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Fujitsu Technology and Service Vision 2020

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Finding a shared purpose in a world in turmoil

We live in a complex and uncertain world, where it is increasingly difficult to predict the future.

While the development of the global economy has brought many benefits to society, it has also created complex social challenges, from global warming and environmental destruction to air pollution, industrial waste and rapid urbanization.

People and organizations everywhere now form part of a vast global network. They are interconnected and interdependent. We have come to rely on this complex network to drive our economic growth. However, it has also created new vulnerabilities. The world feels more exposed than it has ever been. Natural disasters, like earthquakes and floods, are capable of disrupting global supply chains, while the COVID-19 outbreak has highlighted the lack of resilience across the global community, creating worldwide health and economic impact.

Thanks to digital services based around the Internet and smartphones, we have improved the quality of people's everyday lives. For example, social media connects people together, enabling us to share our thoughts and feelings. At the same time, however, we are now at greater risk from the impact of fake news, invasion of privacy and intensifying cyber-attacks.

In many ways, the world is moving from chaos to crisis.

What can we do in the face of this challenge?

We have to rebuild trust. With corporate growth and the success of society as a whole becoming ever more closely intertwined, a new leadership approach is needed to address the challenge.

Critically, businesses need to understand and pursue a clear purpose in society. This purpose, and the vision it creates, should serve as a compass guiding the direction of the business, providing a "North Star" that links business goals with societal goals. It is only by establishing this shared purpose with society that businesses can help overcome the most difficult challenges we face.

Digital technology provides new tools to support and drive sustainable business growth, enabling businesses to provide greater value to society.

How best can we help to transform business, to make it more sustainable? And how can we build a future that everyone can trust? Let us explore these questions further.

CONTENTS

2	Opening
4	Message from the President
6	Chapter 1 Realigning Business with Society
16	Chapter 2 Our Vision for the Future
22	Chapter 3 Call to Action
38	Ending

The Fujitsu Technology and Service Vision 2020 was created by a team of Fujitsu people from around the world. We are communicating it globally in booklets, web, and video.

For more information, visit our website :
<https://www.fujitsu.com/global/vision/>

Message from the CEO



We are experiencing a fast-changing, uncertain and difficult time.

The outbreak of COVID-19 is perhaps the greatest threat the globalized world has faced. It poses huge challenges both to health and to the global economy. Even without COVID-19, we face many difficult societal challenges, including climate change, industrial waste, rapid urbanization and an aging population.

Digital technology has the power to significantly change the way people live and work. However, rapid digitalization has also brought negative side effects. These include new risks such as the spread of false information and the invasion of privacy.

The key question is for what purpose we will use digital technology. We must use this power to change our world for the better. We believe the true value of digital transformation lives in this idea.

As a global company with a long history of delivering technology-based value to customers, it is our responsibility to contribute proactively to the transformation of society.

Our purpose is to make the world more sustainable by building trust in society through innovation. This is the Human Centric Intelligent Society, our vision for the future of society.

To achieve our purpose, we create human centric innovation by bringing together people with data and physical things. This enables us to strengthen our customers' businesses and support their success.

To deliver trust for society, we will continue to build our unique technology and capabilities. For example, we provide Explainable AI that people can use with confidence, while our Digital Annealer is helping to solve complex real world problems. We are using these technologies to help solve societal challenges, like developing new treatments and drugs to combat difficult diseases.

We develop technologies that protect data and enable its secure exchange, digital twins that can visualize mobility on a city-wide scale and 5G technologies that connect people and things at high speed. These technologies enable us to contribute to the sustainable growth of cities and wider economies.

To make this happen, we need people to work collaboratively, while maximizing their creativity and imagination. We support and grow people who are passionate about innovation and willing to take risks to drive transformation. We always promote diversity and inclusion.

We want to be a strong partner for our customers, helping them deliver successful digital transformation. In this way, we continue to strive to build a trusted future together.

May 2020
Fujitsu Limited
CEO & CDXO

Takahito Tokita

chapter

1

Realigning Business with Society

Every business aims to deliver value for people and to improve society, for example by developing products that improve lives and by harnessing natural resources to drive greater efficiency. However, rapid global economic growth has also unintentionally created many difficult challenges for our society, from climate change to harmful waste and from inequality to privacy issues.

We now need to realign business with society. The mindsets of world business leaders are changing rapidly; providing value to society is becoming a priority on the global business agenda. But how can we achieve this transformation? Digital technology has the power to transform business and society. The true value of digital transformation is to connect business with society, changing society for the better.

The next decade will see the emergence of a new global megatrend: "Business = Society". Let us explore what this means.

Responding to complex societal challenges

Since the 18th century, the rapid advance of science and technology has improved people's lives in many countries. The first industrial revolution, and the economic growth that followed it, transformed our world. Average incomes have significantly increased, we are better educated and we are living longer. The world has effectively become smaller, with people able to move around faster and more easily. Business has driven these changes, supported by government policies of each country.

Still many challenges need to be addressed

- 5.4 Million children die before their fifth birthday^{*1}
- 821 Million people are undernourished^{*1}
- 785 Million people are without basic drinking water^{*1}
- 736 Million people live on less than \$1.90 a day^{*2}
- 61.7 Million people affected by natural hazards^{*3}

Source : *1 The Sustainable Development Goals Report 2019, *2 The World Bank, *3 UNDRR

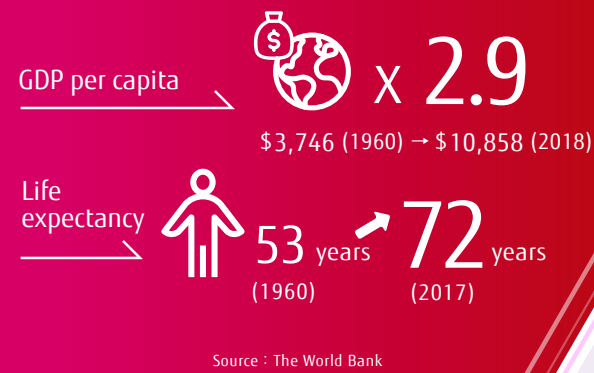


Complex global networks have created new vulnerabilities. The global impact of COVID-19, for example, is part of an accelerating pattern of rapid spreading global infections.

In addition, as we described in detail last year, the rapid spread of digital technology is causing major confusion in terms of trust in society. Do you trust data on the web? Is your private data exposed to the risk of abuse? Can you trust the judgment of AI? In addition, intensifying cyber-attacks threaten not only data but also physical social infrastructure.

We are living in an age called the Anthropocene. Humans are no longer bit-part players on this planet; we are now the biggest factor in driving change to our global environment. It is our responsibility to solve the problems we have created. And businesses must take the lead to put this right.

