Solutions for digital innovation
Lumada

HITACHI
Inspire the Next

LUMADA

Lumada concept video
https://youtu.be/2pTZIJBBNRo

Improving corporate value and people's quality of life

Better social value

Better environmental value

Better economic value

Digital transformation

☀ LUMADA

Digital transformation for a better society

In this day and age, we need transformation through the use of digital technologies—or digital transformation (DX)—in order to realize a better society.

In the face of dramatic, unprecedented changes, Hitachi helps build sustainable societies with the aim of creating a "green world"—one that recycles and is decarbonized.

Alongside customers and business partners in a wide range of business areas, we are currently working to bring forth various social innovations through digital transformation.

To identify signs of changes that heretofore could not be predicted and take swift action—

To build a co-creation ecosystem that creates new value for society in the coming age—

Hitachi presents Lumada.

Accelerate your business strategies with the speed and scalability offered by Lumada's digital innovations.

These days, changes that are hard to predict occur one after another.

To maneuver through these waves of change and create new value, it is important to ascertain and analyze the latest data at all times and adjust our trajectory accordingly as we carry out our business.

Lumada makes it possible to swiftly create new businesses that utilize data.

By building ecosystems with customers and business partners in various business areas, we can accelerate digital innovation to create new value for a new society.
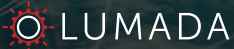
○ LUMADA

Coined from the words "illuminate" and "data", the name Lumada embodies our goal of shining a light on our customers' data and illuminating it in such a way that we can extract new insight, thereby resolving our customers' business issues and contributing to their business growth.

Co-creation with customers and business partners
To transform your businesses, processes, products, and services, we work with you to formulate strategies based on data analysis.
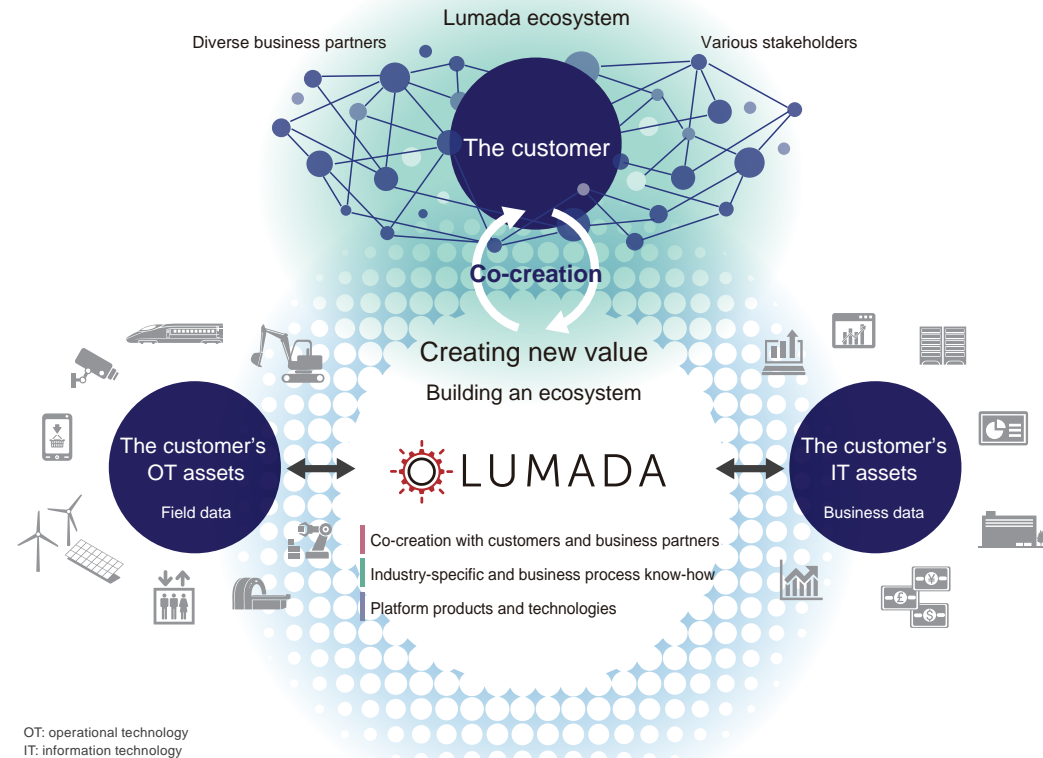
Industry-specific and business process know-how
(Solutions and customer cases)
Leveraging Hitachi's industry-specific and business process know-how and the expertise that we have accumulated over the years, we provide support throughout all phases of digital innovation, from planning and design to implementation.

Platform products and technologies
We provide the cutting-edge products and technologies you need for digital innovation.

Lumada ecosystem

Diverse business partners

Various stakeholders

The customer

Co-creation

Creating new value

Building an ecosystem

The customer's OT assets

Field data

○ LUMADA

The customer's IT assets

Business data

Co-creation with customers and business partners

Industry-specific and business process know-how

Platform products and technologies

OT: operational technology
IT: information technology

Lumada Ready (Products that support Lumada)
We provide cutting-edge products to help you create services and systems using digital technologies more quickly.

Co-creation with customers and business partners

Hitachi has developed a variety of approaches to creating new value with its customers and business partners.

