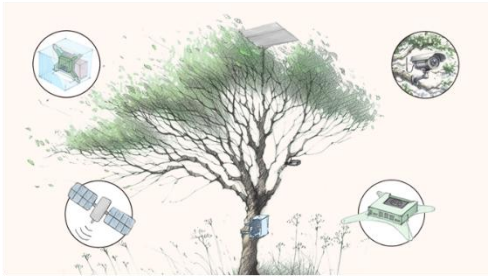
AI for Nature (2025)



- AI-driven analysis of data on forests, water resources, and other factors, enabling real-time monitoring
- The use of large language models promotes citizen science, making it easier for non-experts to access knowledge.
- AI promotes the understanding of complex systems through the simultaneous processing of various types of data.

Sparrow (2024)

- Edge AI for biodiversity monitoring
- Equipped with solar panels, and analyzes images, audio, and other data on-site using AI



Source:
（left）https://sustainability.google/reports/google-2025-AI-for-Nature/ (Last accessed on January 21, 2026)
（right）https://blogs.microsoft.com/on-the-issues/2024/12/18/announcing-sparrow-a-breakthrough-ai-tool-to-measure-and-protect-earths-biodiversity-in-the-most-remote-places/ (Last accessed on January 21, 2026)

The US-based nonprofit organization XPRIZE held a competition with a USD 10 million prize from 2019 to 2024 to evaluate technologies for assessing biodiversity in tropical rainforests.[23] The technologies evaluated included autonomous drones, bioacoustics, LiDAR, multispectral and hyperspectral sensors, environmental DNA, RGB cameras, and capture traps. Limelight Rainforest (US), the winning team, demonstrated that biodiversity data can be efficiently collected using technologies such as drones and machine learning.

As AI rapidly advances, it is increasingly recognized as an important tool not only for visualizing biodiversity but also for understanding its complexity. In addition, the roles of AI extend beyond mere visualization to include data collection by the general public, who are not experts.

4-3. Examples of Co-creation with Consumers

In addition to large corporations, the general public—who are not experts—also play a significant role in visualizing biodiversity. Citizen science refers to the collection of data and other information by members of the public in collaboration with experts,[24] and citizen science platforms are emerging that enable individuals to gather photos and audio data using their smartphones and similar devices. One such example is the platform iNaturalist.[25] Participants can communicate with one another by uploading photographs of organisms and other information. Furthermore, if the data is recognized as research-grade, it is integrated into data infrastructures such as the Global Biodiversity Information Facility (GBIF) and utilized in research and environmental conservation efforts. In Japan, Biome Inc. develops and operates the wildlife collection app "Biome."[26] When users take photos of plants, insects, and other organisms using the app, AI identifies the species and makes a record along with location data. Various entertainment-oriented functions, such as Ikimono Quest, which enables users to conduct biological surveys, and Ikimono SNS, a community for nature enthusiasts, are key features of the app. This approach is building a biodiversity database by engaging the public in a gamified format.

One company co-creating environmental value in the form of biodiversity with consumers is Sea Vegetable (Japan)[27], which is engaged in seaweed aquaculture. Seaweed production in Japan is on the decline. This is due to the progression of a type of marine desertification known as rocky-shore denudation. This occurs when naturally

[23] XPRIZE Rainforest Competition Page | XPRIZE Foundation
[24] SciStarter - SciStarter
[25] https://www.inaturalist.org/
[26] Biome: A living organism collection app – Biome Inc.
[27] https://seaveges.com/

growing seaweed in an area is fully consumed by sea urchins, fish, and other organisms, and it is believed to result from a combination of factors. The company has established a number of seaweed aquaculture methods, even for species for which no method had previously been established.

Engaging in seaweed aquaculture also contributes to the conservation and restoration of marine biodiversity. According to a report[28] released by the general incorporated association good sea (Japan), sea-surface aquaculture has resulted in up to a 36-fold increase in fish populations compared to areas where such aquaculture is not practiced. The report also suggests that positive messaging regarding the health and environmental benefits of seaweed will be able to enhance consumers' willingness to consume it.

When Sea Vegetable launched a crowdfunding[29] campaign to open its first restaurant in Yaesu, Tokyo, it raised 15 times its target amount shortly after the campaign began, indicating that the company is steadily expanding its fan base through co-creation with consumers (Figure 13). The company also runs a co-creation project[30] in which it collaborates with consumers and interested companies to develop business ideas. Companies in a wide range of sectors are participating, including financial institutions, real estate developers, retailers, and major media outlets. The company has launched a new initiative to explore new business models that transcend corporate and industry boundaries in addressing the major challenges of biodiversity.