The advance of science and technology has improved our lives



But as shown in the United Nations Sustainable Development Goals (SDGs), our society still faces significant challenges. Some are long-standing problems that are still unresolved. Others are the unintentional side effects of rapid economic growth and improving living standards, such as climate change, environmental damage, waste, urban issues, healthcare and welfare for an aging population.

People created huge new challenges

- 9 in 10 urban residents breathe polluted air^{*1}
- 0.8 meters Sea levels expected to rise by 2100^{*2}
- 1,270 Million metric tons plastic dumped in oceans every year^{*3}
- \$88 Billion The annual cost to the US economy from time lost to traffic congestion^{*4}
- 1 in 6 people in the world will be over age 65 by 2050^{*5}

Source : *1 The Sustainable Development Goals Report 2019, *2 IPCC, *3 Science 2015 *4 INRIX, *5 United Nations



Trust challenges created by digital

- 70% find it difficult to judge if online information is correct and trustworthy
- 72% are worried organizations exploit personal data without permission
- 60% would not trust AI on its own. The final decision should be made a person
- 68% are worried about the risk of cyber-attacks to social infrastructure

Source : Fujitsu Digital Transformation Survey 2019




A new era of empathy

Our lives are now totally different to the lives people led in the age of the first industrial revolution. There are already 4.5 billion people connected on the internet, of which 3.8 billion people use social media, virtually half of the world's population. As a result, people can empathize more easily with others in the world beyond geographical limitations. In this hyperconnected world, empathy has become an important and powerful force.

Younger generations are more motivated to solve social challenges

73% are taking an active role to improve sustainability 

78% would be willing to change their lifestyle to protect nature and the environment 

Source : World Economic Forum
*Global Shapers Survey 2017

The mindsets of business leaders have undergone significant change too. For example, top business leaders in the US are advocating 'value for multi-stakeholders' instead of 'value for shareholders first'.

In our survey, over 90% of business leaders believe their organizations should deliver value to society in order to be sustainable in the mid to long term, and their organizations deliver value to society through profit-making business.

Our annual Global Digital Transformation Survey confirms this trend. When we asked business leaders about the importance of multi-stakeholders, shareholders came behind customers, employees and partners. The result implies that business leaders recognize the importance of treating multi-stakeholders equally, rather than the prioritization of specific stakeholder groups.

This change in business leaders' mindsets is driven by the motivation not only to increase the value of products and services, but also to respond to increasing demands of ESG (environmental, social, governance)-conscious consumers and investors.

Today, major trends are driven by these connected people, rather than by governments or large enterprises. The gravity of every business shifts from supplier to consumer. From the hands of organizations that supply goods and services to the hands of people that are looking for experience and value. Individuals empathize with products and services and make their choices accordingly. People are at the center in this new world. Especially younger generations - Millennials and Generation Z - who are demanding businesses more proactively deliver value to society.

People are more connected than ever, influencing each other

4.5 Billion people connect on the internet 

3.8 Billion people connect via social media 

Source : We are social and Hootsuite digital 2020 report

The mindsets of business leaders are changing rapidly

 The Business Roundtable* group of leading US CEOs now favors **multi-stakeholders** over the shareholder-first idea

* An association of chief executive officers of America's leading companies

92% say they should deliver value for society *1 

88% think it is important for them to deliver value to society through profit making business *1 

Source : *1 Fujitsu Digital Transformation Survey 2020



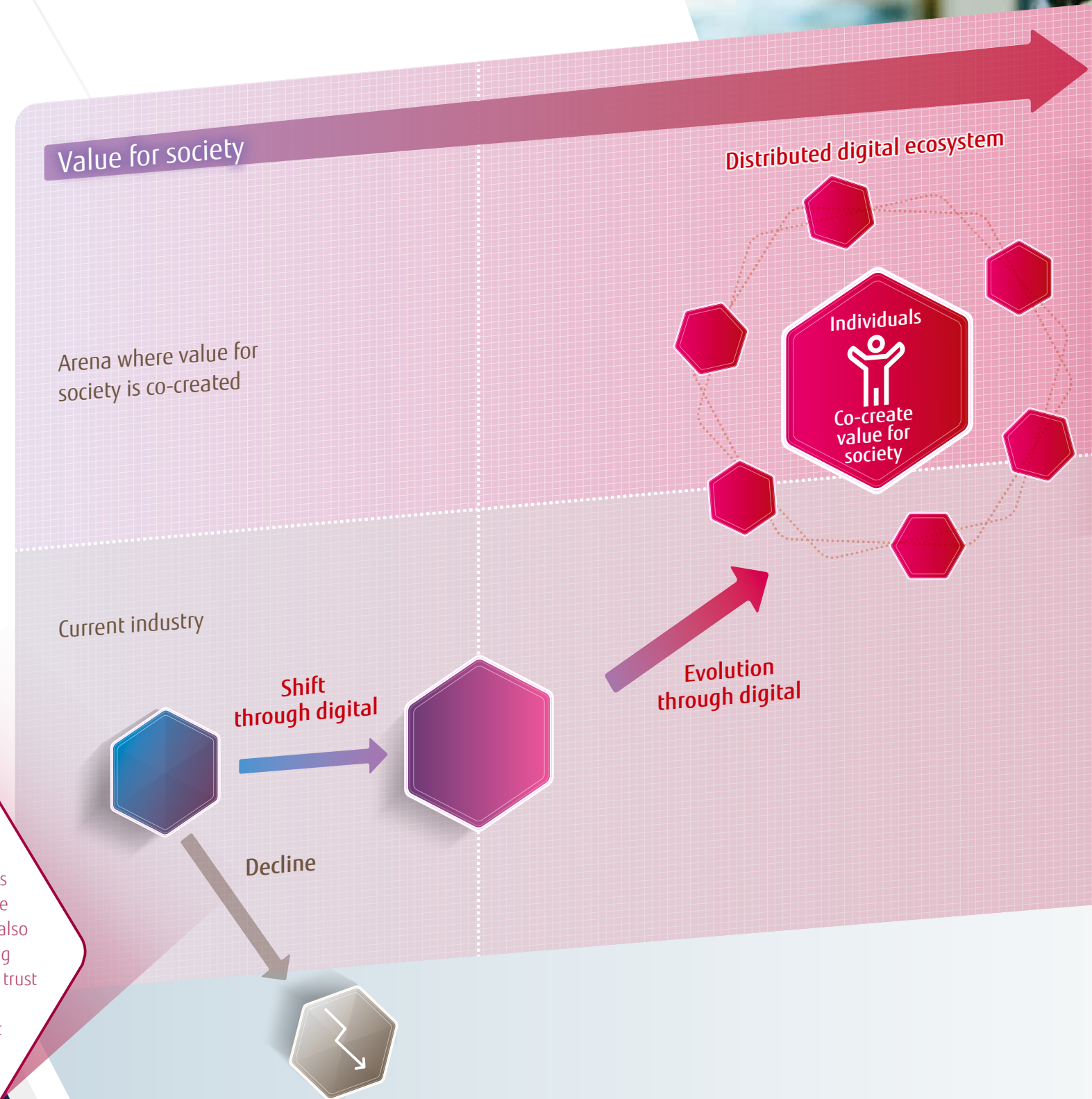
Digital transformation to a more trusted business

How can you sustain and grow by continuously strengthening your business? Especially under an uncertain and even critical business environment? Over the next ten years, how should you lead your business to create greater value for society?