In this era of dramatic changes, the issues facing society and businesses are becoming increasingly complex and thus more difficult for any one company to resolve. Through various initiatives to connect people, Hitachi and its customers and business partners are working together to collect knowledge and create innovation.

Lumada Innovation Hub

A place where Hitachi and our customers and business partners share our knowledge and technologies to continuously create new value—that is the Lumada Innovation Hub.
Here, people gather in both the real world and the virtual world, combining their diverse knowledge and digital technologies to create new value for society in the real world.

Digital talent

Lumada is supported by digital talent including experts specializing in DX and other areas. Hitachi has defined the skills required of these experts and is working to develop and enhance such digital talent.

Design thinkers — Data scientists — **Lumada Innovation Hub** — Combining and connecting knowledge and ideas — Domain experts — Co-creation facilities

Co-creation process — Relationship building — Value creation — Implementation on a social level

New value / New businesses / Resolution of social issues

Solution catalog — Support for system operation — Cloud environments and edge computing/IoT — **Lumada Solution Hub** — Connecting solutions and technologies — **Lumada Alliance Program** — Connecting business partners — Innovation partners — Solution providers — Technology providers

Examples:	
Design thinkers	Specialists who identify customer issues through design thinking and propose innovative solutions
Data scientists	Specialists who create value from data and facilitate the resolution of issues
Domain experts	Specialists with extensive knowledge or skills in a specific industry or field, who help customers identify and resolve issues from a business-process perspective
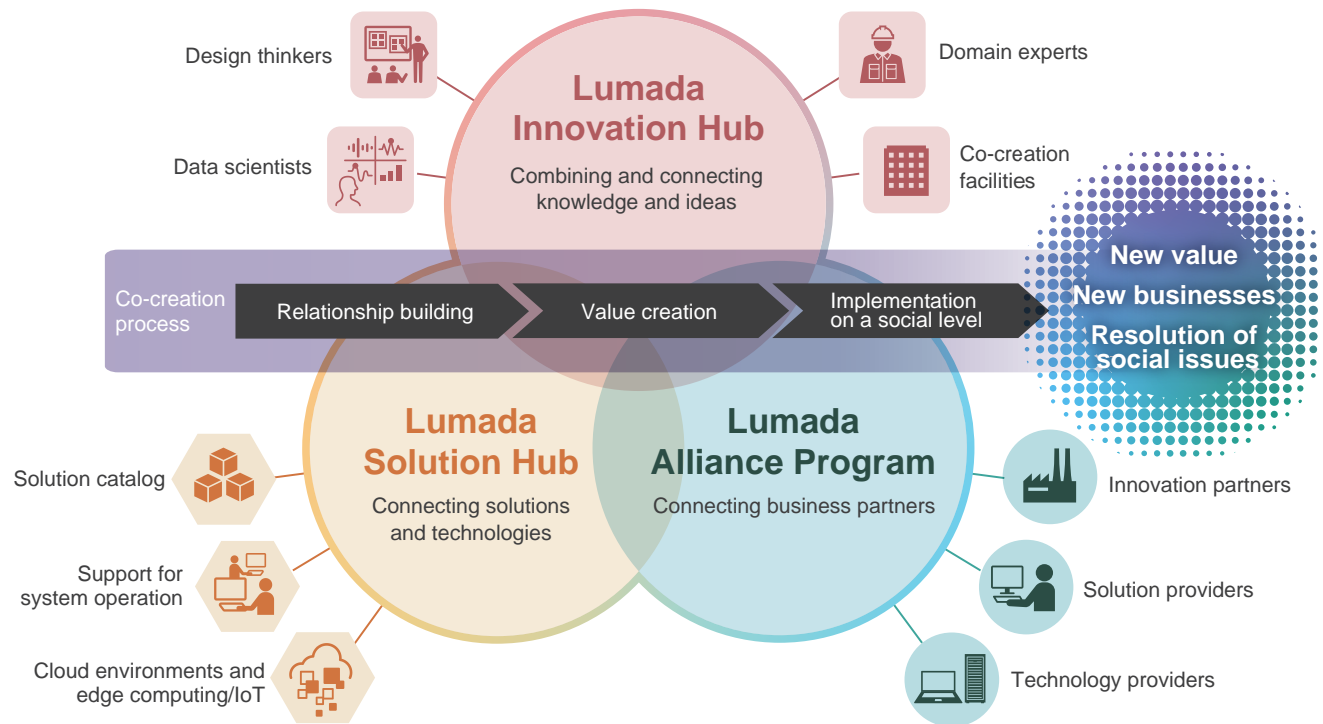
Lumada Data Science Lab.

The Lumada Data Science Lab. enables experts in data science to link together seamlessly to accelerate digital innovation. Here, we provide new value for our customers' businesses and work to build a society where people can live more comfortably.

Co-creation with customers and business partners

Hitachi has developed a variety of approaches to creating new value with its customers and business partners.

Creating experience value through design thinking

At Hitachi, we think of design as a series of processes: always thinking about things from a human-centered perspective, establishing a goal, creating a plan to achieve the goal, and carrying out the plan. Our work includes developing methodologies for creating experience value through co-creation and training specialists through actual experience. Along with GlobalLogic, which provides design-based digital engineering services around the world, we help customers who want to succeed in DX carry it out.

