HITACHI

HITACHI White Paper

Advancing Social Infrastructure with HMAX

HMAX™ by Hitachi:
AI Solutions Supporting the Realization of a Harmonized Society

Prologue:

Modern society is at a crossroads of unprecedented complexity and untold opportunity. How can we, for example, advance decarbonization while responding to growing energy demand? How can we develop and enhance social infrastructure* while protecting people's safe and secure lives? How can we increase productivity on the front lines while reducing the burden on workers? And how can we balance advanced medical care, including cancer treatment, with work and social participation?

Environment, well-being, and economic growth. These are no longer themes to be addressed in isolation. For society to continue developing sustainably, it is necessary not to prioritize one value at the expense of another, but to enhance multiple values at the same time.

To respond to the complex challenges of this era, Hitachi will leverage the vast amounts of data that exist within social infrastructure and industrial systems to enable more advanced and flexible decision-making and execution. At the heart of this strategic approach is HMAX by Hitachi, a suite of next-generation solutions that combines AI, data, and deep domain expertise to help customers solve complex social infrastructure challenges – from energy to transportation – maximizing outcomes and value for clients and society.

In this white paper, we will clarify the value of HMAX and how it will help drive Hitachi's mission of realizing of a more "Harmonized Society," one in which the environment, well-being, and economic growth are in harmony.

*Social infrastructure:
Refers to essential systems and services that underpin society and economic activities, including mobility, energy, industry, and finance.

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Epilogue:

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01.
Challenges Facing Social Infrastructure

On the front lines of social infrastructure, addressing labor shortages, transferring expert knowledge, and responding to aging equipment have become urgent priorities. Implementing AI is essential to meeting these increasingly complex challenges.

A New Evolution Is Required for Social Infrastructure

The realization of a “Harmonized Society,” in which environment, well-being, and economic growth are in harmony, requires the rapid evolution of social infrastructure to support people’s lives and industrial activities.

Energy, railways, healthcare, manufacturing, logistics, cities, and public services. Across the many domains that support society, stable operation, safety, efficiency, and sustainability are required more than ever before. At the same time, front lines are facing increasingly apparent challenges such as declining working populations, the retirement of experienced engineers, and aging equipment.

Until now, social infrastructure has been supported by people with extensive experience and specialized knowledge. Going forward, however, it will be necessary to continue advanced operation, maintenance, and improvement with limited personnel, while responding to increasingly complex changes in the operating environment.

At the same time, advances in artificial intelligence (AI) technologies, including generative AI, are beginning to significantly transform industry and society. How AI is implemented in business operations as well as the front lines, and how it will connect to value creation are important themes shaping everything from the competitiveness of companies to the advancement of social infrastructure.

What is needed to succeed in this new era is AI that not only analyzes data, but understands real-world conditions and autonomously makes decisions and takes action. In particular, in mission-critical social infrastructure domains, the application of AI agents and Physical AI that operate in the real world is expected to play an increasingly important role. While Physical AI is typically used to describe robotics in devices, industrial AI (a segment of Physical AI) is used to describe the AI developed for and deployed in mission-critical systems of industry, including power generation facilities, railway systems, medical equipment, manufacturing lines, buildings, urban infrastructure, and more. Hitachi believes that this expansion of AI will lead to the next evolution of social infrastructure.

HMAX is a next-generation suite of AI solutions that connects the physical and digital worlds. By combining vast amounts of data obtained from both physical and digital assets with advanced AI strengthened by Hitachi’s deep domain knowledge, HMAX addresses the most complex challenges facing social infrastructure.

By bringing together the operational technologies (OT), information technologies (IT), and product knowledge that Hitachi has cultivated over many years, HMAX captures complex real-world conditions, makes decisions, and connects them to action. Through the evolution of social infrastructure, HMAX will drive the realization of a “Harmonized Society.”

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02.
What Is HMAX?