The use of data and digital technology is key to helping you strengthen your business, connect it with society and achieve your purpose.

We believe most current vertical industry sectors will undergo significant transformation toward 'arenas', where new value for society can be co-created. As you see in the examples on pages 14 and 15, the focus of vertical industries is shifting, for example, from car production to mobility services, from treatment of diseases to wellbeing services and from retail banks to engagement banking services.

Digital transformation enables you to continuously strengthen your existing business by improving customer experience and operational efficiency. Digital also enables you to shift towards delivering better value to society and to create trust in your business. If you lose trust, your business may be forced out of the market in the medium to long term.



As the next step, you can evolve your existing business to deliver greater value to people and society by connecting it with innovative services and other partners' services in adjacent industries. This creates an ecosystem-type business model, centered around people's needs, that can help solve complex societal challenges.

Key to success on this digital journey is learning to be ambidextrous. With one hand redevelop your existing core business and with the other hand invest in innovation. While strengthening your business resiliency and customer value, you can attempt to grow a portfolio of innovation projects that support your purpose.

In our global survey, 43% of business leaders said that digital had impacted the transformation of their existing business, and 25% said that it had led to the creation of new business, 33% saying that it had delivered both.

In the long run, digital can enable you to evolve your current core business into a completely new business model, leveraging new ecosystems to deliver human centric value.

How will business evolve?

During the next decade, we expect that the borders of existing industries to become increasingly blurred, with new ecosystem-type businesses emerging to deliver greater trust and value to society.

Digital technology and data enable this transformation. For example, the automotive sector is now transforming to embrace connected cars and electric vehicles. The automotive industry will evolve into new mobility services, co-created by many cross-industry players. This shift has the potential to reduce traffic congestion, accidents and environmental impact in cities.

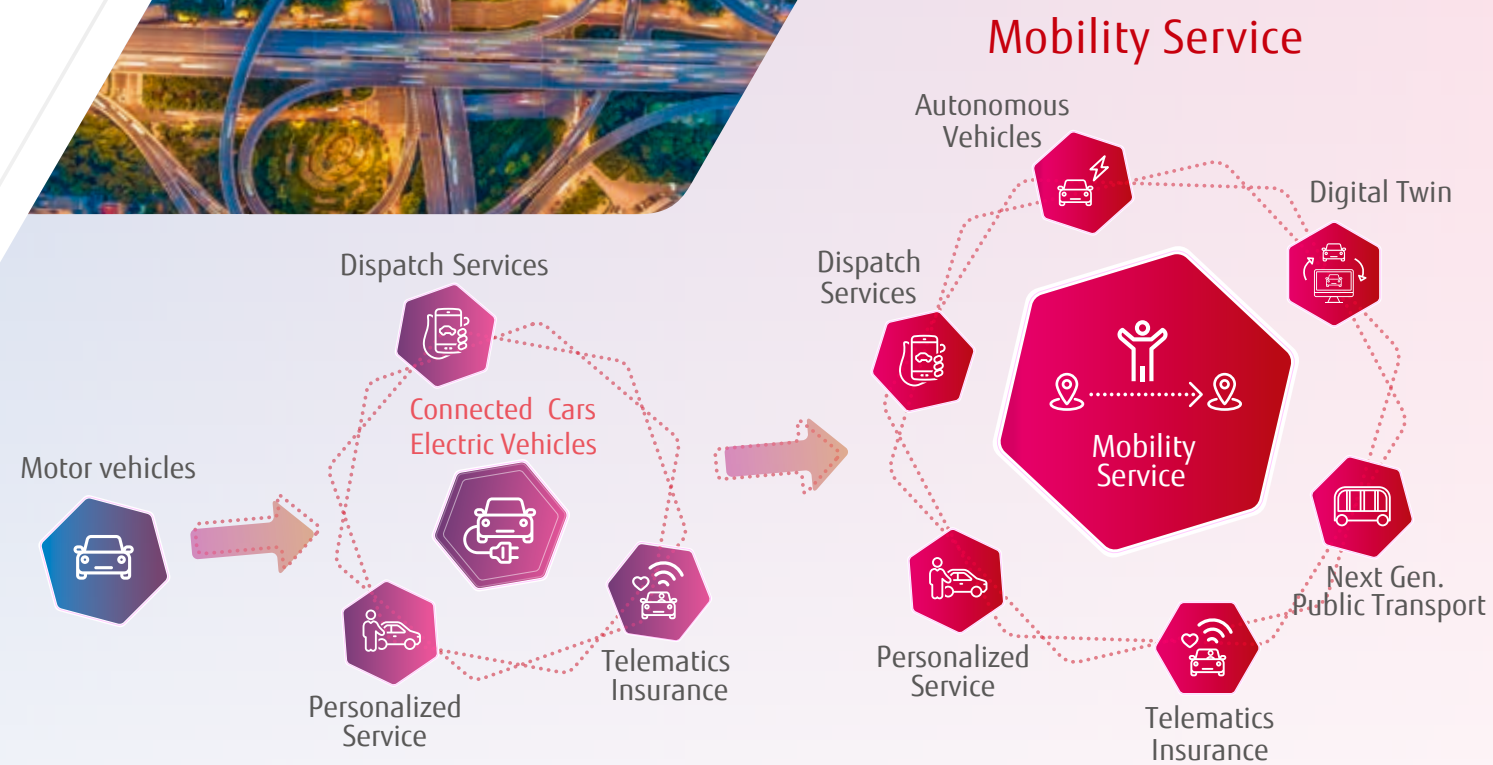
Retail banks are rapidly adapting to deliver personalized mobile banking. Moving forward, banking services will be seamlessly integrated into people's lifestyle activities. People will use banking services without noticing.

Hospitals currently provide healthcare services to treat patient diseases. However, we are seeing more connected healthcare services, spanning hospitals, elderly care, and personal health monitoring services. Beyond that, wellbeing services to help people live healthy and fuller lives will emerge.