Figure 13: Crowdfunding by Sea Vegetable

Source: https://www.makuake.com/project/seavege-stand/ (Last accessed on January 21, 2026)

4-4. Summary and Outlook

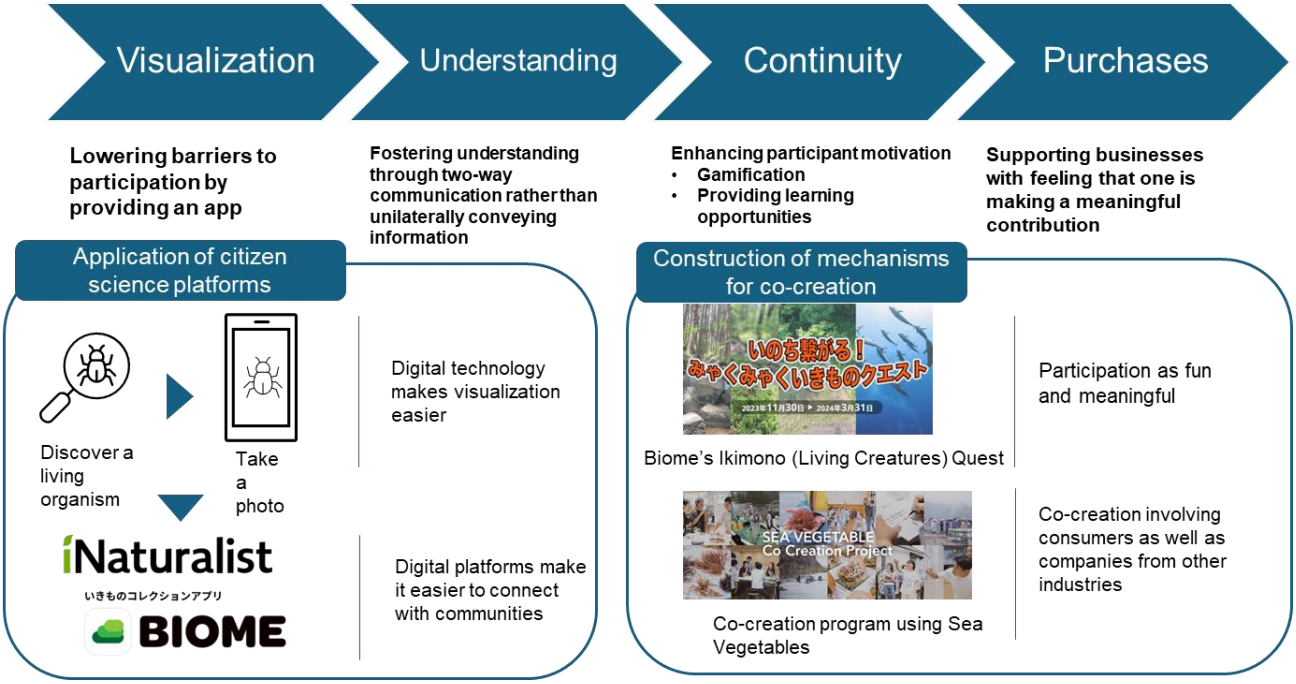
As noted earlier, while biodiversity is difficult to quantify, advancements in technologies such as AI and the expansion of citizen science platforms have enabled better visualization. As described in Google and WRI's "AI for Nature" report, the advancement of AI itself has been remarkable, and its capabilities have further improved since the report was published.[31] In addition, as the first groups of students who have had access to large language models throughout their entire university education begin graduating from 2026 onward, the number of students

[28] PRINT_GOOD SEA Future Report.pdf - Google Drive
[29] Starred Restaurants Around the World Take Notice! Sea Vegetable, the Seaweed Startup, Opens Its First Permanent Store [in Japanese] | Makuake – a crowdfunding service supporting innovative products and experiences
[30] Sea Vegetable Co-creation Project | Sea Vegetable LLC – SEA VEGETABLE COMPANY
[31] Refers to models such as Gemini 2.5 Pro and GPT-5.

and researchers with deep expertise in AI is expected to increase, and research in this field has the potential for dramatic advancements.

While some argue that such efforts do not contribute to business profits, it is important to note that leveraging citizen science platforms such as iNaturalist and Biome and incorporating entertaining aspects that are fun and engaging will make it easier for non-experts to participate in environmental conservation activities. This would also help deepen understanding of corporate-led biodiversity conservation initiatives. Citizens who participate in these activities are also consumers, giving companies the opportunity to increase their fanbase (Figure 14). In addition, initiatives that seek to connect companies, share challenges, and build new business models—such as those of Sea Vegetable—are emerging, and it will be interesting to see how these developments unfold.