Flow of co-creation

Through the three steps of identifying issues, proposing solutions, and verifying the value, we guide you through the process of creating social innovations and help our customers and business partners resolve issues.
Hitachi has various co-creation tools and techniques and applies what is best for the topic at hand or the status of examinations. As the general flow, we first identify future business opportunities based on trends in society, and then analyze the issues that end users, our customers, or our business partners are facing. Next, we come up with ideas for services based on the aforementioned business oppor- tunities or issues, and design business models for promising ideas, evaluating their feasibility and simulating their business value.

Customers and business partners

Co-creation

STEP 1: Identify the issue | STEP 2: Come up with a solution | STEP 3: Verify the value

Opportunity Discovery | Ethnography | Service Ideation | Business Model Designing | Service Value Evaluation | Simulation of Service Businesses
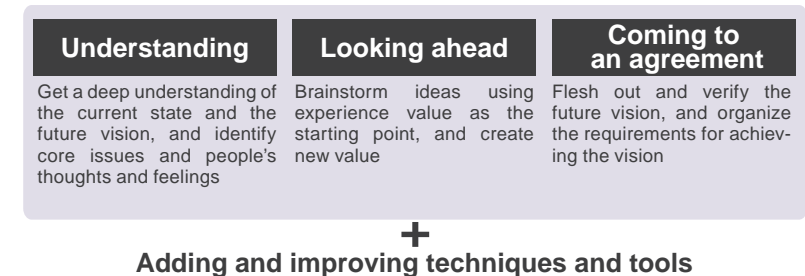
Implement the solution on a social level

A co-creation methodology for creating value with customers and business partners NEXPERIENCE

Consisting of various methods, tools, and spaces for collaboratively creating new businesses and services, NEXPERIENCE stems from a Hitachi design approach based on human-centered ideation. We offer support for all phases from the development of new business ideas to the creation of value and the formulation of implementation strategies.

Design Studios: Places for gathering and giving form to knowledge

Centered on experience value (in terms of happiness, excitement, joy, etc.), we help stakeholders go through the steps of understanding, looking ahead, and coming to an agreement. At Lumada Innovation Hub Tokyo and the Hitachi Group's Design Studios located in various places around the world, specialists accompany customers on their transformation journey, actually carrying out the following phases, which are features of design thinking: understanding the customer or worksite's actual situation, sharing and combining diverse knowledge from various stakeholders, implementing ideas swiftly, and continuously making improvements. Through actual practice, we add to and improve our arsenal of tools and techniques to further develop our co-creation methodologies.

Supporting transformation

Understanding	Looking ahead	Coming to an agreement
Get a deep understanding of the current state and the future vision, and identify core issues and people's thoughts and feelings	Brainstorm ideas using experience value as the starting point, and create new value	Flesh out and verify the future vision, and organize the requirements for achieving the vision

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Adding and improving techniques and tools

GlobalLogic's digital engineering services

Joining the Hitachi Group in 2021, GlobalLogic is a leading company in design-based digital engineering services. In addition to upstream services (such as formulating a vision or creating ideas based on design thinking), GlobalLogic rapidly applies the results of such services to actual products and customer experience, thereby accelerating DX.

Co-creation with customers and business partners

Hitachi has developed a variety of approaches to creating new value with its customers and business partners.

Lumada Alliance Program

A partnership system that accelerates open innovation

Under this program, Hitachi and our business partners share technologies, knowledge, and ideas to create new value from data. Through a cycle of value creation and application, we and our partners help improve people's quality of life and contribute to sustainable social and economic development, leading to mutual growth.

Under the Lumada Alliance Program, you can work with business partners who share your vision to create innovations tackling all kinds of social issues and local issues that cannot be resolved by any one company alone. We match you with a variety of business partners, each with their own strengths such as digital solutions, the ability to deploy solutions on a global scale, and technological support. By teaming with the right partner, you can start a wave of co-creation, the effects of which are multiplied exponentially, thereby accelerating open innovation. The new solutions and value that arise can be registered in the Lumada Solution Hub for future use, leading to the further creation of new value.

Through this value creation chain, we can achieve continuous innovation.

Building of ecosystems with our business partners

To accelerate social innovation, we have built ecosystems where business partners can contribute in their respective areas of expertise. For social issues that are difficult to handle alone, the Lumada Alliance Program provides a setting (community) for open innovation in order to resolve those issues and provide value.