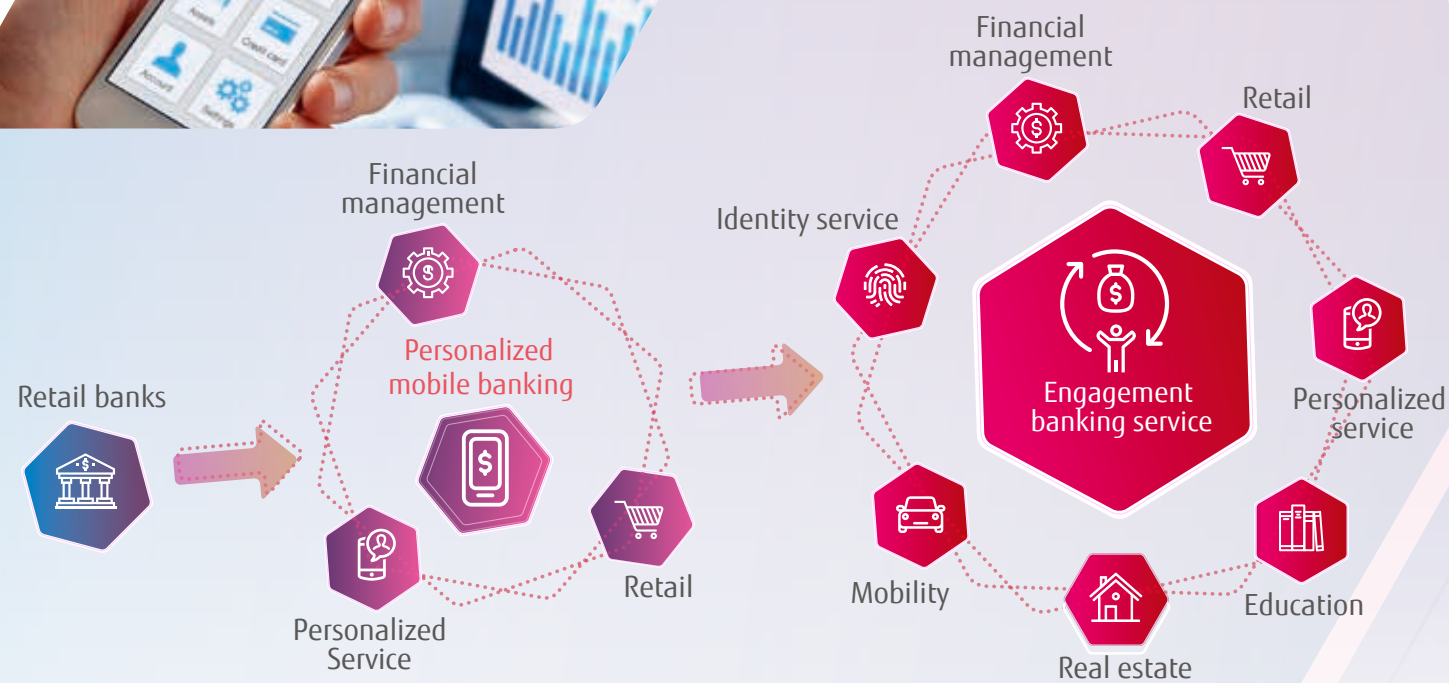
These are just a few examples. Product-based businesses will shift from product supply to providing services like subscription. They will further evolve into new ecosystem business models that will co-create customer experience and societal outcomes. Retail and logistics businesses will increasingly connect seamlessly with adjacent industries, enabling them to create connected, human-centric customer experiences.

Fujitsu enables new ecosystem business models by connecting various services with trusted data and turning this data into value.

We enable new ecosystem business models by connecting various services with trusted data and turning this data into value.



Engagement banking service



Wellbeing Service



Our Vision for the Future

chapter 2

The Fujitsu Technology and Service Vision sets out our future vision for society and our approach to making this a reality. This is where you can find our thinking on how you can use technology to create business and

social innovation. It also provides a compass, setting the direction and driving the transformation of Fujitsu itself. We will continue to update our vision and provide insights that relate to our purpose.

Fujitsu Technology and Service Vision

We create human centric innovation by bringing together people with data and physical things.

We launched the first edition in 2013. Since then, we have provided insights about the future of the world as well as the latest trends in technology and business. This is an ever-evolving story, introducing new initiatives along the way and charting our progress towards realizing our vision.



In 2010, we set out Human Centric Intelligent Society, our vision for the future.



Human Centric Innovation

In 2014, we proposed a new approach to creating innovation by putting people at the center and bringing together data and physical things.

Co-creation in an ecosystem

We recognized the importance of co-creating human-centric value through new cross-industry ecosystems. These enable organizations to respond to societal challenges and play a role in transforming society for the better. Using our unique design-thinking approach, we have led co-creation projects and delivered successful outcomes for many customers.



Human Centric Intelligent Society



Hyperconnected World

A new world has emerged where not only people but also many millions of things are connected to networks. The enormous amounts of data that arise enable the creation of innovative services. This complex connected world presents both huge opportunities and difficult challenges to every organization.



Digital Transformation

Data and digital technologies like cloud, IoT and AI enable organizations to transform the value of goods and services, business processes and business models. The aim of this transformation should be to create a better society.



The spread of digital technology has led to some negative impacts, including the misuse of private data and the increase of security risks. This has led to an urgent need to rebuild trust. In the past, people and institutions created trust. To build trust throughout autonomous and distributed ecosystems, we now need to rely on technology. Fujitsu continues to focus on providing digital innovation that creates trust.

Digital Trust

Human Centric Intelligent Society

Making the world more sustainable
by building trust in society through innovation.

We proactively contribute to co-creating societal values such as mobility and wellbeing by generating human centric innovation across new ecosystems. We enable these ecosystems by connecting various services with trusted data and turning this data into value. By connecting these ecosystems with autonomous distributed networks protected by digital trust, we can realize a more sustainable world where people have hope and confidence in the future.

Our vision is aligned with the United Nations' Sustainable Development Goals (SDGs). We contribute to achieving the SDGs through our ongoing business activities.





Call to Action

chapter 3

How can you sustain and grow your business in these increasingly uncertain times? How can you evolve your business model, aligning your goals with the goals of society at large?

How can you win the trust of both customers and wider society? And how can digital technology help you achieve this?

As your trusted partner, Fujitsu helps you address these challenges and realize successful digital transformation.

At Fujitsu, we are on our own journey of transformation, giving us invaluable practical experience of the challenges and opportunities. Using this experience, and our deep expertise in digital technologies, we provide services that help our customers to transform their businesses and to build a better society together.

Your transformation partner for enabling trusted business



In these challenging times, it is more important than ever that organizations exploit the potential of digital technologies.