**How can the vast amounts of data generated on the front lines of social infrastructure be transformed into value?
This section explores the background, design philosophy, and value creation mechanism of HMAX.**

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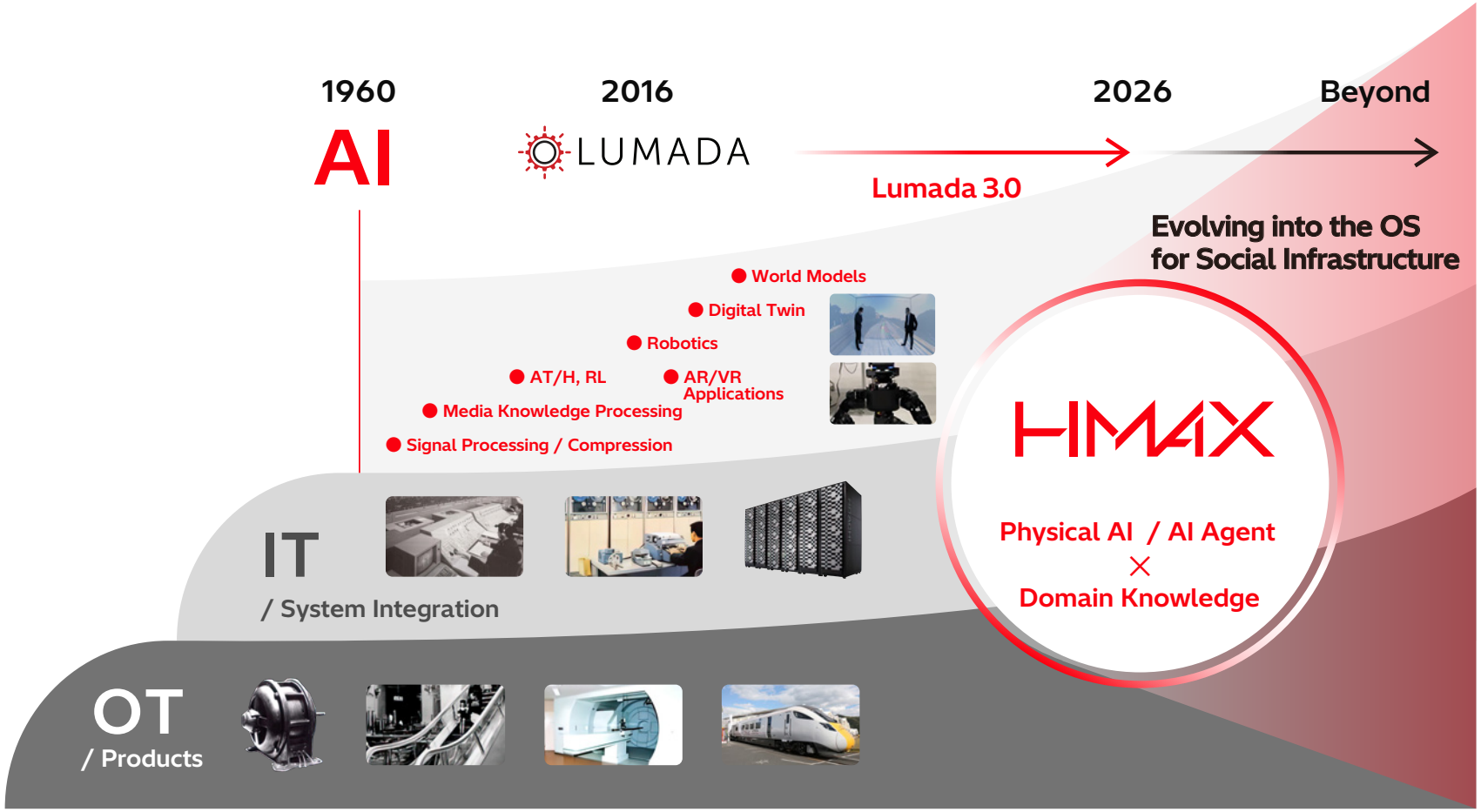
A next-generation suite of AI solutions for transforming social infrastructure

HMAX is a next-generation suite of solutions that combines AI and data with Hitachi's domain knowledge to address the complex challenges facing social infrastructure, delivering maximum outcomes and value to customers and society. In the field of social infrastructure, vast amounts of data are generated by facilities, equipment, and systems. However, this data does not create value simply by being collected. It can only be used to advance social infrastructure and solve challenges when it is accurately understood, stored, analyzed, and connected to action. The following section explains the background and history behind the creation of HMAX, as well as its design philosophy and value creation mechanism.

The Journey and Evolution of HMAX

Behind the creation of HMAX lies Hitachi's history of supporting social infrastructure for more than 116 years since its founding. Hitachi has continued to create products that move society, from motors to elevators and railway systems. At the same time, the company has developed OT to control these products safely and reliably, as well as IT systems that support social infrastructure. Since the 1960s, Hitachi has also conducted research and development in AI-related technologies, including image recognition and speech recognition, applying these technologies toward the innovation of social infrastructure.