■ **Business partners who accelerate social innovation**

Innovation partners

By teaming up with Hitachi and the various business partners in the Lumada ecosystem, you can resolve complex and diverse social issues, regional issues, and business issues through co-creation.
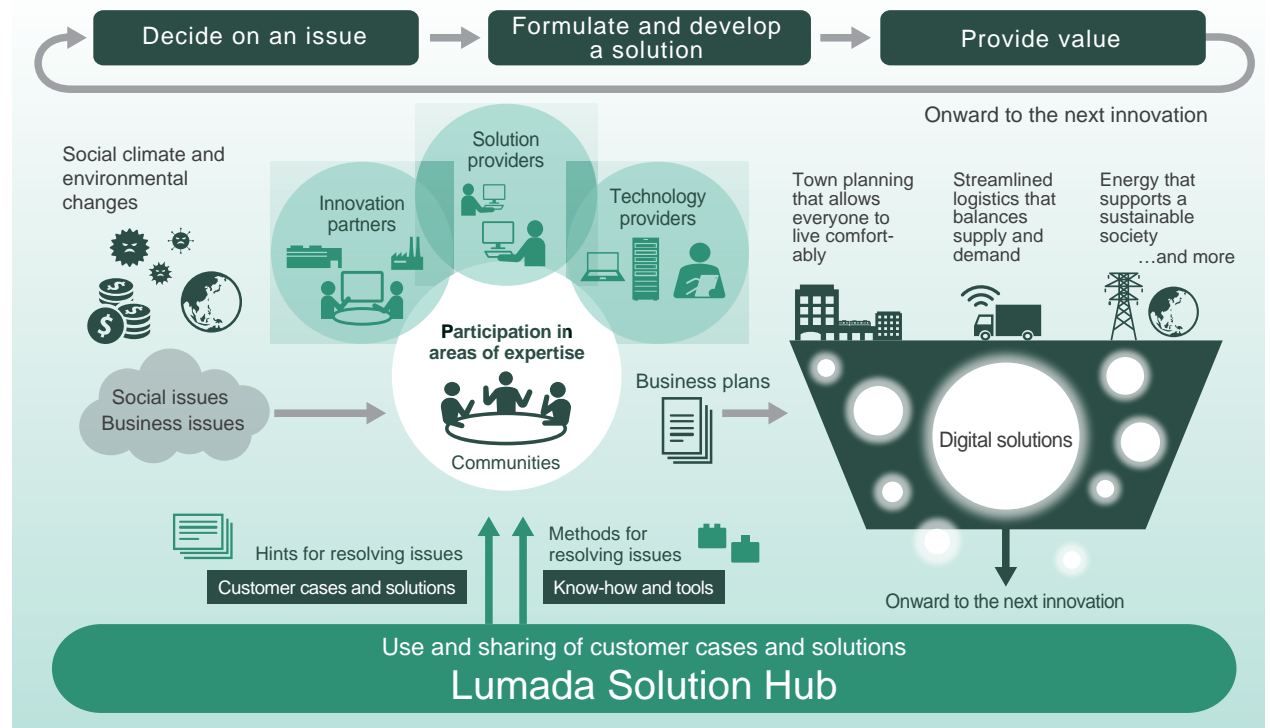
Solution providers

The Lumada Solution Hub allows Hitachi and our business partners to share and use each other's digital solutions.

Technology providers

Through this program, business partners can provide each other with platform products, cloud services, and other proven technologies. The mutual linkage of ecosystems enables each company to improve their capabilities and expand their business.

Industry-specific and business process know-how (solutions and customer cases)

Using our rich portfolio of customer cases, we promptly provide the digital solutions you need to resolve your business issues.

Hitachi has a wealth of experience and know-how in various industries and business processes, as well as proven digital solutions for creating new value through co-creation with customers. These are **collected and stored in Lumada** as solutions and modelized customer cases, allowing them to be quickly applied in a wide range of fields. Each year, the number of customer cases and the fields in which they can be applied are increasing.

To promote new co-creation with customers in various fields, Hitachi utilizes Lumada customer cases that match each customer's business issues and Lumada solutions that incorporate our know-how.

We put together the right mechanisms for each customer and swiftly provide digital solutions that create solid value.

Examples of Lumada customer cases

Manufacturing

Real-time monitoring of production line equipment

| Environment | Resilience | Safety and security |

Use a production dashboard to improve the productivity and efficiency of production lines.
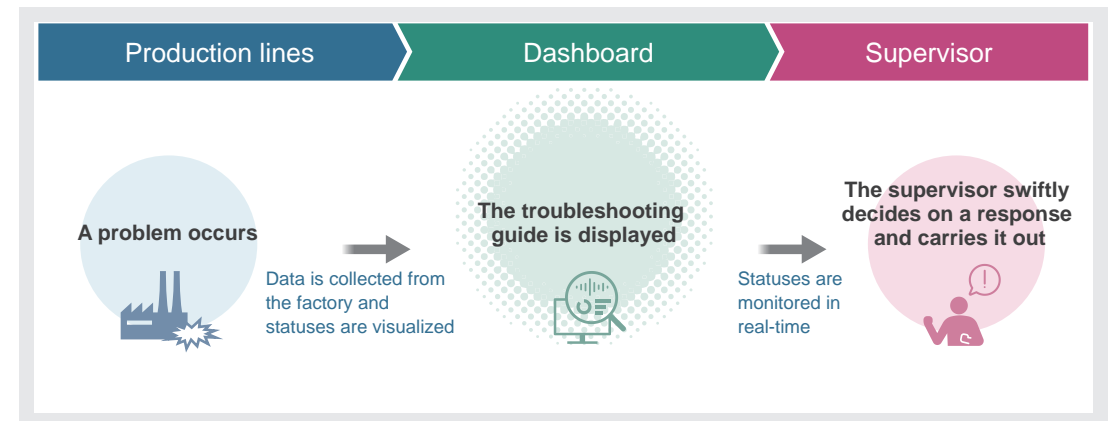
This solution monitors production line equipment in real time and detects problems at an early stage. Then, it displays a troubleshooting guide that tells the user how to handle the detected problem, thereby facilitating swift recovery. By reducing the downtime of production lines, the solution helps improve productivity.