You need a trusted partner. Our aim is to be a trusted partner to help you transform your business. This goes well beyond providing technology solutions. Instead, we aim to understand your challenges, purpose and strategy so that we can help you strengthen your business. Ultimately, we will help you realize an ecosystem business model, which we believe the future economy will demand.

As we described last year, we believe that the following actions are key to transforming a business and to winning the trust of customers and other stakeholders.

Architect a purpose-driven business

You need to revisit the fundamental purpose of your business in a wider societal context. You should then drive your digital transformation with management priorities based on this purpose.

Build a human centric organization

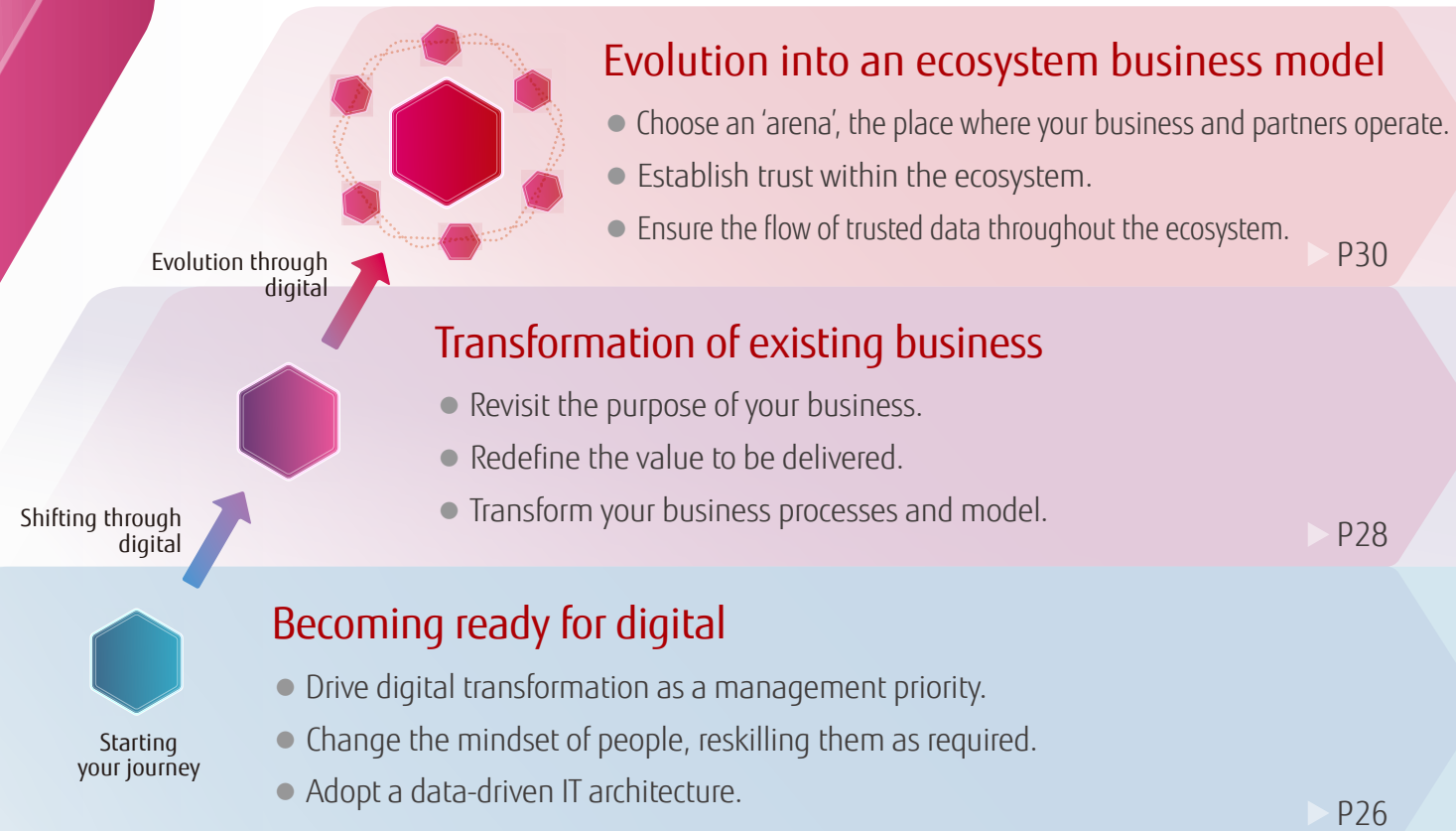
It is people who realize transformation. Innovative ideas arise from developing a deep empathy for the challenges people face. You need to establish an open working environment in which people can use their creativity and imagination, pursuing new solutions through collaboration and agile working. Diversity and inclusion are key to establishing such an environment.

Drive the business with digital

You can drive your business forward by integrating digital technology into your products, services and business processes. You need to create value from data, while ensuring your data is trustworthy. Fujitsu is focused on providing digital innovations that help create trust.

Steps of the digital journey

Based on these actions, Fujitsu can help you move forward on your digital journey. Firstly by becoming ready for digital, then by transforming your existing business and finally by evolving into an ecosystem business model. What key questions should you consider at each step? And how can Fujitsu help you?



Becoming ready for digital

From supporting business to driving business

The first step of your digital journey is to make your IT ready for digital. Historically, IT supported businesses by focusing on improving efficiency and reducing costs. However, in today's increasingly uncertain business environment, you need to drive value by using data more extensively and increasing the speed and agility of your business processes and strategy.

You need technology that enables you to respond quickly and flexibly to fast-changing societal conditions and customer requirements. Digital transformation is not just about replacing legacy IT systems with new digital technologies; it needs to encompass all aspects of business operations. As such, digital must be a key management priority.

At Fujitsu, we have extensive experience in creating IT solutions for organizations across a broad range of industries. We are helping organizations around the world to deliver the potential of large-scale digital transformation.

With our experience and knowledge, we help organizations establish their digital transformation strategy and migrate their business operations using digital technologies.

Key questions

What does technology mean for your business strategy?

How do you use technology to drive change across your business? It is important to transform all aspects, including people, KPIs and processes, both simultaneously and coherently.

How do you change the mindset and skills of your people?

Changing people's mindsets and skill-sets is essential for successful transformation. Firstly, it is important to establish a common purpose. Then, you need to strengthen specific skills such as agile development, DevOps and data exploitation across your business.

How do you exploit data throughout your business?

How can you make use of data stored in the silos of various departments? You need a technology architecture that enables organization-wide data to be used real-time. Legacy systems need to be optimized within a comprehensive roadmap that supports your overall management strategy.