Figure 1: The Journey and Evolution of HMAX



O&M : Operation & Maintenance AR : Augmented Reality VR : Virtual Reality AT/H : Hitachi AI Technology/H

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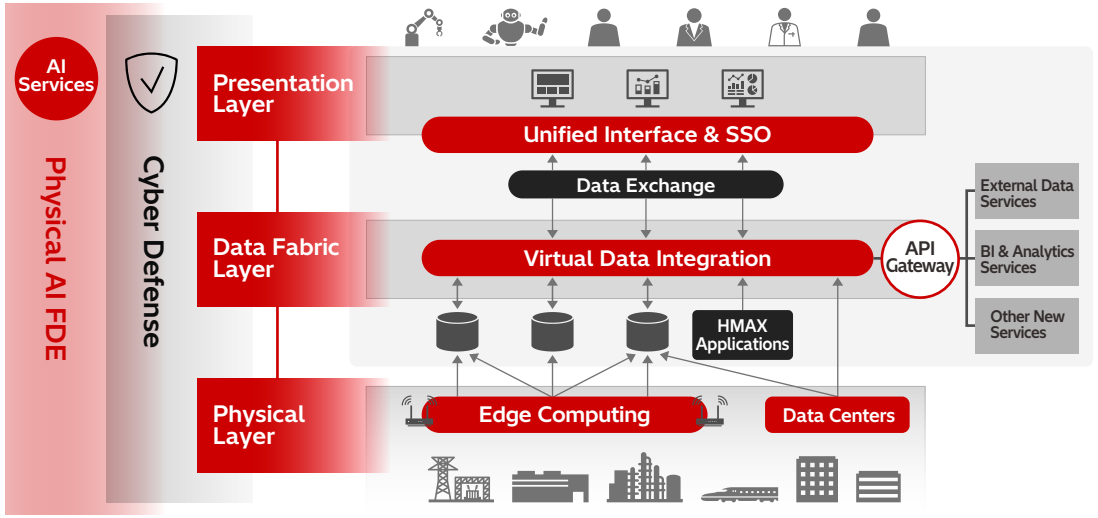
Since 2016, Hitachi has promoted its Lumada business, which shines a light on data to create new value. Through this business, Hitachi has accumulated expertise in collecting and utilizing data that exists on the front lines of customers and society and transforming it into value. With Lumada 3.0, Hitachi aims to create new value by incorporating AI agents and Physical AI on a foundation of digitalized assets and digital services. HMAX is the suite of solutions at the core of this initiative.

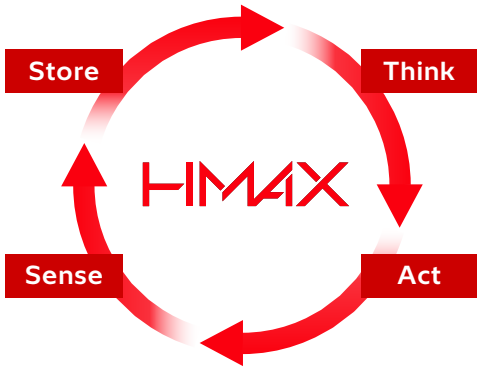
HMAX is being deployed across domains such as mobility, power, industry, and finance, enhancing the operation, control, maintenance, and decision-making of social infrastructure. Furthermore, through co-creation with leading AI companies, Hitachi will bring cutting-edge AI into social infrastructure and enable continuous value creation.

Figure 2: The Design Philosophy of HMAX



FDE: Forward Deployed Engineer SSO: Single Sign-On

Figure 3: The Value Creation Mechanism of HMAX



The Design Philosophy of HMAX

HMAX is not simply a collection of AI solutions. It is a common foundation that connects the diverse domains that make up social infrastructure through AI and data, enabling continuous optimization. Hitachi aims to evolve HMAX into a “social infrastructure operating system (OS)” that connects diverse areas of social infrastructure—including mobility, energy, industry, and finance—and creates new value across them.

At the core of HMAX is a simple three-layer architecture consisting of the presentation layer, data fabric layer, and physical layer. The presentation layer provides an integrated interface that enables different types of users to access the information and functions they need. The data fabric layer connects data from existing systems and external services and integrates it into a form that AI can readily utilize. The physical layer connects with sensor-equipped equipment and products, as well as existing systems, to capture data from frontline operations.

These three layers are supported end to end by cyber defense and Physical AI FDE. With its flexible architecture, HMAX enables customers to begin from whichever layer best addresses their specific challenges—whether integrating interfaces, preparing data for AI utilization, or modernizing existing equipment and systems.