For details:

Solution: Management and production dashboard

| Production lines | Dashboard | Supervisor |

A problem occurs — Data is collected from the factory and statuses are visualized

The troubleshooting guide is displayed — Statuses are monitored in real-time

The supervisor swiftly decides on a response and carries it out

https://www.hitachi.co.jp/products/infrastructure/product_site/dashboard/ (Japanese site only)

Industry-specific and business process know-how (solutions and customer cases)

Using our rich portfolio of customer cases, we promptly provide the digital solutions you need to resolve your business issues.

All industries

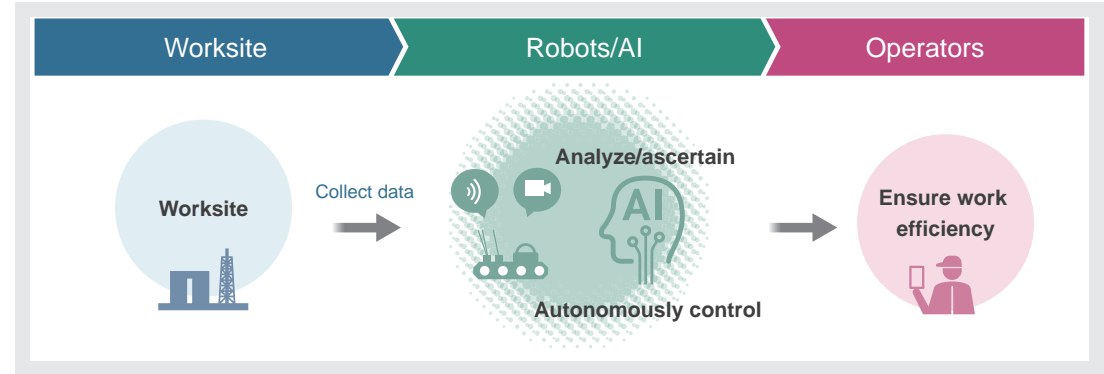## System for real-time environment recognition and autonomously controlled robots

| Environment | Resilience | Safety and security |

Support reactor-decommissioning work by autonomous robots that use worksite data.

AI analyzes worksite data collected by robots, and then assesses the situation in unknown environments that are too dangerous for people to enter.
Based on the latest worksite data, the system autonomously controls the movement of robots at remote sites, thus improving work efficiency without relying on operator skills.

For details:

Featured customer case:
Supporting reactor-decommissioning work by autonomous robots that use worksite data

https://www.hitachi.com/products/it/lumada/global/en/spcon/uc_01803s/

| Worksite | Robots/AI | Operators |

Worksite → Collect data → Analyze/ascertain / Autonomously control (AI) → Ensure work efficiency

Retail

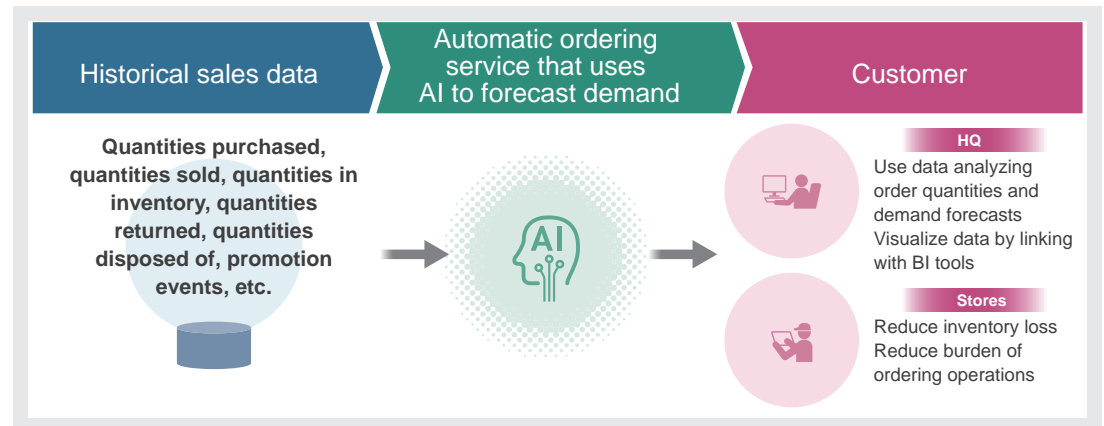## Automatic ordering service that uses AI to forecast demand (for the retail industry)

| Environment | Resilience | Safety and security |

Optimize inventory and order quantities to improve cash flow.

This service uses AI to forecast daily demand based on the historical sales data of each product, determines the optimal order quantity, and then automatically places the order.
By reducing the burden of ordering operations, eliminating dependencies on the skills of individuals, and reducing inventory loss, the service helps maximize profits.

For details:

Solution:
Demand prediction service

https://www.hitachi.co.jp/products/it/bigdata/service/demand-forcast/   (Japanese site only)

| Historical sales data | Automatic ordering service that uses AI to forecast demand | Customer |

Quantities purchased, quantities sold, quantities in inventory, quantities returned, quantities disposed of, promotion events, etc. → (AI) →

HQ
Use data analyzing order quantities and demand forecasts Visualize data by linking with BI tools

Stores
Reduce inventory loss Reduce burden of ordering operations

Industry-specific and business process know-how (solutions and customer cases)

Using our rich portfolio of customer cases, we promptly provide the digital solutions you need to resolve your business issues.