Figure 14: Conversion into consumer value



Source: Compiled by MGSSI based on various sources
Connecting Life! Myaku-Myaku-Ikimono (Living Creatures) Quest – Biome Inc. (Last accessed on January 22, 2026)
Sea Vegetable Co-creation Project | Sea Vegetable LLC – SEA VEGETABLE COMPANY (Last accessed on January 22, 2026)

To address the major social issue of biodiversity, it will be important going forward to appropriately assess the degree of separation between companies (i.e., producers) and consumers, while collaborating with firms in other industries to build new business models.

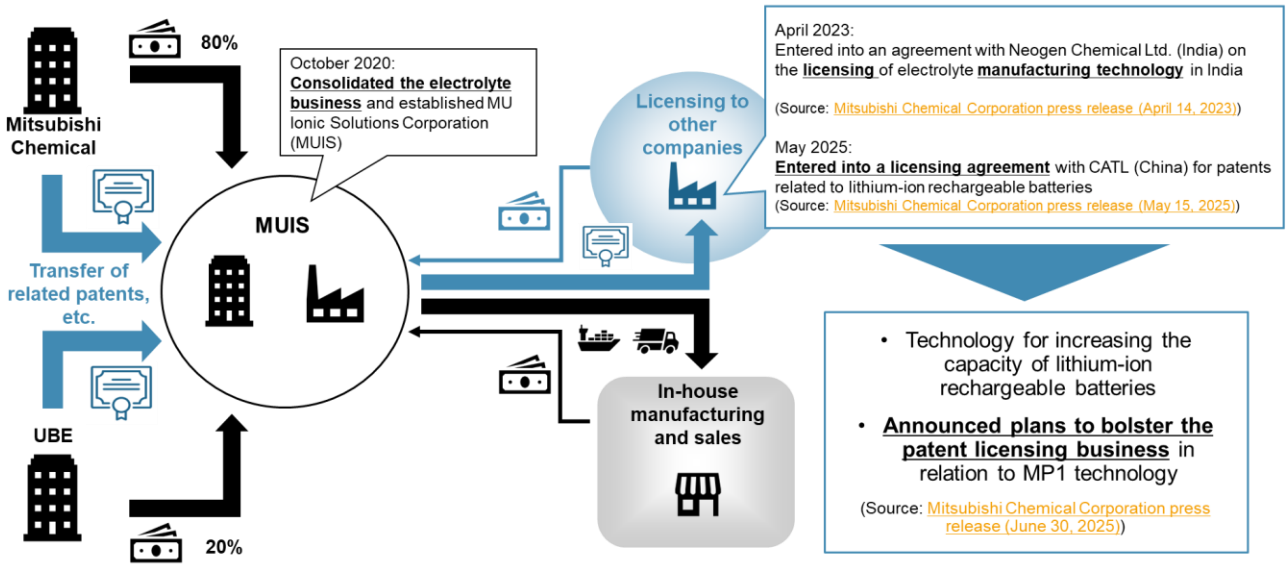
5. The Impact of Intellectual Property Externalization Strategies (Ishiguro)

In recent years, the process of externalizing intellectual properties (IP)—in which companies collaborate with external organizations and investors to make strategic use of their intellectual properties—has been attracting attention. This is a well-established strategy for companies to leverage intellectual properties, not only as a means of protecting proprietary technologies and business operations from imitation, but also as a management resource for generating new business and financing. Furthermore, this approach is expanding beyond intellectual property rights, such as patents, to encompass a broader range of intangible assets, such as brands, data, and expertise, and various initiatives, aimed at creating value from and circulating the intangible assets held by companies are beginning to attract attention.

Patents have conventionally been regarded as defensive assets used to protect a company's competitive

advantage. However, as global competition intensifies and the pace of technological innovation accelerates, an increasing number of companies can be seen actively sharing and collaborating with external partners on intellectual properties to promote open innovation. In the pharmaceutical industry, US-based Bristol-Myers Squibb (BMS) carved out patents related to treatments for autoimmune diseases and established a new company through a USD 300 million financing round led by an investment fund (US-based Bain Capital). BMS will retain a portion of the new company's shares while earning ongoing revenue through a royalty-based structure. In the chemical industry in Japan, MU Ionic Solutions (Japan)—a joint venture between Mitsubishi Chemical (Japan) and UBE (Japan)—is accelerating its global expansion by licensing its proprietary MP1 Technology, which improves battery performance, to battery manufacturers both in Japan and overseas (Figure 15).