The Value Creation Mechanism of HMAX

The mechanism through which HMAX creates value is a cyclical model based on Sense, Store, Think, and Act.

HMAX captures real-world conditions through Sense, accumulates them as data through Store, enables AI to analyze and make decisions through Think, and connects those decisions to on-site control, optimization, and improvement through Act. The results are then captured again as data and used for continuous learning.

Through this cycle, HMAX continuously enables automatic control, optimization, and efficiency improvements in mission-critical social infrastructure domains, while ensuring reliability and peace of mind. Furthermore, the more it is used in operation, the more knowledge it accumulates, making it possible to continue evolving social infrastructure itself.

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03.
Why Hitachi Can Implement HMAX

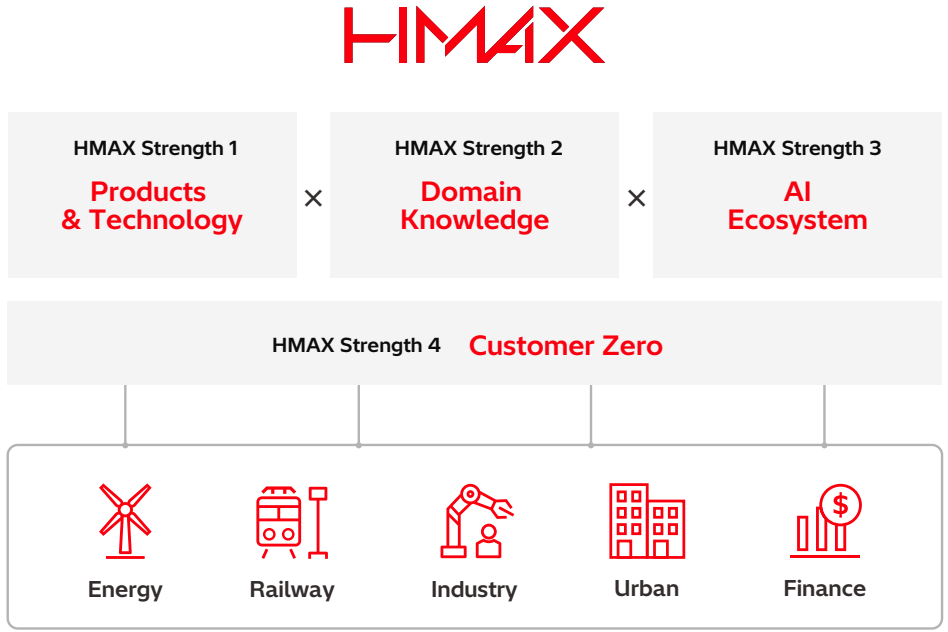
Because Hitachi has deep knowledge of social infrastructure, it can connect AI to value that functions on the front lines. This section explores the four elements that support this strength.

The Ability to Turn AI into Value in Mission-Critical Domains

Implementing AI in mission-critical social infrastructure domains requires more than the introduction of advanced technologies. What matters just as much is the ability to understand the complex constraints and landscapes of the specific industries and the ability to integrate AI into those operations to ensure not only performance, but safety, reliability, and continuity. Hitachi's strength lies in its ability to bring together, as One Hitachi, the knowledge and technologies cultivated across its diverse social infrastructure businesses, including mobility, power, industry, and finance, to optimize social infrastructure as a whole.

HMAX is built on four core strengths: products and technologies, domain knowledge, an AI ecosystem, and the Hitachi's "Customer Zero" approach. By integrating these strengths, HMAX goes beyond the mere introduction of AI technologies, enabling AI to function reliably on the front lines of social infrastructure and continuously create value.

Figure 4: HMAX's Four Core Strengths



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HMAX Strength 1:
Products and Technologies
Products and control technologies that have supported social infrastructure

For more than 116 years since its founding, Hitachi has provided products and technologies that support social infrastructure. Hitachi has a long history of creating, operating, and controlling a wide range of real-world products, including motors, elevators, railway systems, energy equipment, and industrial machinery.

HMAX views these real-world facilities, equipment, and systems as digitalized assets that serve as the starting point for AI utilization. It collects data from the products that make up social infrastructure, captures their conditions and changes, and connects them to AI-driven decision-making, control, and optimization.

Hitachi also possesses technologies that connect the real world with digital space, including digital twins, edge computing, and cloud integration. Data is collected from equipment on the front lines, processed in real time at the edge, analyzed, learned from, and optimized in the cloud, and then reflected back into on-site control and operation. This integrated technology foundation supports the implementation of HMAX.