How Fujitsu can help

Providing comprehensive support from assessment to operation

Fujitsu enables transformation by providing a comprehensive capability, from assessing legacy IT through to the integration and operation of new digital solutions. We examine each block of complex IT systems, identifying the optimal migration to ensure you are ready for digital and driving the desired outcomes, including efficiency benefits.

Hybrid IT support

Fujitsu supports your hybrid-cloud environment by leveraging our extensive ecosystem of technology partners, including our global strategic partnership with Microsoft.



Case Study 01

Modernizing its flood warning service, adding new features and flexibility

The Environment Agency

The Environment Agency is a non-departmental public body responsible for protecting and enhancing the environment. Its remit covers the whole of England, about 13 million hectares of land, 22,000 miles of river and 3,100 miles of coastline.

The Environment Agency wanted to improve its flood warning system and make it more cost-effective by changing from licensed to open source software and databases, and moving dedicated hardware to the cloud – thus enabling a more flexible, portable and resilient approach.

The Agency selected Fujitsu as its strategic partner, based on its experience with the previous flood warning service as well as its ability to use an Agile, DevOps and co-creative approach. Daily collaboration between the Environment Agency and Fujitsu ensured that issues were addressed immediately, and the new solution was ready in a matter of months. Together, we built a multi-channel, virtualized flood warning system which integrates seamlessly with mobile operator systems.

Fujitsu's Flood Warning System enables the Environment Agency to alert citizens more quickly about potential threats. The system automatically targets multiple at-risk groups via social and mobile channels. It is recognized as the world's most advanced alerting system and, to date, it's sent over seven million messages.

The system helps reduce the impact of flooding by ensuring that 66% of households and businesses at high risk of flooding receive direct alerts. We can't change the weather, but these messages do save lives.



Transformation of existing business

Continuously shifting your business with digital

Once your business is ready for digital, the next step is to plan a bold adoption strategy. In such uncertain and volatile times, this strategy will need strength and resilience to build trust and deliver greater value to society.

You will need to demonstrate how you can continuously drive value for your business processes and customers. Using your business's purpose as a North Star, you can then deploy digital technology to enhance customer experience and maximize operational excellence. This connects your business with society, helping to establish you as a trusted business.

Fujitsu has already worked with many customers to co-create innovative value and help them transform their businesses. These projects start with gaining a deep understanding of business purpose and challenges and working collaboratively to explore future trends and opportunities.

Digital technology enables you to shift your value proposition in many different ways. For example, developing new sharing services, delivering more personalized customer experiences or transforming traceability across value chains. Propositions like these enable businesses to deliver new value, helping them build trust both with customers and wider society.

Questions to ask

What is the purpose of your business?

The most important question to start with is 'why?' By defining your purpose in the context of wider society, you can connect your business with society, helping you focus on what is and is not necessary for your business.

What opportunities and threats will you face in the future?

It would be a mistake to plan purely within the constraints of current industry structures. You will need to explore all the potential challenges and opportunities facing your business, including insights from relevant industry experts, academic researchers and entrepreneurs.

What value do you offer? Do you need to change this value?

Articulating the unique value that your business provides will require deep understanding and empathy with both your customers and people who benefit.

How will you change the business processes and business model?

Introducing digital technology will not deliver positive impact if poor, underlying processes are left unchanged. You need to free your business from current constraints, shifting your processes and business model to exploit the new possibilities.

Business co-creation program

Fujitsu practices our unique co-creation program around the world. This is based on our design thinking methodology.

Technologies and services for digital transformation

Leveraging technology that creates value and trust from data (see pages 32-37), we provide services that enable customers to transform their businesses. We help customers across a broad range of industries including finance, manufacturing, retail, health-care and public sector.

Resources to support digital transformation

We are continuously strengthening our Global Delivery Centers to provide services on a global basis. In Japan, we have established a new company, Ridgelinez, to provide a one-stop service from consulting to implementation of digital transformation projects.

How Fujitsu can help

Case Study 02

Telematics - transforming car insurance and improving driver safety

Aioi Nissay Dowa Insurance

Aioi Nissay Dowa Insurance is pioneering the new field of telematics-based car insurance, deploying the latest digital technologies to create a safe and secure driving environment.

Traditionally, a driver who has caused a road traffic accident might help the injured, alert the police and then submit a report to an insurance company. In these circumstances, the insurer is reliant on the driver's subjective recollection of what happened, creating the potential for complications and delays in resolving the settlement.

In 2019, in response to this challenge, Aioi Nissay Dowa Insurance launched its Telematics claims service system. With this solution, devices within the car automatically record the moment of impact, sending information about the accident location and video data directly to the insurance company. By using AI image recognition technology, the system is able to accurately record details such as traffic signal colors and road conditions, while also exploiting Fujitsu's unique Visual SLAM technology to accurately pinpoint vehicle position and speed.

By integrating this system with its 24/7 claim assistance service l'mZIDAN, Aioi Nissay Dowa Insurance is aiming to halve the time required to process insurance claim payouts of property damage liability insurance. They also continue to collaborate with Fujitsu to develop innovative services that can help realize their vision of an accident-free mobility society.



Evolution into an ecosystem business model

Towards a business model that co-creates social values

The final step is to build an ecosystem business model. As described in Chapter 1, many current industries will ultimately transform into 'arenas'. In these arenas, diverse organizations will form ecosystems that operate beyond the borders of existing industries, co-creating new societal value such as mobility and wellbeing.

No ecosystem will be sustainable unless it delivers benefits for society. Competition between different ecosystems will impact every business. Each organization must be capable of leading an ecosystem, or must have the unique qualities required to be chosen as an ecosystem partner.

Fujitsu is proactively working on new ecosystem business models by bringing together the domain expertise of various organizations and academic research institutions with our own digital experience and expertise. In addition, we provide technologies and services that enable the exchange of trusted data within an ecosystem.

Technology to protect privacy and enable trusted data exchange

We are developing blockchain and security technologies that enable the safe use of data. By providing these as services, we are now working to promote specific projects with customers and partners.

Questions to ask

Where do you play?

The key question here is 'where'. In order to realize your business purpose, you need to consider which Arena you will belong to, as opposed to your current industry. And who will be your key partners in shaping this new ecosystem?

How do you establish trust within an ecosystem?

It is essential to define a shared purpose across the ecosystem. To build trust, there needs to be transparent information sharing within the ecosystem.

How do you make use of data, including partner data and data about customers?

The secure exchange of useful data between partners will drive growth in the ecosystem. It is essential to protect data security and privacy.

Cross-industry partnership, open innovation and industry-government-academia collaboration

We are working to co-create ecosystem business models in areas such as mobility, wellbeing, engagement banking and insurance. We are also actively promoting collaboration with startups and academic research institutions around the world.

How Fujitsu can help

What is your role in the ecosystem?