Manufacturing

Improving the efficiency and security of differential updates of in-vehicle software

Environment | Resilience | Safety and security

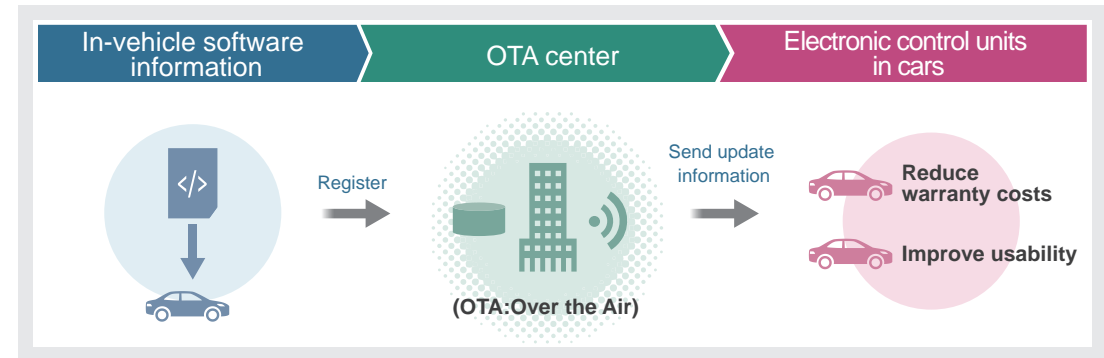### Improve the safety and efficiency of maintenance work, and reduce costs.

Information about in-vehicle software is registered in the OTA center and then sent wirelessly to target vehicles.
By encrypting the data to be sent, you can automatically update in-vehicle software in a secure manner.

For details:

Featured customer case:
Secure updating of in-vehicle software by using OTA technology

https://www.hitachi.com/products/it/lumada/global/en/spcon/uc_00866s/

In-vehicle software information → OTA center → Electronic control units in cars

Register → Send update information

(OTA:Over the Air)

Reduce warranty costs

Improve usability

All industries

Use of AI to visualize and analyze the voice of the customer

Environment | Resilience | Safety and security

Collect and analyze the voice of the customer from social media and questionnaires, and leverage the feedback for corporate activities.

AI technology is used to decipher the meaning of Japanese sentences and visualize, with high precision, information such as customers' sentiments towards a company or product. The ranking of the frequency of categorized sentiments or keywords, the relationships between keywords, and other useful information is displayed in way that is easy to understand.
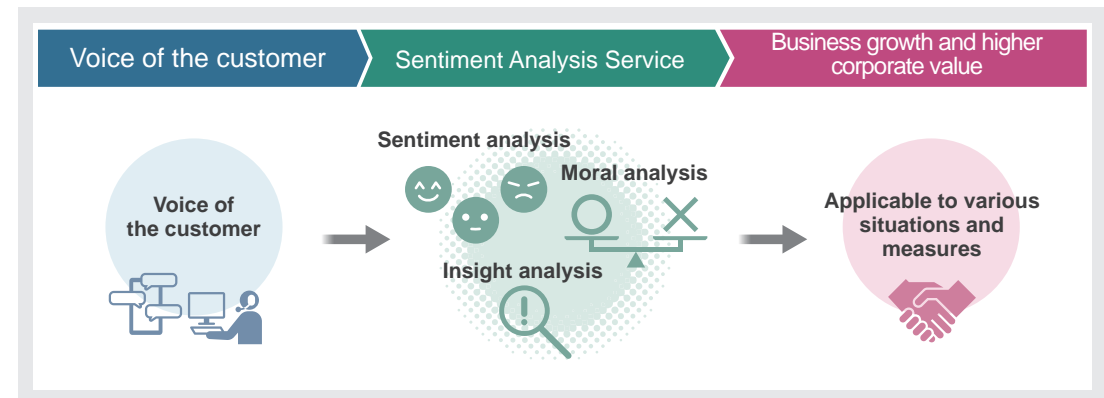With this service, the voice of the customer can be applied to various situations and measures, for example, when planning or making improvements to products or services.

For details:

Solution:
Sentiment Analysis Service

https://www.hitachi.com/products/it/appsvdiv/service/sentiment-analysis/

Voice of the customer → Sentiment Analysis Service → Business growth and higher corporate value

Voice of the customer → Sentiment analysis / Moral analysis / Insight analysis → Applicable to various situations and measures

Platform products and technologies

Our architecture, technologies, and platform services enable the prompt provision of cutting-edge digital solutions.

To create a better society through DX, the concept of cyber-physical systems that use IoT is important. In such a system, data obtained from the real world (physical spaces) is visualized and analyzed by AI or other technology running in a cloud in cyberspace. Based on the analysis, solutions to issues are fed back to the real world.

Through the use of digital twins (technology that simulates the real world in cyberspace), we can now find ways to address changes in the real world with greater speed and a broader perspective than in the past. By feeding this back to the real world, business sites are reborn as places where new value is continuously created even in the midst of great change.

Lumada's digital innovation platform achieves continuous innovation by accelerating this value creation chain.