For AI to function effectively in social infrastructure, it is essential not only to handle data, but also to deeply understand how products operate and under what constraints they are used. The product and control technologies that Hitachi has cultivated form the foundation for HMAX to become an AI solution trusted on the front lines.

HMAX Strength 2:
Domain Knowledge
Knowledge assets that understand mission-critical front lines and connect AI to value

On the front lines of social infrastructure, even the slightest error in judgment can have a significant impact on safety and stable operation.

For this reason, the introduction of AI requires not only knowledge of equipment and systems, but also an understanding of business processes, operational constraints, decision-making criteria accumulated on the front lines, and expertise cultivated through responses to risk.

For many years, Hitachi has provided systems and equipment across social infrastructure domains such as railways, energy, manufacturing, buildings, and public services, while working closely with customers' operations to solve their challenges. In this process, the knowledge accumulated by sales, systems engineering, product, and service divisions has become more than technical expertise. It has become valuable domain knowledge for understanding front-line operations and decision-making processes.

Hitachi's domain knowledge includes an understanding of customers' businesses and social challenges, industry-specific terminology and operational rules, front-line judgment flows and decision-making criteria, constraints of equipment and systems, and data and metadata accumulated through many years of operation.

These are not simply pieces of information for AI to learn from. They are a knowledge foundation that enables generative AI, AI agents, and Physical AI to correctly understand front-line contexts and connect them to appropriate decisions and actions.
For example, by incorporating into AI knowledge such as how to respond to equipment abnormalities, criteria for maintenance decisions, and constraints within business processes, it becomes possible to achieve high-quality reasoning and decision-making that reflect the realities of the front lines.

The performance of AI is not determined by the performance of the model alone. Its practical value is greatly influenced by how much valuable domain knowledge can be embedded into AI, and how effectively front-line context is reflected within. By combining knowledge accumulated across a wide range of social infrastructure domains with a deep understanding of front-line operations, Hitachi realizes the reliability and practicality required in mission-critical domains.

These knowledge assets are also used to help suppress hallucinations, prevent deviations from rules, and ensure reliability and safety. Hitachi's domain knowledge is not only a foundation for improving the accuracy of AI decision-making, but also an essential basis for enabling AI to be used with confidence. In HMAX, domain knowledge is not merely experience or know-how. It is structured as a knowledge asset for understanding social infrastructure and supports the decisions and actions of AI agents and Physical AI.

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HMAX Strength 3:
AI Ecosystem
Partnerships that Bring Advanced AI to the Right Domains

AI technologies are evolving at great speed. Rather than attempting to develop and own every AI technology in-house, Hitachi leverages cutting-edge technologies where they can deliver the greatest value through strong partnerships with leading global technology companies.

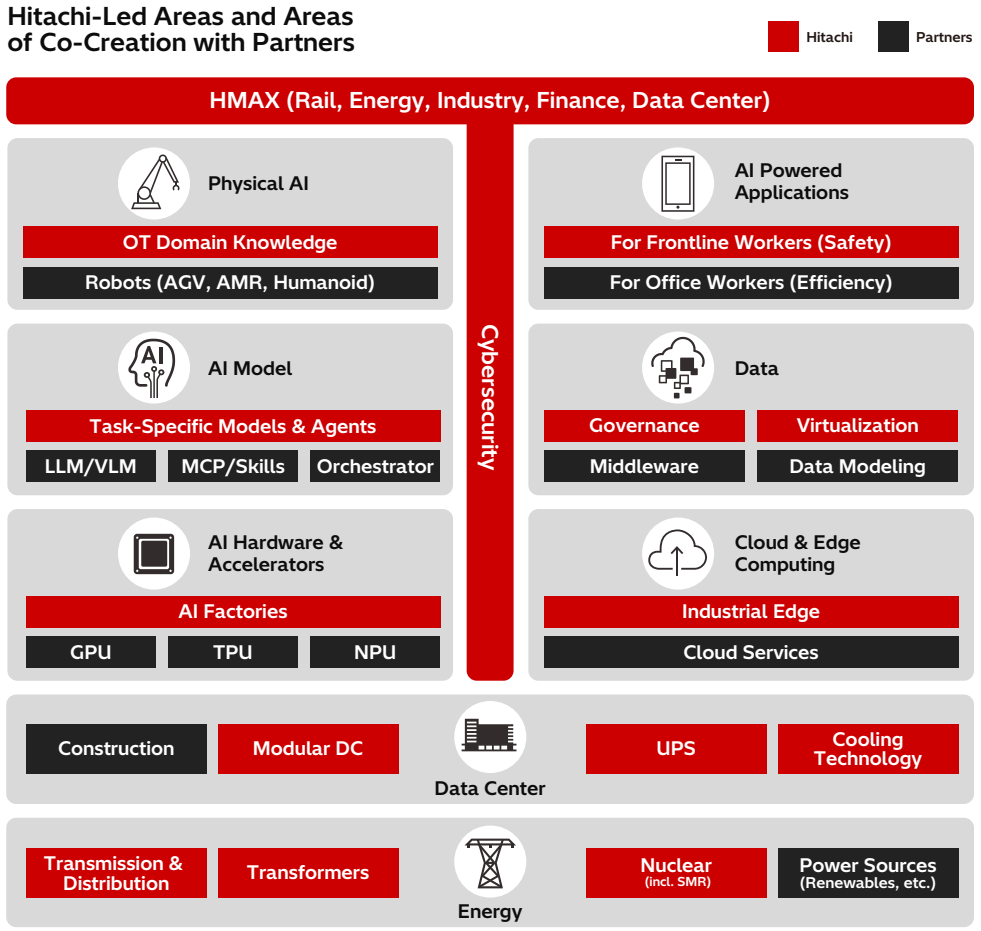
What matters is not simply creating AI. The key is to determine which AI technologies should be applied to which domains and how, to create value on the front lines of social infrastructure. It is also essential to combine AI with OT, IT, products, and domain knowledge, and implement it as a total solution.

