

Fujitsu Technology and Service Vision 2024





The tipping point of AI evolution and sustainability

Both business and society are being transformed by the rapid evolution of technology.

In January 2024, Fujitsu surveyed 800 CxOs from 15 countries to understand the impact of new technology, with specific focus on sustainability transformation¹⁾. According to the survey, 52% of business leaders believe that the accelerating pace of technological change is creating a huge turning point for business and society.

The rapid evolution of AI is at the heart of these technology advances. Generative AI is projected to drive between \$2.6 trillion and \$4.4 trillion in productivity gains for the global economy²⁾. Clearly, the response to AI evolution is now high on the management agenda.

At the same time, sustainability has become an increasingly critical challenge around the world. In 2023, average temperatures reached record highs across many regions. Referred to as global boiling, this is already having a significant impact both on economies and on our daily lives.

As a result, we've arrived at a tipping point, where AI evolution and the sustainability challenge intersect. It's a tipping point that provides a unique opportunity for us to build a different future.

1) Fujitsu commissioned Oxford Economics to conduct a survey of CxOs in Europe, North America, APAC and Japan (online and partially interviewed).

2) The economic potential of generative AI, McKinsey & Company, June 14, 2023.





Our purpose

Make the world more sustainable by building trust in society through innovation



Faced with this major tipping point, it is important to review our own purpose and strategic direction. Based on our purpose, Fujitsu is committed to achieving sustainability transformation that delivers value to the environment and society through technology.

In Fujitsu Technology and Service Vision 2024, we describe the new enterprise model required, how technology can enable transformation and the concrete actions we need to take together now.

CEO message

Our world is facing serious challenges, from environmental pressures to climate change. These are impacting all aspects of our daily lives and corporate activities. All organizations now need to respond to these challenges by placing sustainability at the heart of their operations.

In parallel, the technologies required to address these challenges are evolving exponentially. AI-based solutions, including generative AI, are already in everyday use by people without any previous expertise. We believe that technology will continue to accelerate innovation across society and our daily lives.

At this pivotal time, how can technology help us to drive sustainability transformation? Fujitsu Technology and Service Vision 2024 explores this key question now facing organizations across the world. We focus on three areas - **solving global environmental issues, developing a digital society and improving people's well-being** - to deliver materiality and realize Fujitsu's purpose.

Last year, Fujitsu set a new vision for 2030, to **'become a technology company that realizes net positive¹⁾ through digital services'**. This reflects our determination to ensure we deliver a net positive impact to society through our corporate activities.

While continuing to respect our values of challenge, trust and empathy, as set out in The Fujitsu Way, we will contribute to the realization of a sustainable future by working together with people across nations and industries to solve complex social issues.

May 2024

1) Net positive: to have a positive rather than negative impact on society.

A portrait of Takahito Tokita, the Representative Director and CEO of Fujitsu Limited. He is a middle-aged man with grey hair, wearing glasses, a light purple shirt, and a dark suit jacket. He is smiling slightly and looking towards the camera. The background is a blurred indoor setting with warm lighting. In the top right corner of the page, there is a white circular icon with three horizontal lines.

Takahito Tokita

Representative Director
CEO
Fujitsu Limited

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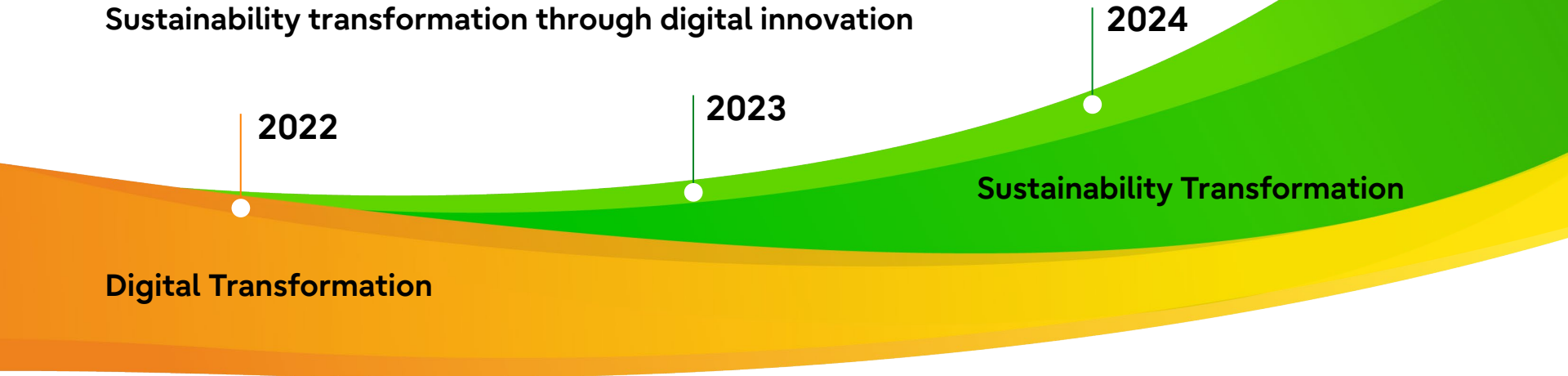
Fujitsu Technology and Service Vision (FT&SV)

FT&SV is an evolving story that describes the future we want to create with our customers and partners, how technology empowers people to realize our vision and the actions we need to take now.

In 2022, we set 'driving sustainability transformation through digital innovation' as our key theme for the next 10 years, and described how organizations need to transform to integrate sustainability into their core business operations.

With the evolution of AI and sustainability now becoming critical management priorities, what actions do organizations need to take to ensure a sustainable future?

Sustainability transformation through digital innovation



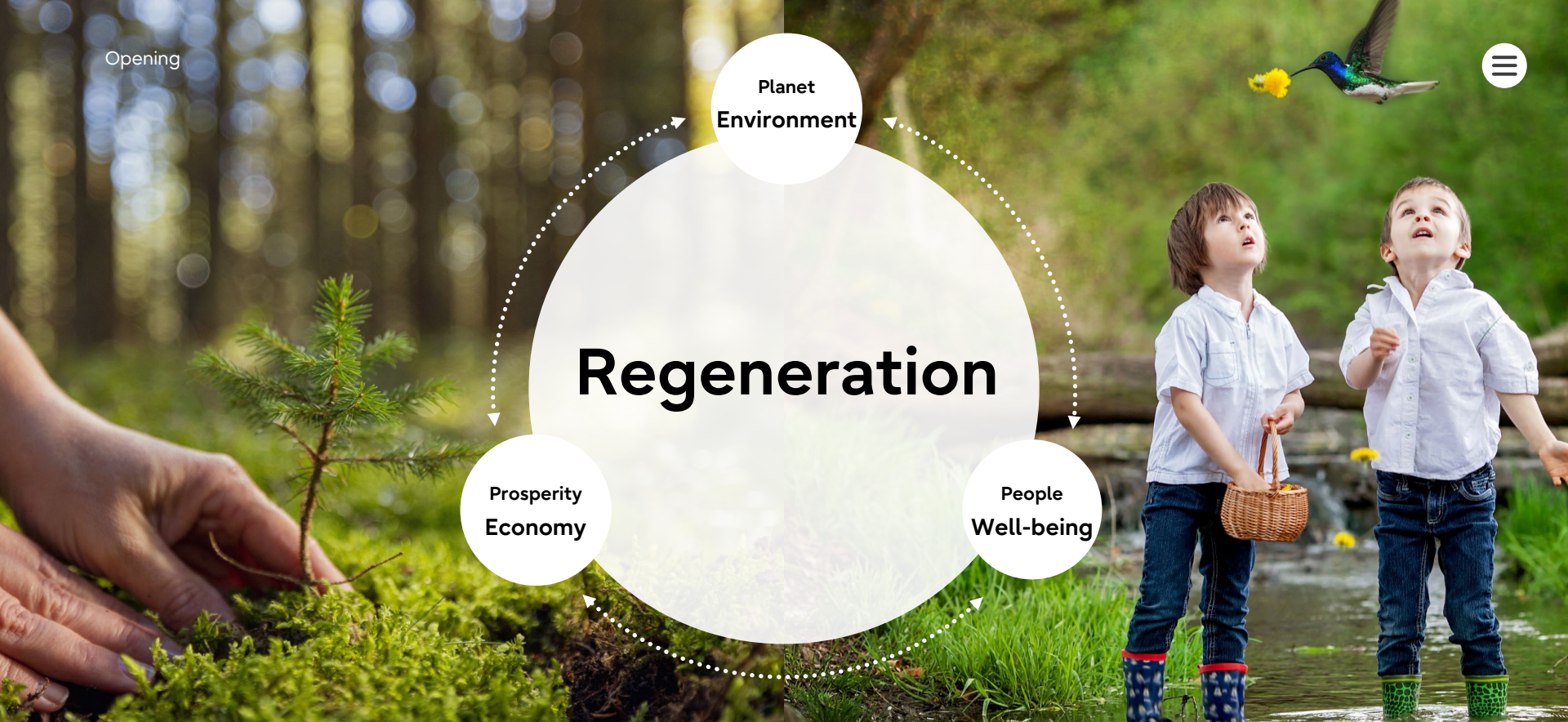
Digital Transformation

2022

2023

2024

Sustainability Transformation



We believe that the key word for our time is Regeneration. We need to regenerate the global environment and ensure that everyone can enjoy a healthy and fulfilling life.

To drive regeneration, various stakeholders need to cooperate to ensure that economic activities generate net positive value both for the environment and well-being, while achieving sustainable growth together.



A regenerative enterprise

An enterprise regenerating the environment, economy and people

As organs of society, all organizations should make a social and environmental contribution, in addition to pursuing their economic interests. Indeed, organizations have now become critical stakeholders in leading the regeneration of the environment, economy and people.

Rapidly evolving digital technologies have great potential to regenerate both the environment and people's well-being. We refer to organizations that use technology to create net positive value for the environment, economy and well-being as **regenerative enterprises**.

In FT&SV 2024, we outline our vision for regenerative enterprise. We explore the role of technology in realizing this vision and describe how we can partner with you to help your organization become a regenerative enterprise.

Regenerative enterprise

1



Sustainability and technology are key management issues



AI is now the 3rd most impactful external factor

The business environment is becoming increasingly uncertain. According to the Fujitsu survey, business leaders believe that both political and economic issues, such as inflation and geopolitical tension, as well as environmental and well-being concerns, are directly affecting their businesses. More than half of those surveyed confirmed that their long-term businesses performance has become increasingly inseparable from environmental and social sustainability.

In addition to these sustainability challenges, the survey highlighted the rapid advance of AI, which is now expected to be the third most impactful external factor. Indeed, more than half of those surveyed believe that their response to the rapid advance of AI will determine the future of their businesses.

External factors with the biggest impact over the next 12 months

- 1 Inflation, interest rates and exchange rate fluctuations** **Politics and economics**
- 2 Geopolitical tension and conflict** **Politics and economics**
- 3 Rapid advance of AI** **Technology**
- 4 Energy issues** **Environment**
- 5 Pandemics** **Well-being**
- 6 Intensifying cyber-attacks** **Technology**
- 7 Climate change** **Environment**
- 8 Poverty, inequality and access to education and healthcare** **Well-being**

Number of samples: 800



AI will permeate a wide range of tasks within the next three years



Now, with the rapid evolution of AI functionality, organizations are trying to strengthen their use of AI across more areas of their operations. Indeed, 88% of organizations said they expect to increase their investment in AI in 2024, compared to 2023. So, in which areas of business do we expect AI to have the most impact?

According to our survey, organizations are currently using AI mainly for automating customer-facing work, routine tasks and support activities. Within the next three years, about 80% of organizations plan to expand AI into areas requiring more complex judgment, from enhancing products and services through to supporting management decision-making. How will this wider, accelerated use of AI impact business and society?

The use of AI will expand to areas requiring more complex judgment within the next three years

Current status of AI usage		Plan to use AI within three years	
Automation of customer service, such as chatbots	52%	Enhancing products and services, such as dynamic pricing	82%
Human tasks supported by generative AI, such as ChatGPT	31%	Enhancing management decision-making	79%
Creation of images and other content	22%	Automating business processes, such as supply chains	74%



Our goal is to use AI in 80% of our processes by 2025. In some cases, this will be end to end, in some cases not, but they'll be touched or governed by AI in some way.

Chief Data Officer, Healthcare, UK



The impact of AI

Positive and negative impacts of AI on economies, employment and the environment

Evolving AI technologies have the power to boost economic and business growth, most notably through innovation and productivity improvement. According to our survey¹⁾, 73% of leaders say that the collaboration between people and AI will create new ideas and innovations, while 66% say AI deployment will increase human productivity, enabling organizations to deliver greater performance while keeping their employees.

Conversely, research by Goldman Sachs²⁾ predicts that 300 million jobs could be automated by the deployment of generative AI. In terms of environmental impact, the International Energy Agency³⁾ forecasts that electricity consumption by AI will be 10 times higher in 2026 compared to 2023, due to the increased power requirements of large-scale AI models.

Before AI is deployed, we need to take very careful consideration of both the positive and negative impacts it could have on people and the environment.

Innovation and productivity created by AI will contribute significantly to business and economic growth

Collaboration between people and AI will create new ideas and innovations

73%

AI deployment will increase human productivity, enabling organizations to deliver greater performance while keeping their employees

66%

Number of samples: 800

1) Fujitsu commissioned Oxford Economics to conduct a survey of CxOs in Europe, North America, APAC and Japan (online and partially interviewed).