Figure 15: Acceleration of global expansion through patent utilization



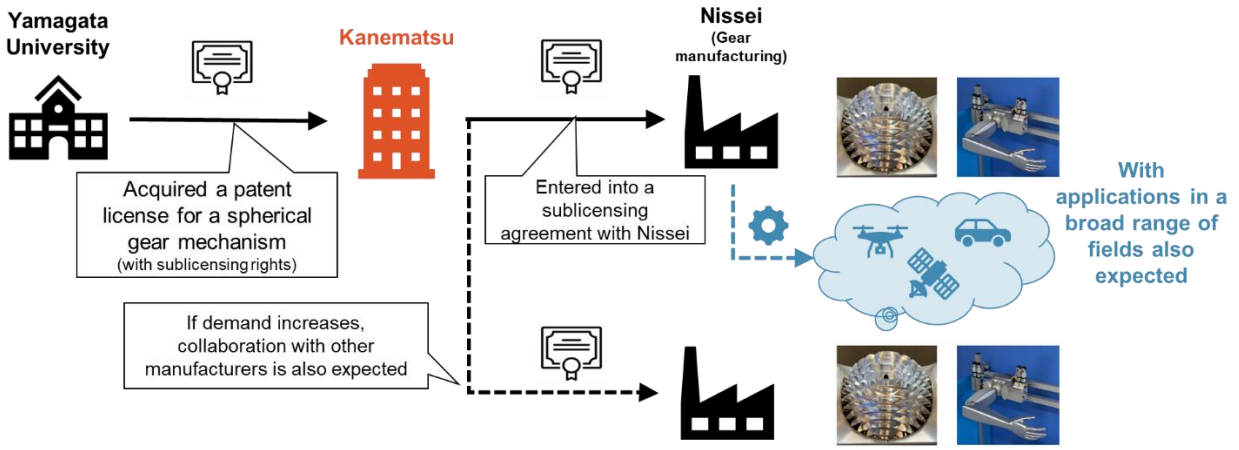
Source: afif / stock.adobe.com、Source: Compiled by MGSSI based on Mitsubishi Chemical press releases

Utilization through the externalization of patents is expanding beyond the manufacturing sector. On July 22, 2025, the US-based major music entertainment company Universal Music Group (UMG) announced a partnership with Liquidax Capital (US), a firm specializing in patent development, management, and licensing. The two companies plan to expand their portfolio of music-related AI technology patents and license them globally through Music IP Holdings (US), a new company established under this partnership.

Furthermore, new cases are emerging in which global investment and trading companies are taking the lead in promoting the externalization of intellectual properties held by other organizations. Kanematsu (Japan), for instance, obtained a patent license for a spherical gear mechanism invented by Yamagata University and, in 2025, concluded a sublicense agreement with gear manufacturer Nissei (Japan) (Figure 16). The mechanism is a highly versatile gear that allows unlimited rotation along the X, Y, and Z axes, with expected applications in a wide range of fields, including robotic joints and medical devices. Going forward, possibilities include collaboration with startups, fundraising through intellectual property funds, and joint research projects with universities and research institutions.

This trend toward the externalization of intellectual properties has the potential to drive the creation of new businesses, revitalize industries, and contribute to addressing social issues in healthcare, the environment, and education. By positioning patents as a management resource and leveraging them in an integrated manner alongside intangible assets such as data, brands, and algorithms, companies are expected to be able to simultaneously achieve corporate growth and create social value.

Figure 16: Emergence of trading companies taking the lead in intellectual property transactions



Source: Compiled by MGSSI based on Kanematsu press releases and various other sources

A trend can also be seen toward the new development of intellectual properties that make use of NFTs. NFTs use blockchain technology to verify the uniqueness and ownership of digital assets and are widely used in fields such as art and gaming. More recently, however, the wave of NFTs has been extending into the world of IPs, particularly in digital content.

For instance, in August 2025, Sony (Japan) and Mercari (Japan) announced a new initiative utilizing NFTs for IP management and distribution. NFTs such as art and trading cards began to be sold on the Mercari platform using Soneium, a blockchain technology developed by Sony Block Solutions Labs (Singapore), a subsidiary of Sony. The two companies aim to collaborate on promoting the development and provision of NFTs and digital content-related services relating to various IPs, as well as on building a new ecosystem. This is expected to result in the formation of a new digital economy, combining Mercari's base of 23 million monthly users with Sony's technology and IP assets. Converting digital content and other intangible assets into NFTs enables highly transparent transactions and rights management. Utilizing NFTs makes it possible to automate processes ranging from IP licensing and sales to secondary market transactions through smart contracts, significantly reducing the burden of complex contractual procedures and issues related to rights ownership. In addition, Calbee (Japan) announced Karuretto, an IP management platform leveraging blockchain technology, on April 17, 2025. The platform aims to simplify credit management and licensing operations for external creators, and to streamline IP operations. Karuretto is built on decentralized identifiers (DID) and blockchain technology, enabling the recording and sharing of IP issuance, ownership, transfer, and usage history in the form of digital certificates to allow creators to quickly and easily license their designs.