It is necessary to clearly understand and articulate your role in the ecosystem. It is also important to continually enhance the unique capabilities you provide to the ecosystem.

Case Study 03

AI speeds aneurysm analysis

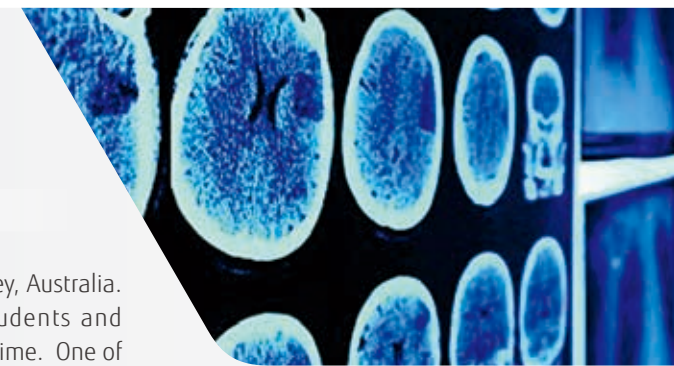
Macquarie University, GE Healthcare

Macquarie University is a public research university based in Sydney, Australia. Its academics are at the forefront of innovation and their students and researchers embrace the opportunity to tackle the big issues of our time. One of its initiatives is the analysis of brain aneurysms, which are present in at least 3.2% of adults globally, and the cause of 500,000 deaths worldwide every year.

Macquarie University joined forces with Fujitsu and GE Healthcare to develop an AI-enabled diagnostic tool that can analyze CT scans to detect brain aneurysms. Fujitsu is leading the project, with primary responsibility for the development of the core artificial intelligence algorithm. This algorithm incorporates annotated training data from clinical radiologists. GE Healthcare provides expertise within the domain of medical imaging technology.

CT scans are the typical choice for brain aneurysm detection, however they require more thorough examination compared to X-rays. Unfortunately, trained senior neuro-radiologists are an expensive resource and are not available equally around the world. The objective of this project is to develop and validate an AI algorithm capable of highlighting blood vessels that may have one or more aneurysms. This technology will also track identified aneurysms over time, serving as a valuable diagnostic support tool for radiologists.

Through this partnership and the future success of this project, radiologists will be better equipped to make early, potentially life-saving diagnoses, and improve the quality of life for patients with aneurysms around the world.



Creating trust through innovation

Digital trust

The world has changed beyond recognition. 4.5 billion people are now connected to the Internet, while over 40 billion things are connected to networks. AI technology is advancing rapidly, embedded in local devices, edges and processes, from cars to robots. These intelligent things are becoming connected through 5G high-speed, low-latency wireless networks to operate in a more autonomous, distributed manner. In the near future, cars will communicate with each other to drive autonomously, while robots will communicate with each other to achieve tasks collaboratively.

How can we deliver trust across this highly complex, connected society? Traditional trust provided by people ('Trust 1.0') and by organizations ('Trust 2.0') are no longer enough. Digital innovation is needed to ensure the trustworthiness of data and real-time transactions between people, between people and AI-based intelligent

things, and between AI-based intelligent things throughout society. We referred to this as trust through technology (Trust 3.0), or digital trust. We believe it will become important to combine trust by people, organizations and technology (Trust 1.0, 2.0 and 3.0) in a continuous and harmonious way.

Innovation is also essential to address complex societal challenges, such as solving urban traffic congestion, developing new drug treatments for complex diseases and optimizing distributed energy.

Fujitsu has a 85-year history of creating trust across both business and society through technology-based innovation. We continue to deliver innovation that delivers trust despite the increasing complexities, contributing to the realization of a more sustainable world.

How can you exchange data securely?

While free data flows are vital to stimulating economic activity and achieving sustainable growth, the current situation has become chaotic. In particular, we see frequent abuse of private data, an explosion in untrustworthy on-line data and the intensification of cyber-attacks.

We want to enable a society where organizations and people can distribute and use trusted data securely. Our priorities include effectively managing the identities of people and things that create data as well as strengthening data security throughout entire ecosystems.

We are working with companies in various industries and academic research institutions around the world to exploit and develop these new technologies. Together, we are promoting projects that will enable secure data distribution and utilization.

Enhanced identity management

Managing the identities of people and things is becoming increasingly important. For human authentication, we are developing a multi-biometric authentication technology that combines face and palm vein recognition. In addition, we are developing Identity Distribution Technology (IDYX), enabling the trustworthiness of private data to be evaluated and enabling new cooperation between organizations.



How Fujitsu can help

Data security in an ecosystem

To protect identity information across an ecosystem, Fujitsu is working on data security using blockchain technology. We are developing Connection Chain technology that enables different blockchains to be linked. We are also developing Chain Data Lineage technology that tracks data and detects data tampering between and across multiple organizations.



Trust 1.0
People

Trust 2.0
Institutions

Trust 3.0
Technology

Case Study 04

Transforming the \$450 billion rice trade

Rice Exchange (Ricex)

Rice Exchange (Ricex) is the first digital platform designed for buying and selling rice. Rice has been a strategic food staple for millennia, with millions of metric tons consumed daily – and over \$450bn traded globally annually. However, rice trading lacks transparency and is a complex and extremely process-intensive business.

Ricex wanted to use automation and blockchain technology to address these inefficiencies, and chose to work with Fujitsu's Blockchain Innovation Center in Brussel. Fujitsu built a production-ready, private, permissioned DLT(distributed ledger technology) scale-out solution running on Hyperledger Fabric.

Fujitsu's solution enables buyers, sellers and service providers to find new partners globally and to conduct business seamlessly, in a secure and trusted environment. This also radically speeds up the whole transaction process. At launch it had 40+ traders and six service providers. It expects to handle around \$20m in trades per quarter.

Early estimates indicate that using Ricex will result in 20% savings for stakeholders and 90% savings in the time it takes to trade – with an end-to-end trade completing in as little as six minutes. It also provides critical market information, such as whether rice has been certified as sustainably grown. This gives buyers certainty about the provenance of the rice and in turn allows producers to charge a premium for their product. By disrupting traditional rice trading, Ricex hopes to deliver greater profits for small farmers, less waste and social good.



How can people have the confidence to work with AI?

Over the next ten years, people will start to use AI technology much more widely in their work and in their everyday lives. We will be able to achieve significant breakthroughs by combining the empathy, creativity and imagination of people with the data analysis and pattern recognition capabilities of AI.

elderly, enabling a society where everyone can live their best life. To realize these scenarios, AI technology must be trusted by people. For example, it is essential that AI provides clear and easily understandable reasoning for arriving at a judgement.

According to our Human Centric AI belief, we develop trusted AI technology that people can use with confidence. We use it to provide transformational services.