The evolution and growing use of AI could have a significant impact on employment and the environment

The number of people whose jobs could be automated by generative AI

300 million

Electricity consumption by AI in 2026 compared to 2023

10 times

2) The Potentially Large Effects of Artificial Intelligence on Economic Growth, Goldman Sachs, March 2023

3) Electricity 2024, IEA, January 2024



Facing sustainability challenges

In addition to technology advances, the response to the sustainability challenge is also high on the management agenda.

In 2023, GDP showed a growth rate of 3%¹⁾, as the global economy continued to grow. In line with this economic growth, global CO₂ emissions also increased, by 1.1% from the previous year²⁾. Meanwhile, the percentage of people living in extreme poverty, which had declined in recent years, started to increase in 2023.³⁾

We need to make urgent efforts to reduce greenhouse gases to achieve the international community's goal of limiting temperature rise to within 1.5 degrees Celsius of pre-industrial temperatures by 2030. At the same time, we must strengthen our efforts to improve people's well-being.

Clearly it is not easy to improve the global environment and people's well-being while also maintaining economic growth. In response to this challenge, what goals should organizations set and what actions should they take?

While the global economy grows, the environmental burden increases and addressing economic inequality remains a challenge

Rate of increase in CO₂ emissions (2023)

1.1 %

GDP growth rate (2023)

3.2 %

Rate of increase in the number of people living in extreme poverty (2023)

8.1 %

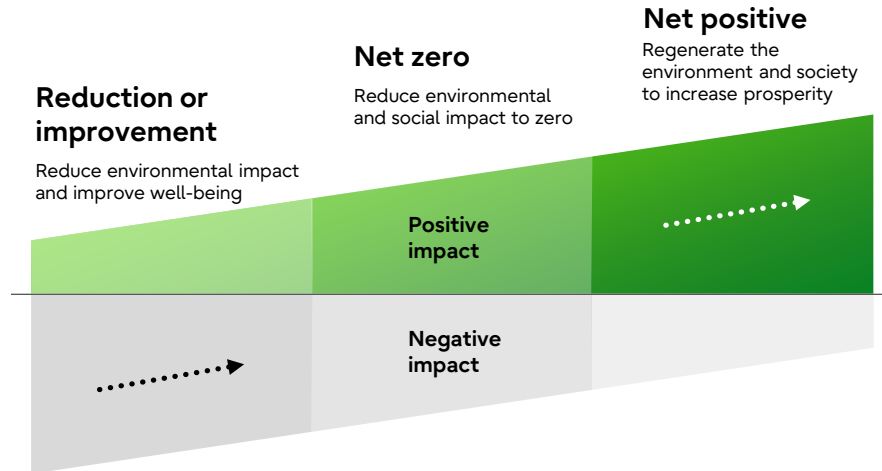
1) World Economic Outlook, IMF, April 2024 2) CO₂ Emissions in 2023, IEA, March 2024, 3) Global Poverty Update, World Bank, Sept 2022 and Sept 2023

Net positive beyond net zero

Efforts to regenerate beyond sustainability

Net zero is the goal of achieving zero emissions by balancing greenhouse gas emissions and absorption. Net positive, however, aims to go beyond net zero by making a positive impact on the environment and society to create a more prosperous world. As concerns around environmental and well-being sustainability grow, organizations are now beginning to focus on these goals.

Organizational initiatives supporting net positive range from technology innovation, more efficient use of resources and conversion to renewable energy through to closer cooperation with local communities. These initiatives contribute to a more sustainable future by regenerating the environment and people's well-being.



Engaging in sustainability as a business

Challenges to balancing sustainability and economic growth

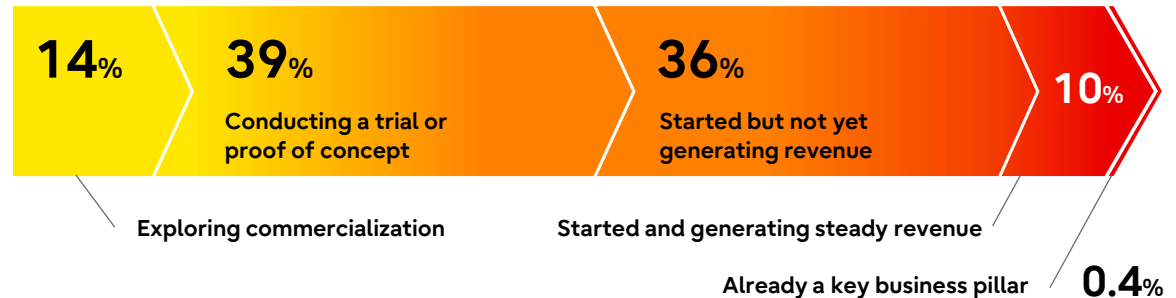
To realize the ultimate sustainability goal of net positive, organizations need to put sustainability at the heart of their growth plans and engage in sustainability as a business.

In our survey, over half of organizations engaged in sustainability transformation identified achieving more sustainable use of energy, decreasing waste, promoting recycling and contributing to sustainable economic development as important business opportunities. So far, however, only a few organizations have started to generate revenue from these opportunities.

Sustainability transformation can be a large-scale and complex process, involving many internal and external stakeholders. In addition, it may not yield immediate financial returns.

So, how can organizations transform to overcome these challenges and establish sustainability as one of their key business pillars?

Progress in the commercialization of sustainability opportunities



Number of samples: 794 (organizations who answered 'engaging in sustainability')
Calculated based on the progress in the commercialization of each for the top three key business opportunities selected by respondents





Regenerative enterprise

Using AI-based technologies to regenerate the environment, economy and well-being

We believe that by harnessing the power of rapidly evolving technologies such as AI, organizations can not only streamline their businesses but also accelerate sustainability transformation, helping to regenerate the environment and people's well-being while creating new economic models.

We describe an organization that uses technology to create net positive regenerative value to the environment, economy and well-being as a regenerative enterprise. A regenerative enterprise will focus on implementing sustainability initiatives as a business while at the same time driving business growth.

Examples of the regenerative value created by a regenerative enterprise include:

Environment

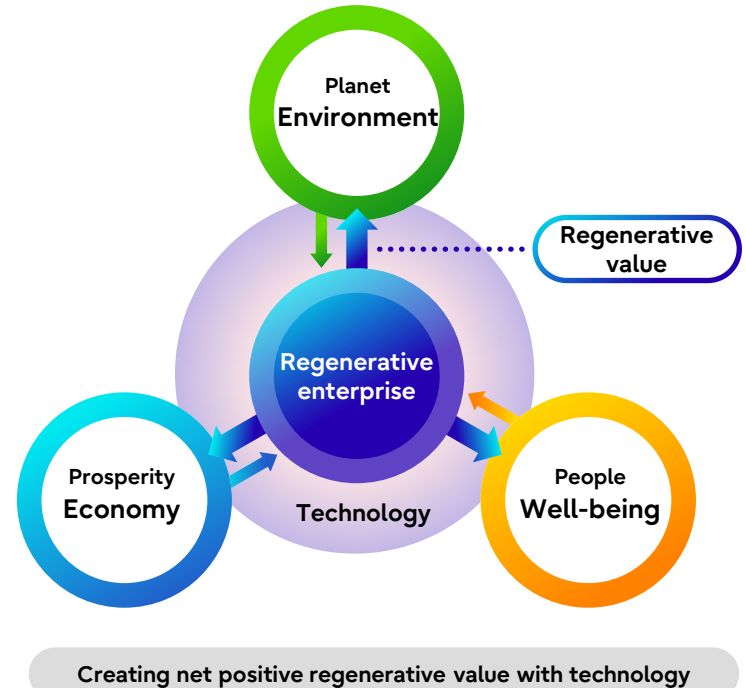
Reducing greenhouse gases in the atmosphere by developing materials that absorb CO₂.

Economy

Creating new economic models that encourage organizations to change their behavior toward sustainability.

Well-being

Extending healthy life expectancy by delivering healthcare that supports the prevention, prognosis and treatment of health problems.

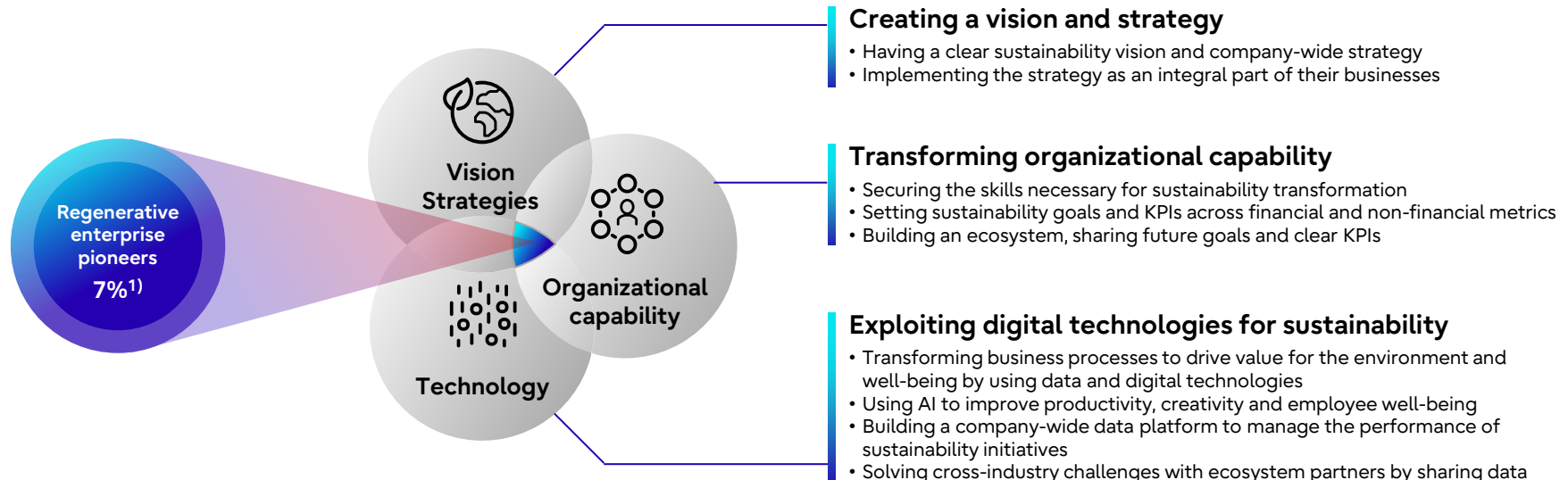




Pioneering regenerative enterprise

The transformation into a regenerative enterprise requires medium to long-term commitment. Organizations need to develop a clear vision and strategy for sustainability, enhance their organizational capabilities and promote the use of technology. We define an organization with these characteristics as a pioneering regenerative enterprise.

Only 59, or 7%, of the 800 organizations we surveyed are already regenerative enterprise pioneers. We now explore the common characteristics of these pioneer organizations.



1) Regenerative enterprise pioneers: 59/800 (number of companies)



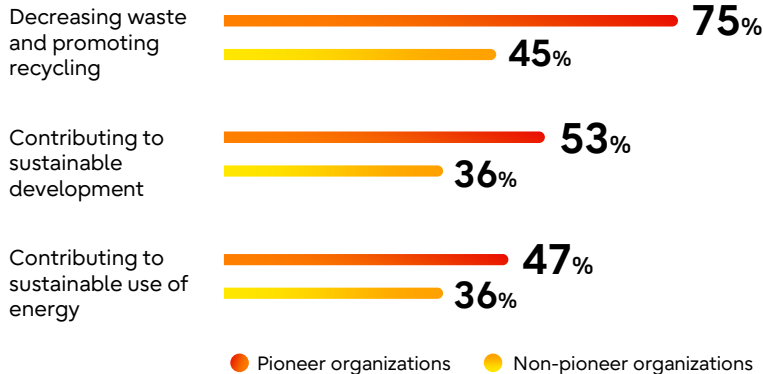
Balancing sustainability and business growth

Pioneer organizations increase financial, customer and employee value, while adding new value to the environment and society

According to our survey, pioneer organizations have successfully created more business opportunities from sustainability initiatives than other organizations. These pioneer organizations are successfully undertaking sustainability transformation and are steadily implementing sustainability as a business.

Over the past year, many pioneer organizations have increased their revenue and operating profit, as well as customer and employee satisfaction compared to other organizations. Pioneer organizations continue to create financial, customer and employee value, while adding new value to the environment and society.

Pioneers create more business from sustainability opportunities



Number of samples: 794 (organizations who answered 'engaging in sustainability')

Creating financial, customer and employee value while investing in sustainability opportunities



Number of samples: 800 (organizations who answered 'improved or significantly improved')



Focusing technology on sustainability

Using technology to drive transformation

Pioneer organizations are focused on the impact of technologies, especially AI. They are already transforming their businesses by using technology.

According to our survey, nearly all pioneer organizations plan to increase their investment in AI this year compared to last year. Of these, 20% plan to increase investment by at least 10%. The survey showed that 97% of pioneer organizations already have an organization-wide AI strategy and AI usage guidelines.

86% of pioneer organizations believe that strengthening their use of AI will contribute to the success of their sustainability transformation. Almost all pioneer organizations are using data and digital technologies to develop new businesses that address environmental and social issues.