Lumada architecture: An intelligent, composable, secure, and flexible platform

This architecture consists of platform services and technologies that form a foundation for the speedy development and implementation of cutting-edge digital solutions. Lumada's digital innovation platform is equipped with architecture that combines such services and technologies, which are essential for DX. Lumada provides cutting-edge analytics technologies, asset management functions, and various other mechanisms all in one place, allowing you to swiftly implement digital solutions.

■ Six elements of the architecture

Studio	Visualizing results	Edge	Relaying device data to IoT systems
Analytics	Analyzing data by using AI and analytics technology	Core	Establishing a data lake and accumulating data
Data Management	Collecting and processing data	Foundry	Providing infrastructure for IoT systems, including servers, network devices, etc.
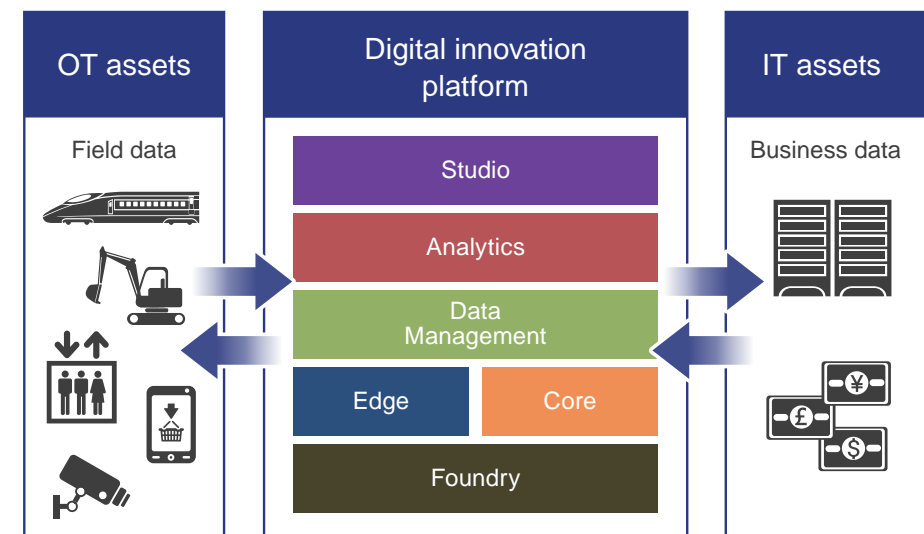
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Platform products and technologies

Our architecture, technologies, and platform services enable the prompt provision of cutting-edge digital solutions.

Lumada Solution Hub

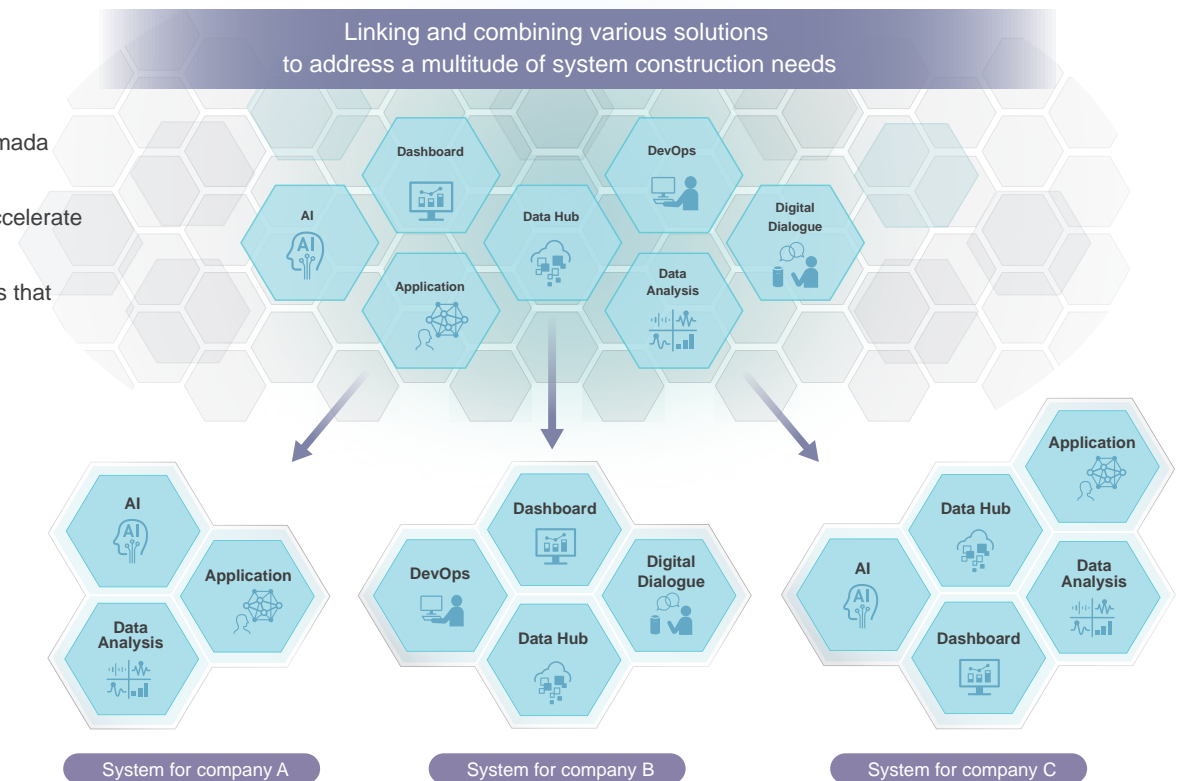### An IT platform that supports Lumada

Lumada Solution Hub provides a mechanism for promoting the registration and reuse of Lumada solutions and the development of new solutions.
Various assets with proven results are registered in this platform and can be combined to accelerate asset-based systems development that uses the latest technologies.
By responding to changes in business operations and facilitating the construction of systems that are resilient to change, we contribute to the continuous creation of value for our customers.