There is potential for AI and robot technology to support the physically challenged and the

How Fujitsu can help

'Explainable AI' that shows the reason for its judgement

Fujitsu provides Explainable AI technology. To enable this, we have developed our original AI technologies: Deep Tensor, a deep learning technology that can handle graph-structured data, Knowledge Graph that identifies the relationships between vast amounts of knowledge, and Wide Learning that derives useful hypotheses from learning data.

'Fujitsu Group AI Commitment' for the safe and secure use of AI

In 2019, Fujitsu announced our AI Commitment. This Commitment sets out comprehensive guidance principles covering AI transparency, accountability and other key aspects. In addition, we have established the AI Ethics External Committee to discuss AI ethics with fellow industry experts.

How can we solve the most complex societal problems?

There are many complex problems that traditional computers cannot solve in practical time. For example, finding the best way to mitigate urban traffic congestion or analyzing the structures of protein molecules to develop new drugs for intractable diseases like cancer.

We aim to contribute to solving complex societal problems through innovation. To help us deliver this objective, we have developed a powerful new computing technology that can solve complex combinatorial optimization problems instantly. We are also developing an exa-scale computer that breaks the limits of current supercomputers.

How Fujitsu can help

Solving combinatorial optimization problems with Digital Annealer

We have developed a computer inspired by quantum behavior. It has been applied to solving complex challenges in various fields and has delivered significant outcomes. These include optimizing logistics and identifying candidates for synthesizing new drugs. We are increasing its scale to 1 million bits in order to expand these application areas further.

'Fugaku' exa-scale supercomputer

In collaboration with RIKEN, we have developed a supercomputer that is 100 times more powerful than the K Computer* and which is expected to be operational from 2021. This will extend the use of supercomputing into new areas to help realize a safer, more secure society.

Note: *The supercomputer that Riken and Fujitsu jointly developed and recorded the world highest performance in 2011.

Case Study 05

AI - accelerating cancer genomic medicine

Institute of Medical Science, University of Tokyo

The Institute of Medical Science at the University of Tokyo (IMSUT) is a leader in research around genomic medicine and associated disciplines, including new generation medical care techniques such as gene/virus therapy and AI-based medicine.

In Japan, one in two people on average will suffer from some form of cancer in their lives. Cancer genomic medicine analyzes the condition of each patient, helping to predict the effectiveness of specific drugs to offer the optimum treatment. This topic has been gaining significant attention and led to the creation of joint research project between IMSUT and Fujitsu Laboratories in 2018.

By combining Fujitsu's expertise in AI-based natural language processing with the knowledge of the Institute, the project creates specific databases known as a knowledge graph, which includes information about the relationship between particular gene mutations, therapeutic drugs, and their likely effects. The knowledge graph* focused on cancer genomic medicine exploited over 2.4 million records from more than 860,000 different medical theses.

In the Proof of Concept, the knowledge graph was created by analyzing past cases of acute myeloid leukemia. IMSUT found that the new approach could halve the time it currently takes to diagnose a cancer type considering a critical single gene mutation. If available to all leukemia patients in Japan, currently estimated at over 12,000 people, this would potentially reduce the current 6,000 hours of diagnosis required by specialist physicians to less than 3,000 hours.

In the future, further advances in AI technology and the accumulation of more case and treatment data is expected to produce effective genomic treatments for many cancer patients.

Case Study 06

Digital Annealer - pushing the boundaries of financial services

MELCO Investments

As the investment management and financial services arm of MELCO Holdings, MELCO Investments aims to achieve steady growth of client assets through the pursuit of stable, long-term returns.

Generating stable returns from asset management requires both maximizing returns and mitigating risks. Mathematical modeling is traditionally used to minimize risk exposure and to optimize a portfolio by analyzing massive combinations of stock selections. However, conventional techniques have been increasingly unable to cope with the huge combination of trading units and target stocks available. As a result, MELCO Investments had to create portfolios reflecting a degree of tolerance and contingency.

To analyze the possible combinations and optimize portfolios more accurately, MELCO Investments worked with Fujitsu to deploy Fujitsu's Digital Annealer architecture, specifically designed to solve combinatorial optimization problems instantly. By enhancing the Digital Annealer and improving both formulation and solving algorithms, the calculation accuracy of potential portfolios has been gradually improved. The Digital Annealer is able to calculate these investment portfolios with minimal risk, as managed by asset management experts.

As a result, MELCO Investments is able to deploy a more scientific approach to analysis, giving them a clear competitive advantage over other asset management organizations. By exploiting Fujitsu's Digital Annealer, they can provide investment portfolios that meet customer requirements for stable investments that both maximize returns and minimize risks.

Technologies underpinning digital transformation

Fujitsu is developing technologies that create trust and enable our customers to realize the potential of digital transformation. Combining these technologies together enables us to deliver transformational services.

Computing

Digital Annealer, HPC

We are working on the development and implementation of Digital Annealer, solving combinatorial optimization problems, and High Performance Computers, providing a powerful infrastructure to address the most complex business and societal challenges.

AI

Explainable AI, Wide Learning

We are developing Explainable AI technology, which articulates the reasoning behind AI judgments. We will continue to develop trusted AI and to accelerate the implementation of AI across various business scenarios.

5G

Local 5G, Network Slicing

We provide local 5G services by bringing together digital and communication technologies. This will enable the creation of new business models involving many different industries.

Cybersecurity

Multi-Factor Biometric Authentication, Security by Design

In addition to providing operational cyber-defense services, we are implementing 'security by design.' This approach enables highly skilled security professionals to build countermeasures according to the risk-severity of data at the planning and design phase.

Cloud

Hybrid IT

We are supporting the migration of customers' existing mission-critical systems to hybrid IT and multi-cloud environments. We are also pioneering new multi-cloud managed services.

Data

Virtuora DX, Chain Data Lineage

We are providing Virtuora DX to ensure trusted data for blockchain applications. We are also delivering Chain Data Lineage that can track the creation and processing history of data. These technologies are helping customers exploit their data in new ways to support business transformation strategies.

IoT

Dracena, Edge Computing

We are developing Dracena, the stream data processing technology, and Edge Computing to enable high-speed processing of big data. These technologies enable pioneering work on the implementation of real-time digital twins.



Human Centric Innovation Driving a Trusted Future

At Fujitsu, we contribute to making the world more sustainable by building trust in society through innovation. We partner with our customers to help them achieve digital transformation successfully. The diagram below summarizes what we described in this booklet. This is a journey toward a society where people can find confidence in the future.

Let us work with you to drive a trusted future together.

Future Society

Evolution to Trusted Business

Societal Challenges

- Still many challenges need to be addressed
- People created huge new challenges
- Trust challenges created by digital

Value for society