Setting an organization-wide AI strategy and AI usage guideline¹⁾



Strengthening the use of AI will contribute to the success of sustainability transformation¹⁾



Using data and digital technology to develop new businesses that help solve environmental and social challenges²⁾



● Pioneer organizations ● Non-pioneer organizations

1) Number of samples: 794 (organizations who answered 'engaging in sustainability')

2) Number of samples: 798 (organizations who answered 'engaging in digital transformation')



Leveraging technology to transform

According to our survey, pioneer organizations are already using technology across various areas of their businesses to drive new value. Examples include improving the customer and employee experience, reducing CO₂ emissions and waste, together with increasing business and social resilience.

The wider adoption of initiatives such as these will help to create a more sustainable future. The first step towards transformation is to paint a picture of the organization you wish to become. In the next module, we describe our vision for organizations of the future.

Sustainability transformation using technology is underway across various areas



Delivering personalized, online and offline customer experience value for everyone

Increasing employee productivity and engagement through AI-powered automation

Developing environmentally friendly materials using high-performance computers and AI

Visualizing manufacturing and supply chains in real time to respond quickly to changes

Reducing waste by tracing and recycling products in the value chain



2

Technology
vision



The future of regenerative enterprise

So far, we have discussed the business and social impact of AI and why organizations need to transform to regenerative enterprise. How will regenerative enterprise evolve in the future?

We believe organizations will increasingly drive collaboration between people and AI to create regenerative value with a net positive impact on the environment, economy and people's well-being.

In this module, we explain how future regenerative enterprises will operate in a radically different way, and how they will be enabled by evolving digital technologies.



Human intelligence and AI growing together

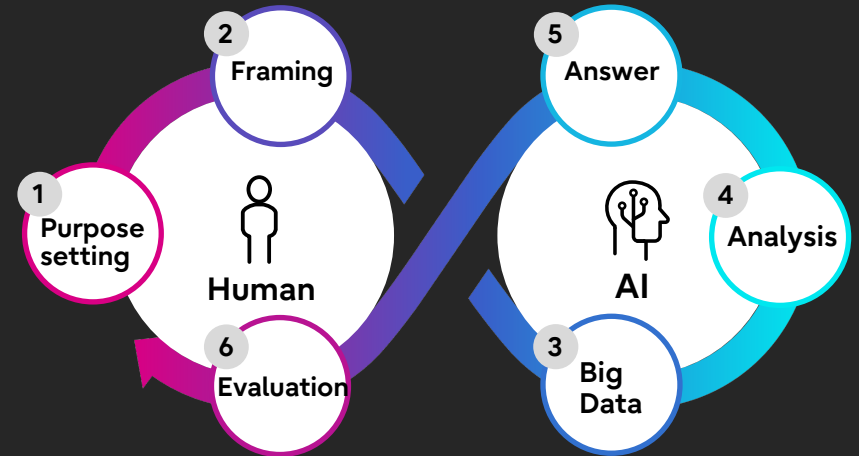
A complementary relationship

Advanced AI will be at the heart of the technology required to enable regenerative enterprise. With the advent of interactive generative AI such as ChatGPT, AI is already helping to support creative work and decision-making. However, there are concerns around privacy, transparency, the impact on people's jobs, as well as the political and economic consequences of disinformation. How will the relationship between people and AI develop in the coming years?

We believe that people and AI will develop a complementary relationship in which their roles will utilize their respective strengths. AI has the advantage of being able to analyze vast amounts of data very quickly, rapidly deriving insights that people would be unable to find. People, on the other hand, have a comparative advantage in asking questions, setting meaningful objectives and capturing tacit knowledge and inspiration derived from sensations, emotions and experiences.

In Fujitsu's survey, business leaders said that the three most important skills employees should develop in the age of AI are sense-making capability to give purpose, critical thinking and the ability to collaborate with others. We believe people should also be encouraged to use innate human qualities, such as empathy and sensitivity, that AI is unable to replicate. People will deploy data and digital technologies through AI to create new value and grow their knowledge and capability together.

Collaboration of people and AI



Human intelligence

- Sensemaking¹⁾
- Questioning skills
- Tacit knowledge, inspiration and intuition
- Emotions and body sensations

AI

- Finding correlations from data
- Multi-tasking with computation
- Instantly generating multiple patterns of information and ideas

1) Sensemaking: the ability to make sense of a complex situation and make reasonable decisions



Four characteristics of the future enterprise

We will now explore the characteristics of regenerative enterprise through four viewpoints: who creates value, what value is created, how value is created and where value is created.

Through four future scenarios, we provide practical examples of regenerative enterprise in action. We also describe the enabling technology breakthroughs, including AI and the latest technologies from Fujitsu.

— Who

1. AI is becoming our trusted assistant



— What

2. Regenerative value from AI and data



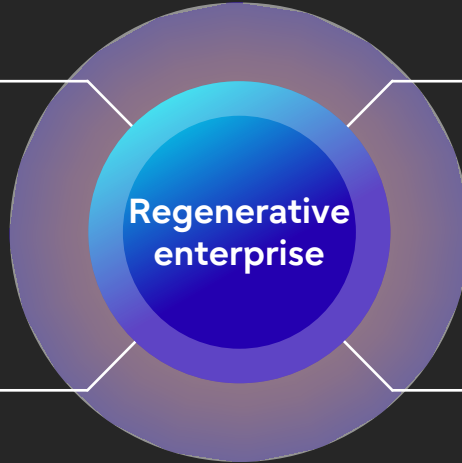
— How

3. Autonomous distributed decision-making



— Where

4. Physical-digital converged ecosystems





1

Who



AI is becoming our trusted assistant

Who will create value in the future enterprise? We believe that the future enterprise will be built around close collaboration between people and AI. In our survey, 70% of business leaders said that people and AI will complement each other and become partners in enhancing each other's capabilities. Organizations will change from creating value from human knowledge and experience to creating value through collaboration between people and AI.

In terms of people development, organizations will need to enhance the unique human capabilities that distinguish their people from AI. We expect that generative AI will be used extensively for training and skills development in this area.

These changes will help to improve well-being across society, enabling people to develop their creativity and other unique human capabilities. In addition, the dramatic improvement in corporate productivity will help to address the serious labor shortages, caused by aging population, in many countries, including Japan.

How will future organizations manage and use AI? We must solve the problem of AI ethics and false information. We need transparent and trustworthy AI that operates according to social norms and organizational rules.

Today

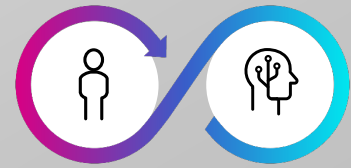
Value creation based on human knowledge and experience



People

Future

Value creation through human-AI collaboration



People

AI

Being more creative with AI

Eddy is leading the development of new sustainable food products at SustenaFood, a global company. Under the purpose of 'achieving well-being for people around the world through food innovation', SustenaFood provides a variety of food-based services and products. Eddy was born with hearing difficulties. Now he works tirelessly with trusted AI tools to design new products.

Eddy talks with his buddy AI in sign language, collaborating with various specific AIs to plan the next new product. Planner AI instantly offers multiple product ideas in response to the customer insights he hypothesizes. When Eddie isn't sure which idea to pursue, he consults research AI, using market data and real customer feedback to help him identify the best candidates. He then creates a compelling story that appeals to customers, while using designer AI to create a retail store with a restaurant attached in a virtual space. Through this beta virtual store, Eddy can test-market to potential customers around the world, enabling him rapidly to iterate his planning.

By working with various AIs through a series of product planning processes, Eddy's creativity and productivity is enhanced significantly. As Eddy works with new project themes every day, he continues to work actively, creating new questions and improving his storytelling skills.

**Self-realization
through work**

**Growth by
increasing
productivity**



AI platforms augmenting human capabilities

What helps people to collaborate with AI as a trusted assistant, in the way described in Eddy's story? We believe that enabling more natural communication between people and AI, and building trust in AI, will be essential to realizing AI's full potential.

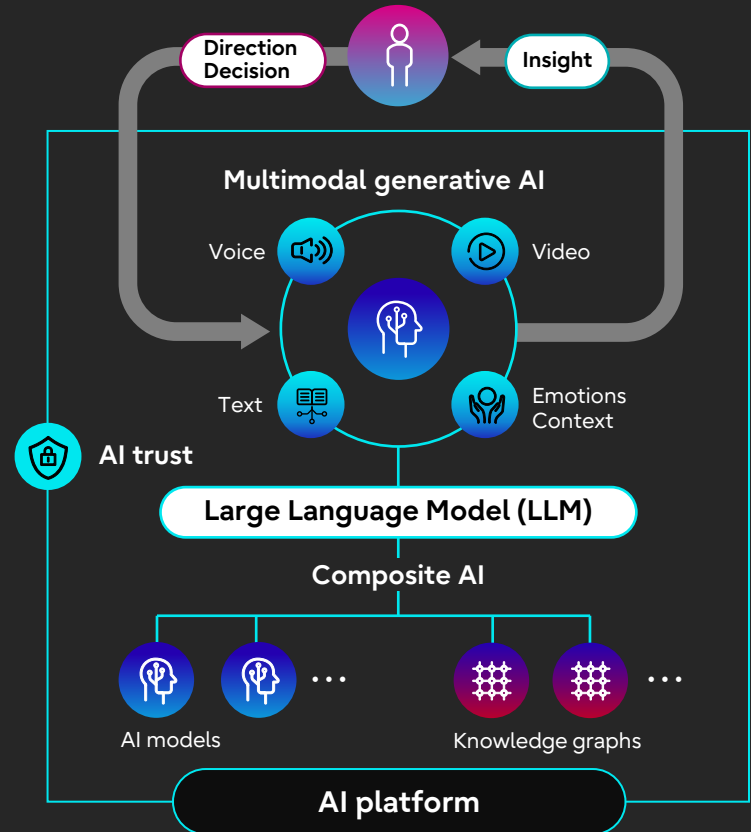
We can already have text-based conversations with generative AI. This generative AI will evolve into a multimodal generative AI that reads and interprets various kinds of information, such as audio, video, human emotions and context, making it possible for anyone to interact with AI more naturally. With multimodal generative AI as the interface, people can access the vast knowledge of organizations through Large Language Model (LLM). Composite AI that automatically orchestrates multiple specialized AI models and knowledge graphs¹⁾ will help us solve even the most complex problems.

For people and AI to be true partners, trust is essential. Trust technologies for generative AI that adequately address issues around disinformation, fairness and discriminatory bias will be critical.

People will access AI platforms consisting of diverse AI models and knowledge graphs through natural communication with trusted generative AI. By gaining insights from AI platforms, people will be able to grow, while the capability of the AI platform itself will also be strengthened.

1) Knowledge graph: a systematic graphical representation of various knowledge connections

Interactive communication between people and AI



AI

Platform and technologies enabling value creation by people and AI

Platform to accelerate AI adoption

Fujitsu has established an AI Platform, introducing the latest technologies to help organizations accelerate their adoption of AI. We're focused on developing AI technologies that drive closer cooperation between people and AI. For example, generative AI amalgamation technology follows instruction through natural language, automatically combining AI functionality relevant to specific tasks. We also deliver AI services using facial recognition to check health status and support communication.

Generative AI and Large Language Model (LLM) for automation

Fujitsu is working to improve the performance, efficiency and security of generative AI technologies. For example, we're developing technologies that can efficiently perform LLM learning using the Fugaku supercomputer.

We have also developed open source-based secure LLM that uses trusted data. In addition, with generative AI, we're developing technologies to detect errors or omissions in documents automatically and to automate source code generation and maintenance, helping to improve the efficiency and quality of system development.

Generative AI trust technologies, improving trust in AI

Fujitsu is leading AI ethics initiatives and the development of AI trust technologies. We're now developing services to detect hallucination and technology to identify whether a URL is actually a phishing site. We're strengthening AI trust technologies, focusing on quality, security and ethics, at research centers in the UK and Israel, to create a society where people can use AI with confidence.



2

What

Regenerative value from AI and data

We have previously created value by consuming natural resources. In the future, it will be possible to create new regenerative value from AI and data, producing a net positive impact on the environment, economy and well-being.

Data is increasingly stored on the AI platform, making it easy for anyone to use as a knowledge base. As a result, there are ongoing initiatives to analyze various types of data, creating regenerative value from AI in multiple industries.

For example, the molecular structure data of materials and proteins, and the structure data of genes, can already be analyzed and processed by AI.

AI is already accelerating the development of new materials for CO₂ absorption and the search for new drug compounds.

In the future, the evolution of AI and computing will enable the end-to-end development process to be stimulated in the digital space, drastically shortening the development lead time. Fujitsu's survey reveals that about 80% of business leaders expect the power of AI and computers will continue to increase, helping solve complex environmental and social challenges.

All industries will embrace AI-based data processing capability, increasingly blurring the boundaries between data and physical reality.

Today

Consuming resources and converting them into economic value



Resources



Economic value



Future

Creating regenerative value from AI and data



AI and data



Regenerative value

Developing food with low environmental impact

Taylor is a food scientist, working in the Innovation Center of SustenaFood. He is pioneering the development of cultured meat¹⁾, which will provide the basis for Eddy's new product. In the livestock industry, water consumption and emission of greenhouse gases have become major challenges. Cultured meat is expected to become a sustainable food source that can address these challenges. There are many hurdles for the commercialization of cultured meat, such as the effective promotion of cell proliferation, safety verification and the set-up of factory environments for stable production. AI and computing are accelerating the innovation required to enable mass production.

Taylor uses AI to analyze vast amounts of data, including scientific literature, to learn about biological processes relating to cell growth and protein synthesis. Through digital simulations, he has successfully discovered a chemical that can cultivate muscle fibers with 3D structure without losing taste, texture or nutrition. Meanwhile, he has conducted simulations to verify the safety and nutritional value of the developed cultured meat. Most of the R&D and manufacturing processes he uses involve cooperation between different AIs in the digital space. In this way, AI and computing are reducing the lead time for commercialization significantly, enabling the mass production of sustainable meat.