NFTs are increasingly being utilized in fields such as publishing, music, and tourism (Figure 17). Shueisha (Japan) is converting popular manga works into NFTs and recording ownership logs using blockchain technology to streamline copyright management. In the music industry, the distribution of NFT-based audio enables the automatic allocation of royalties during secondary market transactions. In addition, as noted in Chapter 3, in the tourism sector, NFT stamp collection events have been incorporated into regional touring services and are being used to create travel mementos and promote understanding of local areas. NFTs also play a role in visualizing the value of IPs for the international community and enhancing their liquidity as an asset. This has given rise to a variety of innovations, including new forms of financing using IP as collateral, promoting investments in startups, and supporting the monetization of individual creators' works.

Figure 17: Examples of NFT usage

Company (Country)	Details	Industry or sector
Sumitomo Corporation Group (Japan)	Incorporated an NFT stamp collection activity into a sightseeing service making use of EV taxis	Tourism and transportation
AEON (Japan)	Converted T-shirts jointly created with other companies into NFTs and sold them as digital items wearable in the XANA metaverse	Fashion and retail
Sapporo Breweries (Japan)	Distributed NFT membership cards and entry tickets as part of a campaign for beer fans to improve engagement with fans	Beverages and food
Sogo & Seibu (Japan)	Opened its own NFT marketplace and converted artwork for young people into NFTs	Retail and art
Shueisha (Japan)	Converted manga works into NFTs and managed logs and ownership information via blockchain	Publishing and copyrights
Fanplus (Japan)	Converted audio tracks into NFTs and automatically distributed royalties upon secondary market transactions	Music and copyrights
Candy Digital (US)	Partnered with MLB, Netflix, and others to develop NFTs as digital collectibles	Sports and entertainment
Adidas (Germany)	Sold limited-edition NFT items and granted rights to wear them in the metaverse and exchange them for physical goods	Fashion
Pixar (US)	Sold NFTs of popular characters, selling out all 55,000 items in 24 hours	Films and entertainment
ANote Music (Luxembourg)	Converted music copyrights into NFTs and established a system for automatic royalty distribution	Music and copyrights

Source: Compiled by MGSSI based on various sources

Furthermore, with the emergence of new systems that combine AI agents and decentralized technologies, the creation of value from intangible assets—including intellectual properties—is expected to accelerate even further going forward. An example of this is the automation of intellectual property distribution through AI agents. An IP marketplace could conceivably be established, in which AI analyzes the content of patents and copyrights to match them with the most suitable licensees or investors. Moreover, by integrating with smart contracts, the entire process from contract execution through to royalty distribution can be handled in real time, significantly reducing transaction costs, and this is expected to increase the importance of the integrated management of intangible assets in a broad sense, including data, algorithms, and brand value. If mechanisms are put in place to evaluate and facilitate the circulation of intangible assets held by companies, such as IP, AI models, and datasets, it would constitute a significant shift from their conventional role as merely defensive tools to serving as a foundation for new business creation.

Through these developments, intellectual properties are shifting from being defensive assets to offensive assets, signaling a new era in which companies can build new business models centered on intellectual properties. The integration of AI, blockchain, and other cutting-edge technologies will continue to increase the value and expand the utilization of intangible assets, pointing toward a future in which social issues can be addressed while simultaneously creating economic value.

6. Future Prospects

The value of intangible assets is not determined solely by a company's unilateral definition and management. Rather, it is formed through its relationships with society and evolves over time. This report discussed co-created assets, intangible cultural heritage elements, biodiversity, and the externalization of intellectual property, all of which illustrate that intangible assets are not static in nature and instead derive their value through social processes.

Going forward, it will be important to appropriately integrate digital technologies such as NFTs and AI as a means of supporting the creation of value for intangible assets. NFTs can serve as a means of providing society with access to intangible elements, such as engagement and history, while AI can play a complementary role in detecting emerging signs of value creation and shifts in value based on the data accumulated. On the other hand,

technologies themselves do not create value. Rather, a company's ability to sustain its competitive advantage depends on how well it understands the context in which intangible assets develop and its ongoing efforts to design its relationship with society.