Examples of solutions registered in Lumada Solution Hub

A wide array of solutions and services are registered in Lumada Solution Hub, including digital solutions that facilitate customer DX, services that support the modernization of core systems, and services that support system development, maintenance, and operation.

Linking and combining various solutions to address a multitude of system construction needs

System for company A
System for company B
System for company C

Digital solutions that facilitate customer DX	
Automatic ordering service based on demand forecasting	Automates ordering operations by forecasting demand
Materials development solution	Supports materials development based on materials informatics
MaaS for tourism	MaaS platform for regional revitalization
Risk Simulator for Insurance	Provides APIs for predicting hospitalization and other risks
Management and production dashboard	Centralizes and visualizes data from production to management
Form recognition service	SaaS that uses AI-OCR
Digital dialogue service	Speech transcription and chatbot services
Sentiment Analysis Service/Empathy Monitoring Service	Visualizes the voices of customers (through social media, etc.) and employees

Services that support the modernization of core systems	
Agile development consulting service	Helps promote agile DX
Microservice Technical Solution	Supports the changing to microservices architecture
DevOps Technical Support Service	Helps accelerate the cycle of development and operation

Services that support system development, maintenance, and operation	
Hitachi Application Framework	Application development platform
Application Service for Blockchain	Supports the rapid development of blockchain systems
Data Preparation Service	Analyzes and processes data by using AI

Note: The solutions and services described herein are current as of September 2022, but subject to change without prior notice.

Facilities for co-creation

Each of our facilities is linked to the Lumada Innovation Hub, accelerating value creation with our customers and business partners.

LUMADA INNOVATION HUB TOKYO

Flagship site for co-creation activities

Functioning as a hub for accelerating open innovation, this flagship site connects customers and business partners across different industries with Hitachi's DX sites and digital talent, combining the real and virtual worlds. Through faster and more active value creation, Lumada Innovation Hub Tokyo accelerates open innovation, aiming for the creation and continuous growth of businesses under the new normal.

Meet-Up Square
Learn about advance case examples and network with others

DX Gallery
Boost your ideas by learning about various solutions

Co-Creation Studio
Co-create value through workshops

Mirai Atelier
Quickly prototype and verify ideas

Incubation Base
Hold discussions to flesh out business ideas

Kyōsō-no-Mori

An R&D site that accelerates innovation

With the aim of achieving the SDGs and the goals of Society 5.0, Kyōsō-no-Mori is an R&D site for accelerating the creation of innovation through open co-creation on a global scale. Here, we share our vision for resolving social issues with customers and business partners from around the world and explore new business opportunities. By using Hitachi's IT and OT, combined with NEXPERIENCE and Lumada, we are able to implement a fast hypothesis-verification cycle consisting of the phases of idea conception and rapid prototyping, in order to build business scenarios. Through these efforts, we contribute to creating a sustainable, human-centered society with high quality of life.

Lumada Data Science Lab.

The Lumada Data Science Lab. consolidates Hitachi's expert knowledge and know-how related to a wide range of industries and business processes, as well as our human resources and cutting-edge technologies.
As the core group in the fields of AI and analytics, the laboratory addresses more complex and advanced customer issues and accelerates digital innovation through Lumada.

Lumada Center Southeast Asia

This facility was established to help achieve the Thailand 4.0 initiative promoted by the Thai national government. A branch office has since been established in Bangkok to provide services in various fields. Lumada Center Southeast Asia supports the vision set forth by the Thai national government.

Lumada Competency Center

At the Lumada Competency Center, you can get a feel for our next-generation IT solutions, which form the foundation of Hitachi's social innovation business. You can gain hands-on experience in system assessment and system testing, attend seminars, and view exhibitions and demos.

Innovation Square

Here, you can take part in hands-on demos and view exhibitions of digital solutions that use AI and IoT to resolve customer issues or to create new services.

Omika Works

Omika Works showcases initiatives for the overall optimization of the value chain from the design and manufacturing processes to operation and maintenance after delivery.

Note: In January 2020, the World Economic Forum (WEF) named Omika Works as a "Lighthouse" factory, one of the world's most advanced factories.

Kanagawa Works

Kanagawa Works showcases our efforts to improve production through the integration, visualization, and analysis of various types of data, combining both IT and OT.

Yokohama Works

Yokohama Works showcases initiatives to implement new human-centered workstyles that allow employees to choose where they work.

Open to visitors   Virtual tours are available.   If you are interested in using or taking a virtual tour of any of these facilities, please contact a Hitachi sales representative.

LUMADA

For details about Lumada or to submit an inquiry, please visit the following sites.

■ Lumada website

https://www.hitachi.com/lumada/

■ Contact for online inquiries

https://www.hitachi.com/lumada/inq/

⊚Hitachi, Ltd.

Digital Systems & Services

2022.10