1) cultured meat: a new type of meat produced by the culturing of animal cells.

Creating
new markets
by new
product
introduction

Reducing
environmental
footprint



Integrating AI and computing to create regenerative value

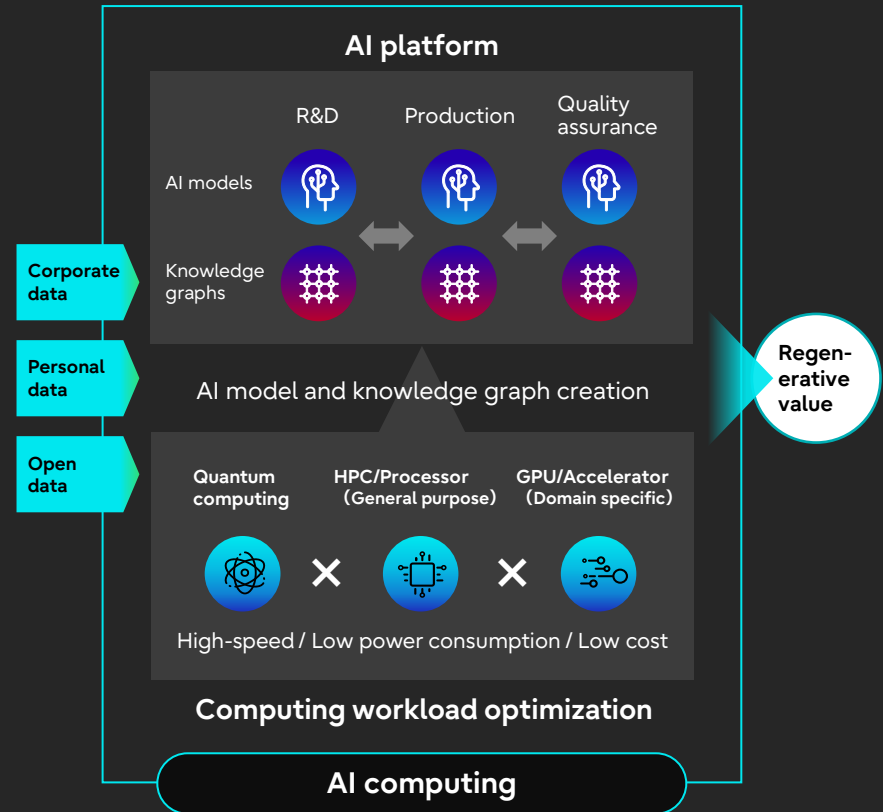
As described in Taylor's story, creating regenerative value from data requires linking AI models across R&D, manufacturing and evaluation processes. The integration of AI and computing makes this possible.

Prediction and judgement by specialized AI can already make specific processes more efficient. Intensive research is now being conducted to enable the inference of complex causality, such as downstream and upstream impact across supply chains, by combining multiple specialized AI models and knowledge graphs, and using corporate, personal and open data.

For example, in drug development, efforts are underway to combine AI models for development, manufacturing and clinical trials. Multiple AI models can share and learn from data, enabling both more efficient searching for target molecules, as well as production cost prediction and safety evaluation in clinical trials, even in the R&D phase. Understanding the relationships between these factors will help shorten drug development timescales significantly.

The convergence of AI and computing will accelerate this process. Selecting the ideal computing technology with low power consumption for large-scale data processing and the creation of AI models and knowledge will help us to overcome complex challenges. In addition to GPU and HPC, scalable high-speed computing environments, including quantum computing will be developed and integrated with AI platforms, accelerating the creation of regenerative value.

Regenerative value from combined AI models



AI x Computing

Computing technologies that drive the evolution of AI

Using AI to derive causal relationships from large-scale data

Fujitsu has been engaged in the development of knowledge graphs and explainable AI, with an early focus on applications in healthcare. We're now integrating computing and AI technology to explain causality from large-scale data, applying this approach across various industries. We're also enhancing our graph technology, combining large-scale knowledge graphs and generative AI to verify relationships between more than 1 billion pieces of data, enabling us to visualize complex events and network structures.

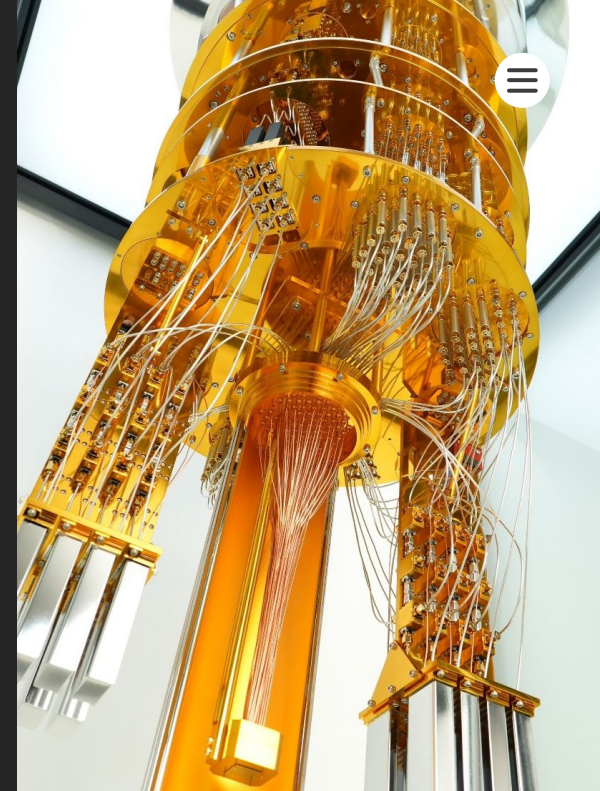
The evolution of computing with AI

We're pursuing new ways to integrate computing and AI technologies. These include addressing the shortage of GPU units. For example, Fujitsu is developing AI Computing Broker technology that dynamically assigns GPUs to computations requiring GPU functionality, switching between CPU and GPU computation processing in real time.

We're also focusing on technology to reduce the increasing power consumption of AI computing, and developing FUJITSU-MONAKA, a next-generation data center processor that combines high performance with low power consumption. Based on this CPU technology, we will create new AI computing technologies to improve AI performance while reducing power consumption.

Large-scale computations with Quantum-HPC hybrid computing

Fujitsu has developed a hybrid quantum computing platform that can be used in conjunction with a quantum simulator and a superconducting quantum computer jointly developed with RIKEN. We will develop a quantum computer with 256 qubits in 2025 and 1,000 qubits in 2026. At the same time, we will accelerate the speed of quantum simulators and strengthen our co-creation with university and corporate partners to integrate these with AI technologies and expand potential application areas.



Quantum computing

Fujitsu is pursuing the exciting potential of quantum-based software and hardware technologies through joint development with world-class research institutions.

3

How



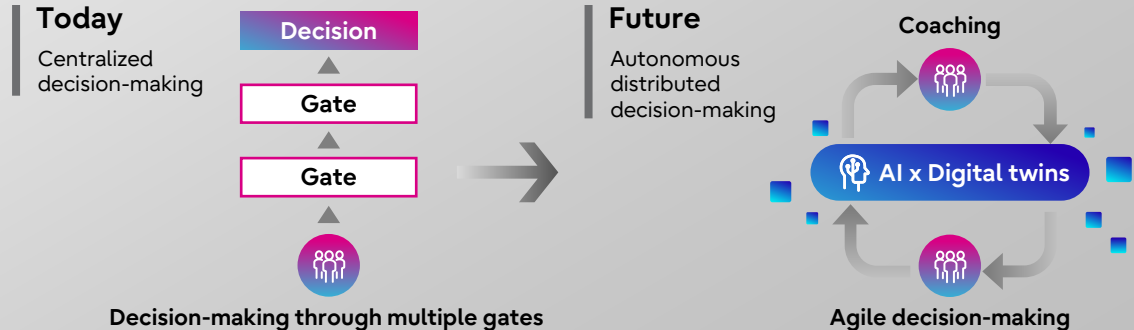
Autonomous distributed decision-making

In times of uncertainty, organizations need to make agile decisions based on reliable data. Previously, it was common to have gated decisions by multiple departments. In the future, data-visualization and AI-driven decision support will empower the edge of the organization to make autonomous judgements with agility.

Our survey found that 74% of business leaders believe that organizational structures will be flatter and more decentralized by 2030, because AI will enable more autonomous decision-making.

Predictive simulations powered by AI and digital twins that mirror diverse data inside and outside the organization in the digital space will play an important role.

With access to digital twins of the organization, front-line employees can understand the changing environment in real time, responding to changes quickly based on AI-based simulations. In turn, management and support functions can provide data-driven coaching and assistance, helping employees to work autonomously and to pursue innovation.



Enabling quick decision-making

As an in-house entrepreneur at SustenaFood, Sarah is the project leader for a new food delivery service. She aims to improve customer well-being and reduce food waste by selecting foods that meet the exact needs of individual customers, using the products created by Eddy and Taylor.

Sarah uses digital twins and AI to make decisions about raw material sourcing, production and logistics in the face of daily changes in demand due to weather conditions and customer preferences. For example, she conducts digital rehearsals to validate production and delivery plans by combining digital twins of sourcing, manufacturing and logistics. Digital twins and AI predict the food selection and quantity for each household based on local events and individual purchasing history, updating both procurement and manufacturing plans in real time to ensure delivery as required. These changes will be shared with the relevant departments via digital twins and AI, helping them to reduce costs and waste across all operations. This allows SustenaFood not only to improve customer satisfaction but also to reduce food waste.

This approach also protects their operations against unforeseen circumstances. For example, in the event of a natural disaster, Sarah simulates a recovery plan, selecting alternative suppliers and changing delivery routes to prevent major disruption to service operations. Leveraging digital twins and AI enhances the agility of the organization, enabling more resilient operations and delivering new value to customer experience and the environment.

Improving
organizational
agility

Reduction of
waste



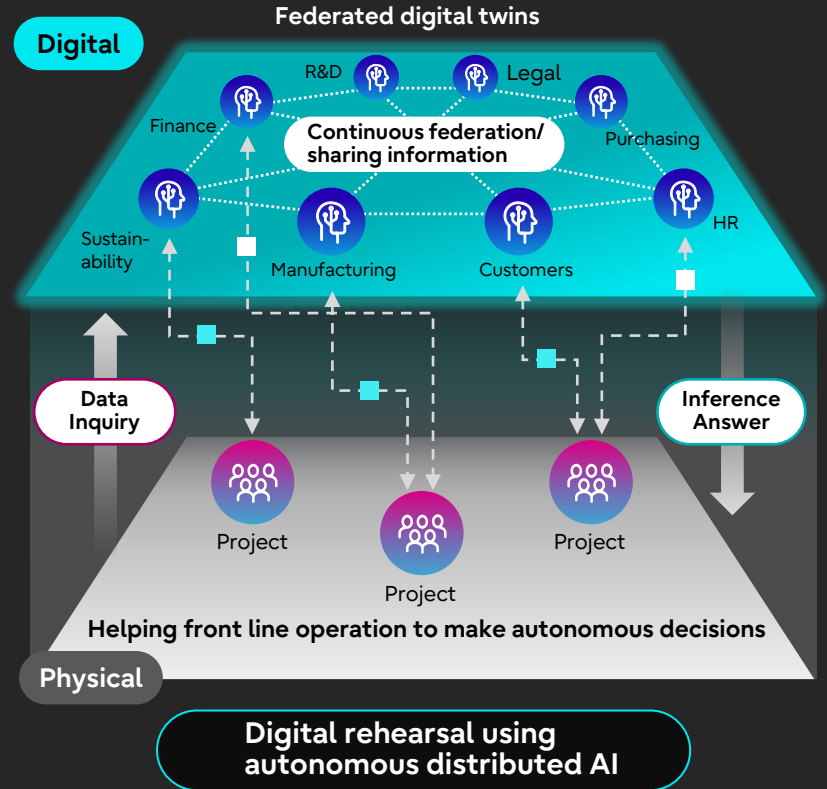
Digital rehearsal to increase agility on the front line

In the future, digital twins will be built to visualize the status of various fields, such as customers, manufacturing and human resources, enabling process automation and decision-making support. Autonomous decision-making on the front line will be realized by using federated digital twins connecting various fields and specialized AI models, and by combining knowledge from the humanities and social sciences that provide insight into human behavior.

Federated digital twins and AI models work together to predict complex real-world situations. The results of digital rehearsals that simulate impacts of multiple scenarios are shared by relevant departments, so that project teams can make quick decisions. For example, in response to demand forecasts, organizations can formulate multiple scenarios to expand production lines with increased human and production resources. From these scenarios, organizations can make decisions based on various criteria, such as revenue, profits and CO₂ reductions. Project teams can cooperate through digital twins and AI with related departments to execute plans quickly, for example to make real-time adjustments to production lines.

AI-based simulations incorporating knowledge from humanities and social sciences will help project teams to consider individual work styles and skills. In addition, these simulations help employees to work in the most effective way by optimizing their working hours and health management. Autonomous decisions by project teams will increase organizational agility while improving the productivity and well-being of individual employees.

Supporting autonomous decision-making



AI x Converging Technologies

Converging technologies to enhance business agility and resilience

Federated digital twins supporting decision-making

Fujitsu is developing Converging Technologies to pursue innovation by integrating digital technologies with the humanities and social sciences. These technologies include federated digital twins, combining digital twins from various areas of business and society. Multiple scenarios generated by digital twins and AI will help people on the front line to make better decisions, taking into account broader financial and environmental considerations.

Fujitsu is also conducting field trials with our partners to create Social Digital Twin solutions in fields such as urban planning and mobility. For example, we're working with Carnegie Mellon University to improve safety at traffic intersections by visualizing traffic flows. We're also developing digital twin technologies to reproduce the state of oceans in the digital space, predicting changes in the ocean environment and the impact of potential actions using simulation.

Predictive simulation through digital rehearsals

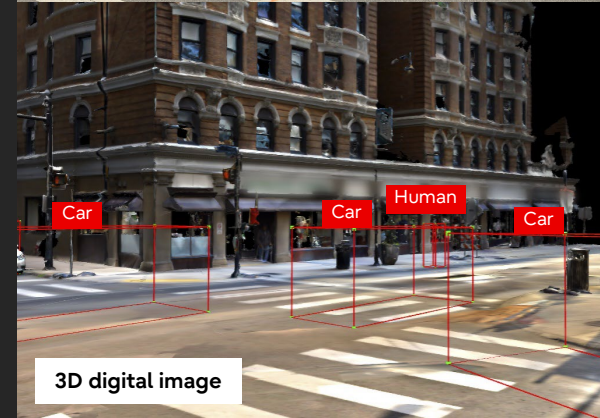
While supply chains have traditionally focused on efficiency, sustainability is now becoming an equally important driver. Fujitsu is developing digital rehearsal technology to create scenarios that realize both efficiency and environmental value by monitoring production and distribution status in real time and developing more advanced simulations that reflect wider economic perspectives.

Understanding and predicting human behavior

Fujitsu is pursuing research and development that combines behavioral economics and AI to understand and predict human behavior. Together with our partners, we're working to improve the environment and well-being by shifting from combustion engines to EVs and public transportation, at the same time helping people to adopt healthier lifestyles.



2D camera image



3D digital image

Social Digital Twin

With the help of AI, the 3D shapes and positions of objects were digitally reconstructed from the images of one monocular camera, achieving high accuracy.



4 Where

Physical-digital converged ecosystems

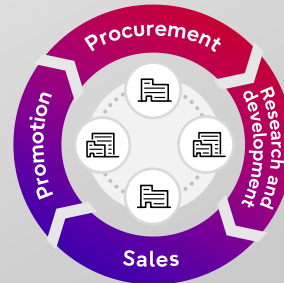
In the future, people and AI will connect and collaborate in a converged physical and digital world. In this converged world, organizations will engage with their customers and compete with other businesses. It will also be a place where organizations work together with multiple stakeholders, including partners, governments, research institutions, NPOs and individuals, sharing a common purpose. In this way, regenerative value will be co-created to address complex challenges.

What kind of mechanisms are necessary to connect organizations and help them do business in a converged physical and digital world? It's clear that we'll need to build trusted ecosystems that utilize digital trust technologies, including cybersecurity, 6G networks, Web3 and blockchain.

We can expect that a new digital economy will emerge, distributing regenerative environmental and well-being value as tokens across trusted ecosystems. This will help change the mindsets and behaviors of people and organizations.

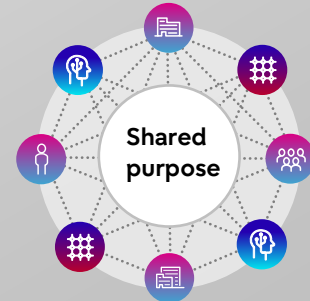
Today

Business through physical-world value chains



Future

Business in physical-digital converged ecosystems



Future scenario #4

Co-creation with a shared purpose

To pursue its purpose, SustenaFood is building a digital ecosystem with partner organizations, co-creating regenerative value and developing new businesses as we have previously described.

By collaborating with healthcare companies, welfare and care facilities, sports equipment manufacturers, research institutions and many others who share a common purpose, SustenaFood is issuing well-being tokens that can be used across their shared ecosystem. Users can choose to share healthcare-related information such as diet and exercise, enabling personal-health AI to suggest personalized meal plans and training, including preventive medicine and mental health programs where they can interact with people with similar interests, in a virtual community created by the ecosystem partners. Tokens are given when eligible services and products are purchased and in response to actual healthy behaviors. These well-being tokens can also be exchanged with different types of sustainability tokens issued by other ecosystems. The visualization of well-being value through tokens increases people's interest in health and promotes healthy behaviors.

In a new digital economy backed by digital trust technologies such as Web3, security and networking, new cross-industry digital services are being co-created every day.

Extension of healthy life expectancy

Realizing new digital economies





Trusted ecosystems for distributing regenerative value

Building a trusted ecosystem requires digital trust based on Web3 distributed platform technology, security technologies to protect data and value, and a network capable of connecting organizations, individuals and other stakeholders in real time.

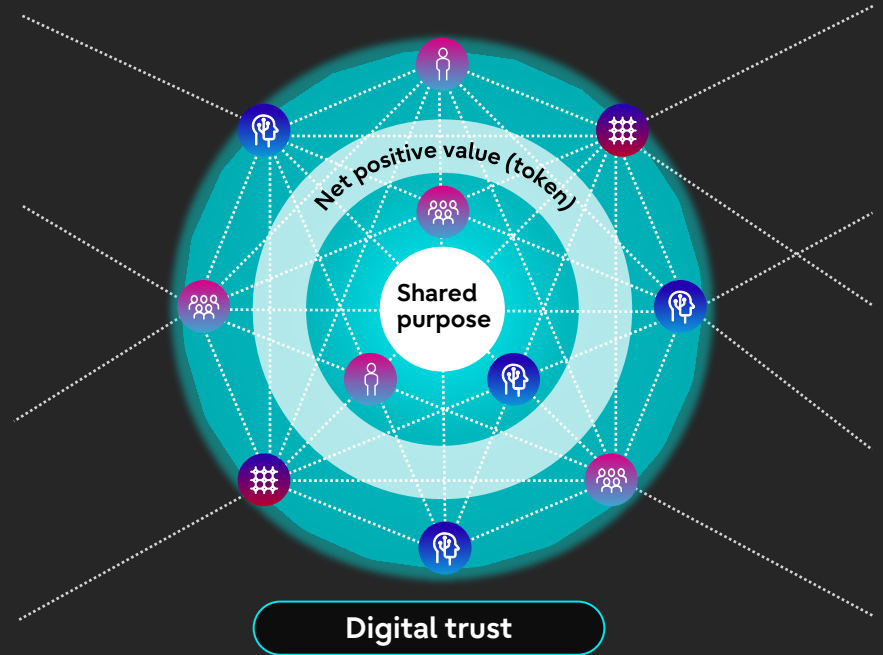
Web3 technology ensures trust in people and data. Distributed identity technology, with low risk of information leakage, protects people's identities. Blockchain ensures trust in the value being distributed as tokens. In addition, DAO helps organizations to collaborate in creating regenerative value.

Security technologies protect trust in people and data. Trustable Internet helps determine the authenticity of data by using AI to analyze information about people and things involved in data generation and processing. In addition, anti-fake technology enables safe and secure data sharing by detecting disinformation generated by AI. Continuous authentication technology enables people to move safely across the physical space and digital space, while protecting privacy.

The convergence of 6G networks and AI enables the intelligent networks required to distribute value across trusted ecosystems, by autonomously combining ultra-high speed with ultra-low latency and power consumption.

Digital trust will contribute to the development of a new economy, enabling the exchange of intangible value tokens such as carbon credits and plastic waste recycling.

Distribution of regenerative value through trusted ecosystems



Web3

- Distributed ID (SSI/DID¹⁾)
- Blockchain
- DAO²⁾

Security

- Trustable Internet
- Anti-fake, AI security and continuous authentication

Network

- 6G
- Intelligent networks

1) Self-Sovereign Identity (SSI): The concept of allowing individuals to own and manage their identity DID (Decentralized Identifier): An identifier used to provide distributed identity management

2) DAO (Decentralized Autonomous Organization): A form of blockchain-based organization characterized by the autonomy of each member without the need for a centralized administrator.

AI x Security x Network

Trust technologies that contribute to the co-creation of regenerative value

Building digital trust through data and security technology

Through our Web3 Acceleration Platform, Fujitsu is developing technology to create distributed ecosystems. For example, with Japan Blockchain Foundation Co., Ltd, we're evaluating the interoperability of assets and data between different blockchains, such as stablecoins and NFTs, using ConnectionChain, Fujitsu's blockchain connection technology. In addition, IDYX, a decentralized identity technology, is being used to create new services for tourism, education and regional revitalization using digital certificates.

We're also developing trustable Internet technologies to combat disinformation and misinformation. We're promoting the social implementation of mechanisms that enable the authenticity of information to be judged by using distributed human knowledge and AI on the Internet.

Using AI to enhance trust between the physical and digital worlds

To provide services across real and digital spaces, Fujitsu is developing security services that use AI to identify suspicious activity by capturing human movement and characteristics from multiple camera images, as well as by developing continuous authentication technology that enables personalized services tailored to people's behaviors.

Distribution of trust value through intelligent networks

We're collaborating with NTT on 6G technology, including distributed computing, low-power base stations and all-optical networks based on the IOWN concept. In addition, we're developing AI technology to control networks autonomously. This will enable the intelligent networks capable of distributing trusted value, providing new customer experiences and reducing environmental impact.

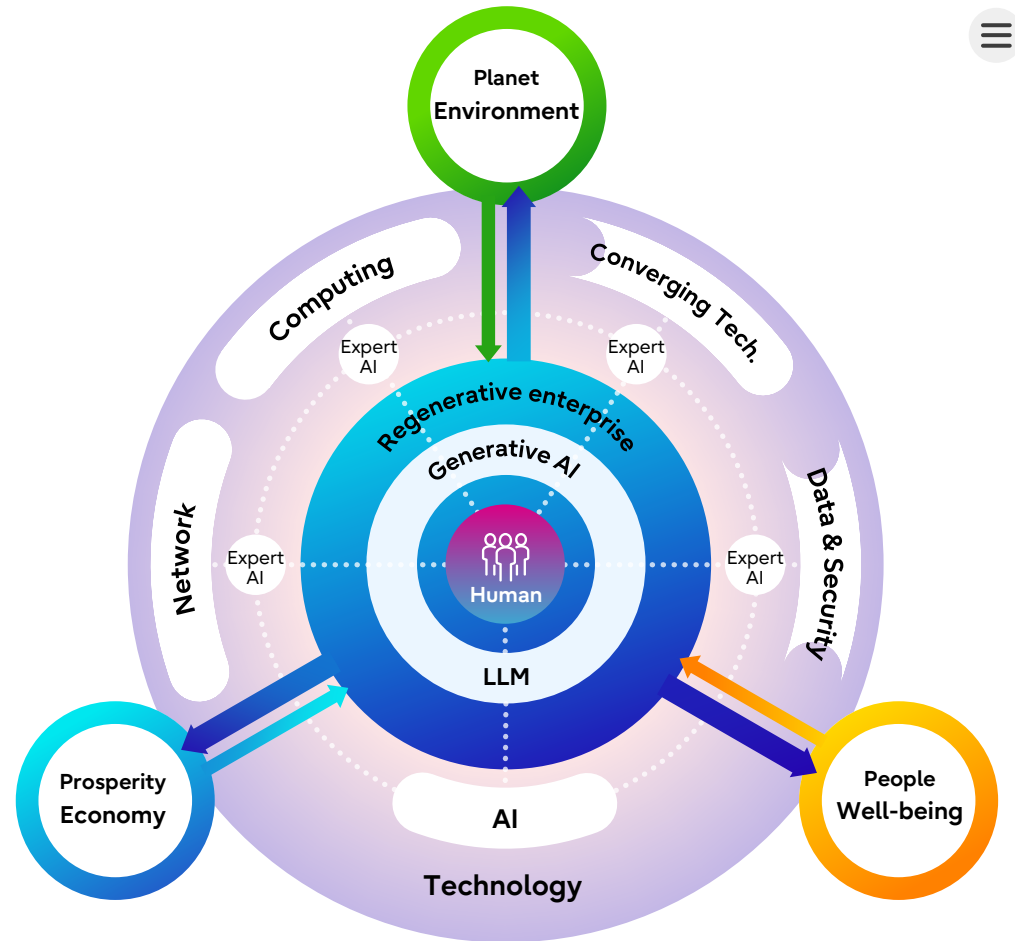


Regenerative enterprise driven by technology

So far, we've looked at the future of regenerative enterprise and how digital technology can help make it happen.

- Enabling people and AI to communicate naturally, complementing each other and growing together.
- Creating regenerative value from AI and data by combining the power of AI and computing.
- Strengthening organizational agility through simulation, using converging technologies
- Distributing regenerative value in trusted ecosystems based on security and network technologies

Regenerative enterprises build their core competencies by accumulating their own data and learned AI models as digital assets and combining them with external open data and AI models. They can then use these digital assets and computing, network and other technologies to deliver regenerative value to the environment, economy and well-being.



Technology creating regenerative value

Efforts to regenerate the environment, economy and well-being through technology are gathering pace across all sectors, from logistics, energy and materials through to healthcare and education.

Fujitsu is collaborating with companies, start-ups, universities, governments and public institutions to pursue joint research and proof of concepts and generate technology innovation that will benefit business and society globally.



Environment

The fusion of AI and other technologies will accelerate the reduction of CO₂ emissions, regenerating the environment.

Reducing CO₂ emissions in the transportation sector with AI and digital twins

The transportation sector accounts for 22% of all CO₂ emissions.¹⁾ To reduce these emissions, efforts are being made to promote the adoption of EVs and shared logistics solutions. Fujitsu, in collaboration with the World Business Council for Sustainable Development (WBCSD), is developing new ways to optimize the installation of the EV charging infrastructure in India by creating a digital twin.

Logistics

Developing CO₂-free next-generation energy with AI and HPC

Green hydrogen and ammonia, which do not emit CO₂ between generation and combustion, are attracting attention as potential next-generation fuels. Technology innovation will help to address both cost and manufacturing challenges. For example, Fujitsu is collaborating with an Icelandic start-up, using AI and HPC to discover catalyst materials capable of enabling the efficient synthesis of ammonia.

Energy

Combining AI and material engineering to absorb atmospheric CO₂

Alongside these ongoing efforts to achieve carbon neutrality, negative emission technologies that remove CO₂ from the atmosphere are now attracting significant attention. Through the fusion of digital technologies, such as AI, with material engineering and biotechnology, research and development of materials and micro-organisms that can capture CO₂ is now gathering pace.

Materials

¹⁾ CO₂ Emissions in 2022, IEA, March 2023

Technology creating regenerative value



Economy

Digital twin and blockchain technologies will create a digital society, helping to regenerate the economy.

Creating resilience with AI and digital twins

Urban development

Building new economies through blockchain

Digital economy

The economic damage caused by natural disasters during 2023 was estimated at \$380 billion.¹⁾ Enhancing resilience will enable local regions to reduce such losses, helping to stimulate their economy and well-being by attracting new talent and investment. Fujitsu is currently working to create safe and secure communities using digital twins in many cities around the world, including Helsinki, Melbourne, Pittsburgh and Kawasaki.

While the Internet has made a significant contribution to economic development, it has also created new challenges such as cybercrime and the creation of economic disparities due to information gaps. For further economic and social development, we need to create an environment in which everyone can share information and carry out their business activities with confidence. Fujitsu is working with Keio University Ben-Gurion University of the Negev in Israel to build a trusted Internet based on blockchain.

¹⁾ Climate and Catastrophe Insight, AON, February 2024

Technology creating regenerative value



Well-being

AI, computing and network technologies will realize healthcare innovation and inclusive services, regenerating people's well-being.

Using AI and computing for healthcare innovation

Drug discovery

Cancer kills about 10 million people a year and continues to be a leading cause of deaths¹⁾. To combat cancer, we are pursuing research and development into new drug and treatment methods using AI and computing. For example, Fujitsu has been conducting research with Kyoto University and Chordia Therapeutics to discover biomarkers for the development of new cancer drugs. By extending their healthy life expectancy, people will be able to enjoy new possibilities and longer, fuller lives.

1) Fact sheet – Cancer, WHO, February 2022

Using AI and networks for inclusive education and employment

Education

With the unemployment rate of 15 to 24 year-olds at the end of 2023 exceeding double digits²⁾, education and employment opportunities for young people continue to be an important priority. Further implementation of remote working and educational services that use AI and networks to meet individual needs will allow people to acquire new skills, creating more inclusive job opportunities and improving lives.

2) Unemployment Rates, OECD, February 2024



Five key technology areas

Our research and development is focused on five key technology areas, helping us to realize our technology vision. To have a positive impact on the environment, economy and well-being, we need to address the challenges posed by technology, such as the increased energy consumption of AI,

the economic disruption caused by disinformation and cybercrime and human rights violations. We're focused on making technology sustainable by developing low-power consumption CPUs and networks, trusted generative AI, AI ethics and both physical and digital security technologies.

Fujitsu's key technology areas



Computing

- The evolution of computing with AI
- Large-scale computations with quantum-HPC hybrid computing

AI Computing Broker, FUJITSU-MONAKA, HPC, Quantum computer, Quantum simulator



Network

- Distribution of trust value through intelligent networks

6G, Software base station, Open RAN, Intelligent networks, Photoelectric fusion technology, Disaggregated computing



AI

- Platform to accelerate AI practice
- Generative AI and Large Language Model (LLM) for automation
- Generative AI trust technologies, improving trust in AI
- Using AI to derive causal relationships from large-scale data

Fujitsu Kozuchi, Generative AI, LLM, Composite AI, AI Trust, Graph AI



Data & Security

- Building digital trust through data and security technology
- Using AI to enhance trust between the physical and digital world

Web3 Acceleration Platform, Blockchain, ConnectionChain, Anti-fake, Trustable Internet, Continuous authentication



Converging Technologies

- Federated digital twins supporting decision-making
- Predictive simulation through digital rehearsals
- Understanding and predicting human behavior

Federated digital twins, Digital rehearsal, Social Digital Twin, Behavioral prediction

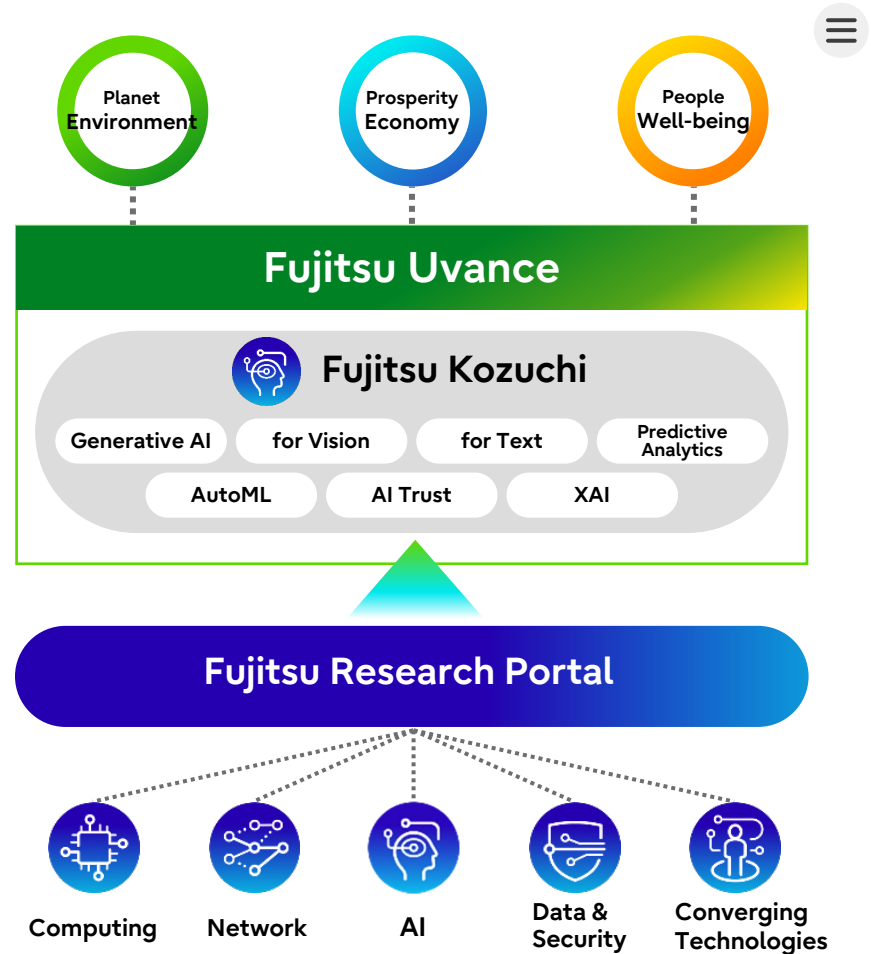
Sharing technology innovation

Helping to regenerate the environment, economy and well-being

We've outlined how our technology vision will guide the transformation into regenerative enterprise, and the positive impact this transformation will have on the environment, economy and well-being.

We will expand our collaboration with organizations around the world by sharing technology innovation across our five key technology areas through the Fujitsu Research Portal. We will also continue to work with many of the world's leading research institutions to accelerate open innovation. We're also encouraging the active use of generative AI by all Fujitsu employees to improve quality and performance.

The advanced technologies we've developed through open innovation will be integrated into new services to address cross-industry environmental and social issues. Indeed, since February 2024, we've been providing Fujitsu Kozuchi, our cloud-based AI service, based on the AI technologies we've developed and validated in the field.





Transformation in action

3



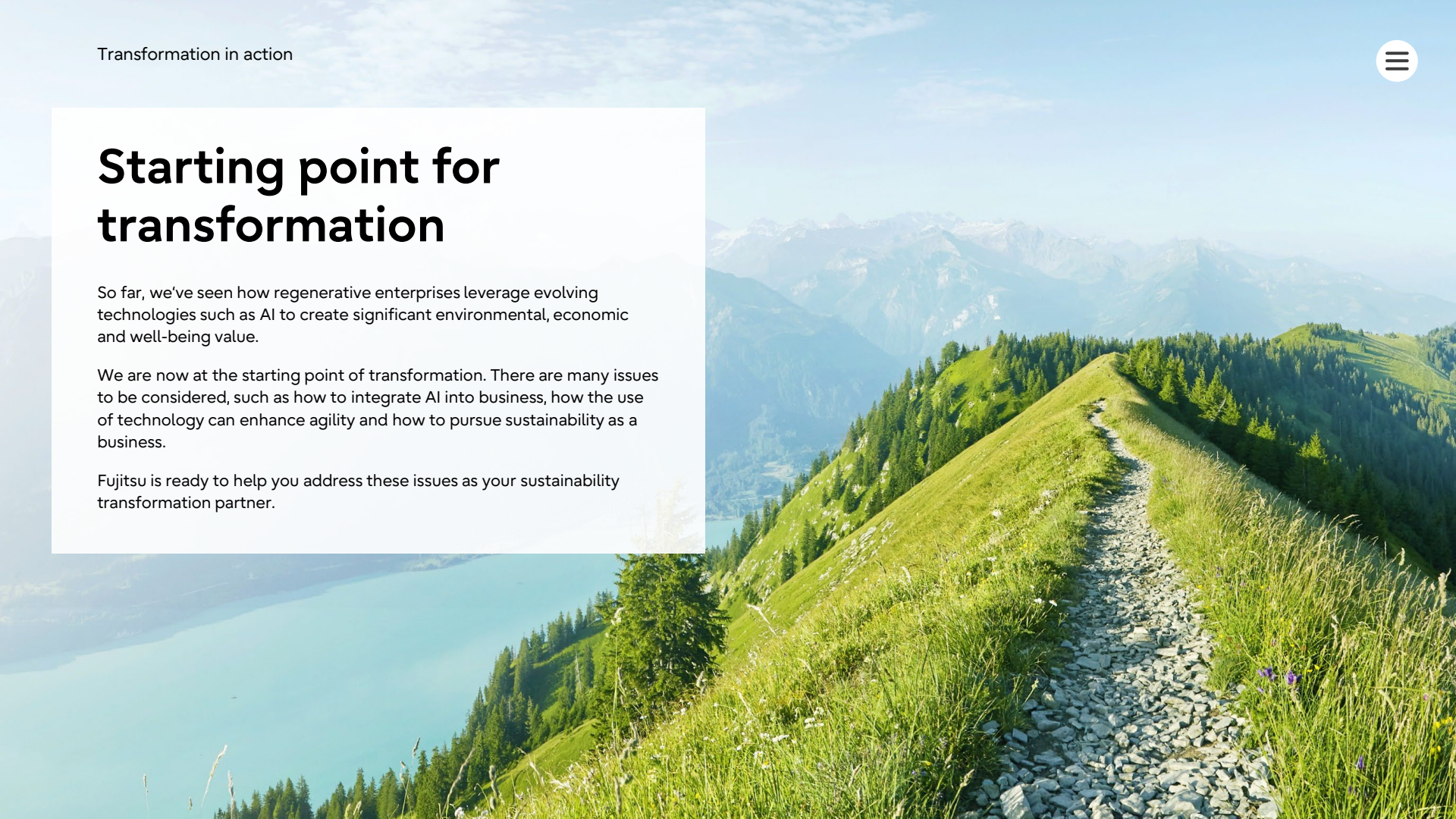


Starting point for transformation

So far, we've seen how regenerative enterprises leverage evolving technologies such as AI to create significant environmental, economic and well-being value.

We are now at the starting point of transformation. There are many issues to be considered, such as how to integrate AI into business, how the use of technology can enhance agility and how to pursue sustainability as a business.

Fujitsu is ready to help you address these issues as your sustainability transformation partner.



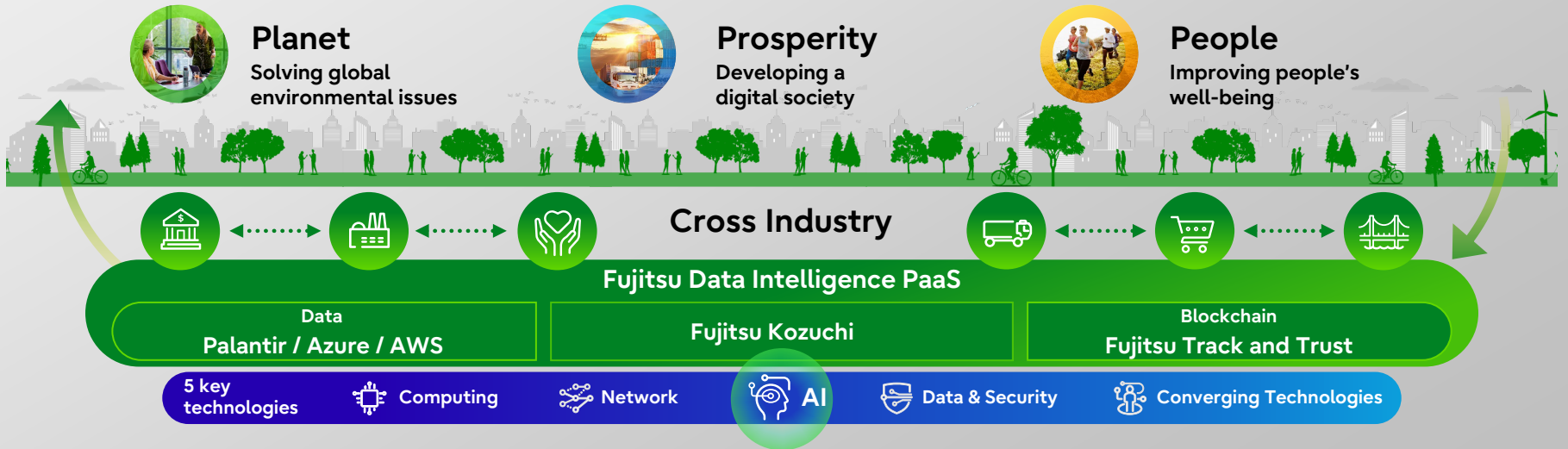


Meeting environmental and social challenges

Fujitsu Uvance enables innovative services on digital platforms

Addressing environmental and social challenges such as climate change and a declining working population requires a cross-industry approach. Fujitsu provides Fujitsu Uvance to help organizations address these complex challenges.

Fujitsu will contribute to solving global environmental issues, developing a digital society and improving people's well-being. To achieve this, we're using Fujitsu Kozuchi AI platform, Fujitsu Track and Trust blockchain technology and our data intelligence platform, combined with our deep industry skills and expertise.





Your partner for sustainability transformation

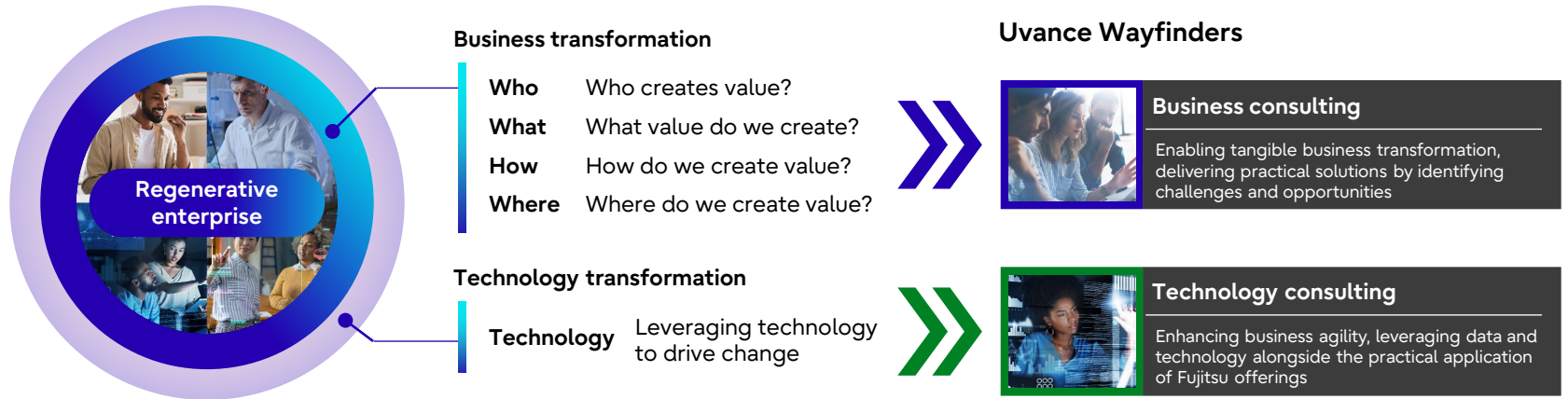
Providing consulting services from both business and technology perspectives

As your partner, Fujitsu uses innovative technology to help you transform into a regenerative enterprise and achieve sustainability transformation.

In 2024, Fujitsu launched the consulting business Uvance Wayfinders, offering consulting services to help organizations map out their businesses and technology transformation.

To realize the vision of regenerative enterprise, our business consultants work with organizations to develop specific business transformation themes, while our technology consultants deploy their deep knowledge of AI and data analytics to create the transformation journey.

To achieve transformation, we're helping to create new cross-industry business models, eliminating traditional industry divisions so that we can respond effectively to future challenges.



Transformation in action

Fujitsu Uvance

Through Fujitsu Uvance, we're working to realize sustainability transformation by using technology to address three social challenges: Planet (solving global environmental issues), Prosperity (developing a digital society) and People (improving people's well-being).



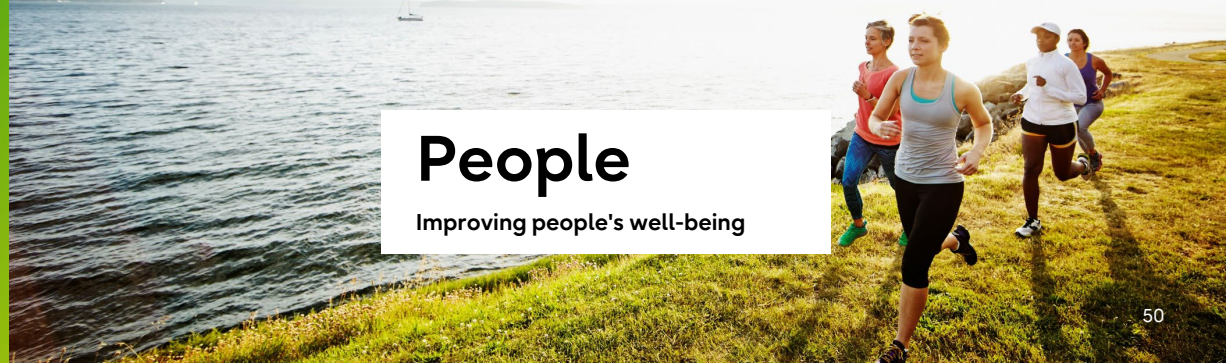
Planet

Solving global environmental issues



Prosperity

Developing a digital society



People

Improving people's well-being



Planet

Solving global environmental issues



We all need to focus on climate change, resource recycling and the preservation of biodiversity, to create a society where people and nature can coexist and prosper together.

Addressing climate change is now a particularly critical issue. In the Fujitsu survey, more than half of business leaders stated that climate change, and the resulting severe disasters, are having a major impact on their businesses.

How can we best address these challenges? We believe it all starts with data.

Accurate and transparent data enables us to understand the current situation and set goals. Data also enables us to measure the effectiveness of new approaches, including the contribution to business performance. Advanced digital technologies, including AI and data analytics, will be essential enablers in this area.

Uvance offerings

Climate change

ESG Management Platform

Supporting data-driven end-to-end ESG management, including ESG strategy planning, data collection, simulation, information disclosure and policy implementation.

Green Transportation

Providing mobility and logistics services for the introduction and operation of EVs, reducing environmental impact and improving operational efficiency.

GHG Visualization and Reduction

Contributing to carbon neutrality by providing platforms that calculate CO₂ emissions and help create strategies, by collecting and tracing environmental impact data.

Engineering Accelerator

Helping to accelerate the market entry of new products, and ensuring products are resilient to change, by providing an engineering platform in the cloud with Computing as a Service (CaaS).





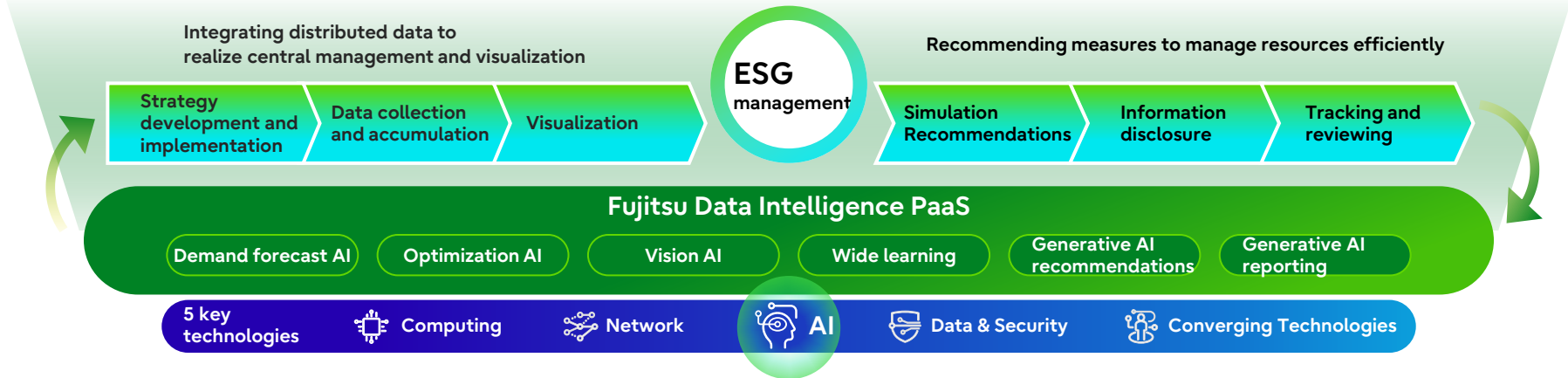
Accelerating ESG with data and AI

ESG Management Platform

Fujitsu is helping to improve corporate ESG management by providing an extensive range of services, from consulting, data collection and visualization through to analysis, simulation and information disclosure. Fujitsu's ESG Management Platform is at the heart of these activities, enabling organizations to optimize their ESG management by using data from both financial and non-financial sources to maximize corporate value.

Based on Fujitsu technology, this platform helps management decision-making by delivering automated simulations (digital rehearsals) to assess activities, including the investment and offset costs required to achieve environmental targets, and to provide recommendations and reporting functions through generative AI.

Supporting management decision-making by utilizing GHG emission reduction initiatives and know-how



Centralized management of environmental value data

IHI Corporation (IHI) has been working with Fujitsu since 2021 with the aim of realizing a CO₂-free, circular society. IHI can now calculate CO₂ emissions and reductions by using energy data, including the power and fossil fuel consumption of equipment and facilities, stored in ILIPS, the company's IoT platform and other companies' IoT platforms, recording them using blockchain. IHI and Fujitsu have been promoting CO₂ reduction measures in anticipation of full-scale trading of CO₂ emissions between companies and individuals.

With various Proof of Concept environments built separately, there were early challenges with silos of activity being created across the system. In addition, the environmental value business, involving governments, regulators and other stakeholders, continues to experience considerable uncertainty, with all organizations trying to keep pace with changing requirements.

Fujitsu's scalable ESG Management Platform was deployed to address these challenges. The platform centrally manages siloed data and supports speedy data analysis for quick decision-making. It will also help accelerate the development of new environmental businesses.

IHI and Fujitsu are now integrating existing traceability platforms to create a solution capable of processing large amounts of IoT data to support the growth of IHI's environmental business. This will contribute to the expansion of green energy utilization in the future.



IHI Corporation | Japan

<https://www.ihi.co.jp/en/>

IHI has a global presence in the aerospace sector, particularly in the field of aircraft engines. They also have operations across many other sectors, including energy, environment, industrial machinery and infrastructure. IHI is focused on the development of social infrastructure, including the design and construction of bridges, power plants and manufacturing sites. Through these projects, IHI is contributing to the realization of societal and environmental sustainability.

Prosperity

Developing a digital society



We're focused on building responsible supply chains, creating better working conditions and eliminating labor shortages. This will help to drive a trusted digital society, enabling global prosperity and stability.

In today's rapidly changing and uncertain world, building a digital ecosystem across organizational and industry boundaries by interconnecting multiple data sources will enhance resilience and contribute to sustainable development across both business and society.

In this increasingly digitalized world, enabling people to have higher digital literacy and inclusive access to digital services will help to realize more equitable and prosperous lives. It will also help to create more flexible working environments and address labor shortages.

AI and other emerging technologies are key to achieving this objective. To exploit their potential, we need to create mechanisms that ensure the safe and trusted distribution of data.

Uvance offerings

Responsible supply chains

Supply Chain Risk Management

Collecting and exploiting information to create resilient supply chains, mitigating risks, enabling rapid decision-making in emergency situations and minimizing business losses.

Supply Chain Planning

Specialized systems integrate and analyze inter-organizational data and forecasts, ensuring retail and manufacturing supply chains remain resilient in the face of uncertainty and disruption.

Improving working environments and reducing labor shortages

Connected Front-line Worker

Supporting essential workers by using AI to provide early warnings, hazard predictions and rapid dispatch of emergency vehicles in emergency situations.



Improving resilience through digital rehearsal

Dynamic Supply Chain Management (DSCM)

By visualizing supply chains using data integration and blockchain technologies, DSCM enables agile, accurate data-driven decision-making by simulating complex real-world events in the digital space (digital rehearsals). A large-scale earthquake occurred in January 2024, centered in the Hokuriku region of Japan. DSCM's demand forecasting and supply chain management contributed to the rapid response to the disaster.

DSCM enabled a major manufacturer to assess the financial impact of the disaster within just two days, despite the complexity of their extensive manufacturing operations and processes.

By using digital technologies, we will help organizations drive agility and resilience in their response to environmental and social challenges.

Enabling faster decision-making through supply chain digital rehearsal



Fujitsu Data Intelligence PaaS

Explainable AI/Ensemble model

Demand forecast/Control tower

Vision AI

Supercomputer

5 key technologies



Computing



Network



AI



Data & Security



Converging Technologies

Disaster countermeasures using digital twins

We need to protect people and social infrastructure from natural disasters to realize a safer, more secure society. To this end, we are accelerating efforts to link data across multiple domains, such as healthcare, transportation and the environment.

Hexagon and Fujitsu have been working together since 2022 to support safe and secure urban development. We announced our use case using digital twin technology to predict and visualize damage from natural disasters in June 2023. By leveraging Fujitsu Computing as a Service (CaaS) to provide advanced computing technologies in the cloud, and Hexagon's real-time geospatial application M.App Enterprise, disaster threats can be assessed proactively, using a digital twin to simulate the effectiveness of potential countermeasures and identify optimal solutions.

The flood prediction use case enables complex flood calculations and visualization using prediction models and precipitation data. In addition, it helps to predict infrastructure damage and formulate disaster response plans by focusing on industry-specific impacts, for example across healthcare, financial services, public sector and retail.

The use case will be available as a Disaster Simulation Data Service offering in 2024. By integrating and evolving our digital twin technologies, we will contribute to the continuous improvement of business and social resilience.



Hexagon

Sweden

<https://hexagon.com/>

Headquartered in Stockholm, Sweden, Hexagon is the global leader in digital reality solutions, combining sensors, software and autonomous technologies. Hexagon's Safety, Infrastructure & Geospatial division improves the resilience and sustainability of the world's most critical services and infrastructure.

People

Improving people's well-being



Everyone can live healthy and enjoyable lifestyles. To realize people's well-being, Fujitsu is providing healthcare solutions that improve customer experience and enable a better Quality of Life (QoL).

Every person has unique lifestyle preferences. It's now possible to create highly personalized and safe services by using secured personal data with AI and other technologies.

These technology-enabled, individually-optimized services will help people adopt better lifestyles and fulfill their aspirations. Fujitsu will help to realize a society where people can live fuller lives, free from physical limitations such as place of residence, age and disability.

Uvance offerings

Promoting healthcare to improve Quality of Life

Digital Care Platforms

Contributing to the development of patient-centered healthcare and healthcare services, created by connecting previously disconnected patient information.

Virtual Pharma

Accelerating and improving the efficiency of drug discovery through centralized data management and the use of AI/computing, contributing to the development and dissemination of innovative drugs.

Improving customer experiences

Omnichannel Services

Centrally managing omnichannel information to understand precise customer needs and realize seamless customer experiences.

Personalized Marketing Services

Analyzing omnichannel purchasing data to drive demand with personalized recommendations and dynamic pricing. Driving sustainable consumption.





Improving well-being through data linkage and AI

Fujitsu is working with various well-being organizations, including medical institutions, pharmaceutical companies, insurers, health insurance associations and retailers, to create a comprehensive new ecosystem capable of supporting individual health. This ensures that every person can enjoy better life experiences by proactively managing their health data, for example by receiving treatment and insurance services tailored to their health and lifestyle.

Fujitsu is also working with producers, logistics organizations and retailers to provide personalized customer experiences. The demand for better shopping experiences is becoming more sophisticated and diverse. By linking individual customer data, we can create consistent shopping experiences across various customer touch points, from online shopping through to physical stores. In addition, we enable personalized recommendations that can improve people's well-being by using AI to analyze individual purchasing history, behaviors and health conditions.

Healthcare integrated into daily life through data linkage

Enabling frictionless, demand-led shopping experiences



Personalized medicine
Treatment tailored for individuals



Acceleration of drug discovery
Utilization of medical data



Prevention and health promotion
Helping individuals to change their behavior



Customer experience
Personalized healthcare based on individual lifestyles



Omnichannel
Demand generation based on inventory and expiry dates



Personalization
Recommendations tailored to each individual



Dynamic pricing
Production and delivery Planning based on supply and demand

Fujitsu Data Intelligence PaaS

AI personalization

Vision AI

AI dynamic pricing

5 key technologies



Computing



Network



AI



Data & Security



Converging Technologies

Analysis and visualization of patient journeys

To improve patient care, it is important to understand each patient's journey through symptoms, diagnosis, treatment and subsequent life. Electronic medical records provide high-potential data sources for patient journey analysis, but until now, they have not been fully utilized.

Takeda and the National Cancer Center, working with Fujitsu, extracted and standardized pseudonymized medical information from 574 ovarian cancer patients from electronic medical records at Japan's National Cancer Center Hospital East. Based on the pseudonymized information, new data sets were generated for analysis in light of medical knowledge, and the data sets enabled the visualization of various treatment patterns. These treatment patterns would be helpful for doctors and individual patients to select the most appropriate treatment path given their specific circumstances.

To create the data sets, we deployed the analysis environment provided by Fujitsu's Healthy Living Platform, launched in March 2023, enabling the effective utilization of various real-world data, such as medical and health data sources.

In the future, we will create secure analysis environments with enhanced functionality, including the AI and visualization technologies required to support new research initiatives. Through these advances, we will create a digital health ecosystem that delivers new value for society. We will achieve this by using real-world data and collaborating with a range of healthcare and well-being organizations, including pharmaceutical and medical device manufacturers and insurers.



Takeda Pharmaceutical Company Limited | Japan

<https://www.takeda.com/>

Established in 1781, Takeda has a proud history as one of Japan's leading pharmaceutical companies. Operating globally, Takeda focuses on the research and development of new drugs, as well as actively engaging in corporate social responsibility (CSR) initiatives to help realize a more sustainable society.

National Cancer Center Hospital East | Japan

<https://www.ncc.go.jp/en/index.html>

This public institution plays a central role in cancer research, medical care, prevention and education in Japan. Established in 1992, the organization, which is now under the jurisdiction of Japan's Ministry of Health, Labour and Welfare, focuses on research across a wide range of fields. These include clinical research as well as research into cancer prevention, nursing, epidemiology and patient care.

Improving customer contact through headless commerce¹⁾

Life operates more than 300 supermarkets across Japan, offering a wide range of products and services. Rapid technology evolution has created many new potential customer contact points, resulting in both opportunities and challenges. New services required Life to upgrade their back-end systems, including ERP and payment systems, as well as additional people and costs, while their offline, online, home delivery and other operational systems had become siloed across the business.

To address these challenges, Life launched a new project to enable customers to enjoy both offline and online shopping experiences, using Fujitsu's headless commerce¹⁾ solution Flexible Commerce to develop their new CX-customer platform. This separates front and back-end systems, enabling new customer contacts, channels and services to be introduced in an agile manner, without the need to adjust back-end processes.

In July 2023, Life integrated five separate membership services using CX-customer, enabling the release of a new official Life customer application. This application embodies Life's concept of customer experience by providing a more personalized experience tailored to individual preferences. This has significantly increased the number of customers signing up to their membership scheme, enabling them to create more personalized customer communications. Fujitsu is continuing to help Life develop new services that will ensure they can meet rapidly changing customer needs.

¹⁾ Headless commerce: Headless commerce is an e-commerce architecture where the front-end is decoupled from the back-end commerce functionality



Life Corporation

Japan

<http://www.lifecorp.jp/>

Life provides a diverse range of products and services in addition to their core Life supermarket operations. Their medium-term management plan describes their journey to achieving annual sales of 1 trillion yen (US\$6.7 billion) by 2030. To achieve this goal, Life is rapidly extending their customer connections through physical and on-line stores, private brands, membership programs and applications.



Fujitsu's initiatives and offerings for a regenerative society

We're continuing to strengthen Fujitsu Uvance offerings by focusing on four critical, cross-industry areas.

This is helping us create solutions capable of cross-industry data utilization, enabling new offerings and services aimed at solving complex societal issues.

Sustainability transformation initiatives

Climate change,
carbon neutrality

Responsible supply chain

Promoting healthcare
to improve QoL

Improving
customer experience

Fujitsu Uvance – focused areas and offerings



**Sustainable
Manufacturing**

Driving environmentally-aware, recyclable, traceable manufacturing



Trusted Society

Creating a safe, secure and resilient society



Healthy Living

Supporting the well-being of all people



**Consumer
Experience**

Delivering diverse consumer experiences across payment, retail and distribution

- ESG Management Platform
- GHG Visualization and Reduction
- Engineering Accelerator
- Supply Chain Risk Management
- Supply Chain Planning

- Connected Front-line Worker
- Unified Logistics

- Digital Care Platform
- Virtual Pharma

- Omnichannel Services
- Personalized Marketing Services



Technology foundations to support cross-industry solutions

Fujitsu Uvance focuses on three horizontal areas to provide the technology foundation required to create cross-industry solutions to social challenges. We're harnessing our extensive technology and industry knowledge to develop new offerings across each of these three areas.

We will accelerate sustainability transformation through digital innovation by pursuing a cross-industry approach that combines this technology and industry knowledge.

Fujitsu Uvance – three horizontal areas and focused offerings



Digital Shifts

In a rapidly changing world, all organizations need to become more responsive to change. We're enabling agile management by using data and technology to help people maximize their creativity and productivity.

- **Work Life Shift**

Providing a rewarding working environment by supporting the autonomous working styles of individual employees.

- **Data Driven Management**

Accelerating digitalization to maximize people's capabilities by enabling data-driven decision-making.



Business Applications

To deliver sustainable value and success, organizations need to enhance operations and services continuously and rapidly. We provide a complete suite of applications to enable the speed, productivity, operational sophistication and rapid innovation required to achieve this goal.

- **SAP/Salesforce**

Accelerating enterprise performance and growth by optimizing intelligent enterprise applications.

- **ServiceNow**

Achieving efficiency and labor savings in routine operations, contributing to productivity improvement throughout the organization.



Hybrid IT

We provide seamless and secure connections between people, data, goods and services to help maximize business integrity across IT ecosystems.

- **Cloud Services**

Building the foundation for continuous transformation by optimizing infrastructure operations, management and automation.

- **Cybersecurity**

Strengthening the cybersecurity required to build trust, protecting businesses from threats and attacks, and enhancing brand and customer trust.

- **CaaS**

Cloud services exploiting the latest advanced computer technologies.

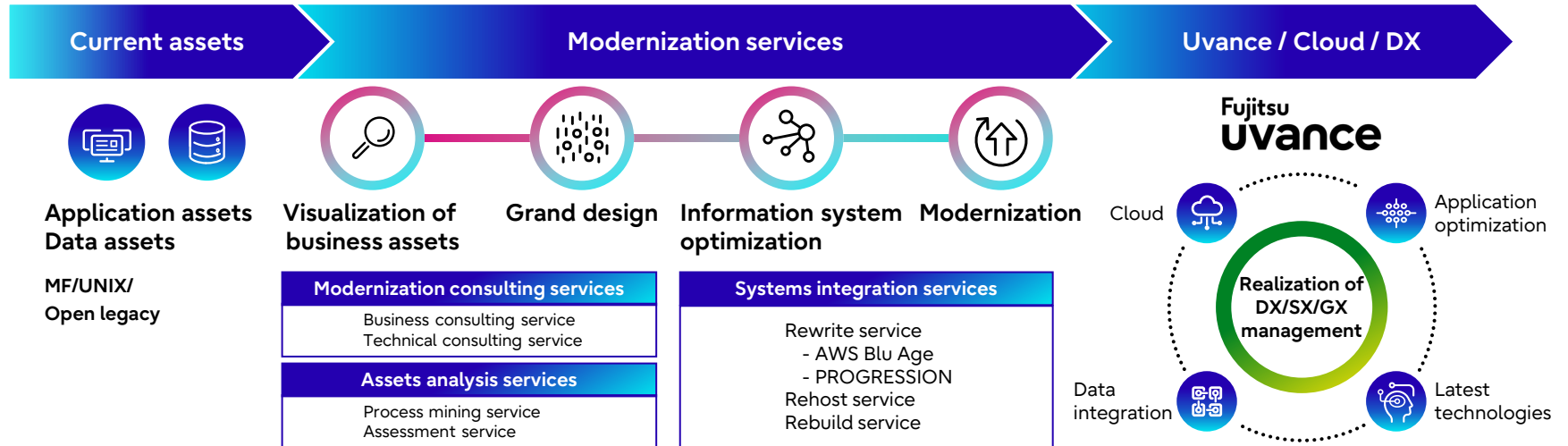


Modernization

As the future becomes more difficult to predict, organizations need to achieve 'change readiness', with both agility and resilience, to improve their competitiveness and drive sustainability. In our survey, 44% of leaders said their existing technology infrastructure would not be able to support their transformation efforts.

We're strengthening our capabilities to realize digital, sustainability and green transformation by focusing on the critical processes, from business asset visualization to modernization, required to advance customer modernization strategies. We're enabling our customers to transform by continuously reviewing and updating their existing information systems.

Service portfolio





The transformation begins now

Using the power of AI and other technologies to drive a sustainable future

In 2024, we've reached a tipping point where two global trends - the evolution of AI and the sustainability challenges - intersect.

At this tipping point, Fujitsu proposes a transformation strategy involving regenerative enterprise, a new approach that contributes positively to the environment, economy and well-being by using digital technologies, particularly AI.

A regenerative enterprise aims to build a sustainable society by leveraging digital technologies, including AI, to address our sustainability challenges.

It's time for us all to embark on the transformation to regenerative enterprise. By harnessing the power of AI and other technologies, we can work together towards a more sustainable future.



— Who
Who creates value?

— What
What value is created?

— How
How is value created?

— Where
Where is value created?

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