Hitachi selects and combines the most appropriate technologies as a user and implementer of AI and deploys them on the front lines of social infrastructure. This enables the technological capabilities of leading AI companies and Hitachi's implementation capabilities in social infrastructure to mutually reinforce one another.

In addition, for leading AI companies to scale AI deployment across society, the stability and sophistication of the underlying layers that support AI — including power, data centers, networks, and industrial facilities — are essential. As a company with deep expertise in supporting social infrastructure such as energy and data centers, Hitachi can contribute not only in the domains where AI is applied, but also in the foundational domains that support the social implementation of AI. This is precisely why leading AI companies choose Hitachi as a partner.

Hitachi's mission is to drive AI into social infrastructure through co-creation with leading AI companies. By selecting cutting-edge AI technologies for the right applications and integrating them with OT, IT, products, and domain knowledge for implementation on the front lines, Hitachi will deliver value that is uniquely its own.

Figure 5: Overview of the AI Ecosystem



VLM: Vision-Language Model
NPU: Neural Processing Unit, AI/ML-specialized processor
UPS: Uninterruptible Power System
SMR: Small Module Reactor

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HMAX Strength 4:
Customer Zero
Using solutions internally and refining them on the front lines before delivering them to customers

One of the key strengths of HMAX is its “Customer Zero” approach, in which Hitachi itself becomes the first customer and refines AI solutions in actual front-line environments.

Hitachi introduces HMAX within its group companies, factories, and business sites, verifying its effectiveness and identifying challenges through real-world operation. By using it on the front lines, improving it, and enhancing the precision of implementation before delivering it to customers, Hitachi creates solutions that are backed by practical experience rather than remaining at the conceptual stage.

In mission-critical domains, it is important not only that AI can be “used,” but that it can continue to be used with confidence. In the AI era, what is required is not only technological novelty, but also the ability to continuously generate results in actual front-line environments reliably and responsibly.

Customer Zero initiatives are a core mechanism for enhancing the reliability, practicality, and continuous evolution of HMAX. By continuously incorporating insights gained from its own operations, Hitachi refines HMAX and delivers proven value to customers. This continuous learning cycle is a key source of HMAX’s competitive advantage.

Sidebar:
The Importance of Cybersecurity and OT Security
A Trust Foundation for Secure AI Implementation

Cybersecurity and OT security are essential requirements when implementing AI in social infrastructure domains.

In domains that handle critical facilities and business systems, it is necessary to protect data, ensure system robustness, prepare for external threats, and manage operational risks. Hitachi has long worked with products that operate in the real world, as well as OT that controls them safely and reliably. As the products and facilities that make up social infrastructure, including power generation facilities, railway systems, medical equipment, manufacturing lines, and building facilities, become connected with AI, the potential for more advanced operation will expand. At the same time, the risk of these assets becoming targets of cyberattacks will also increase. For this reason, securely implementing AI requires a perspective that protects both IT and OT in an integrated manner.

As a company that has supported social infrastructure for many years, Hitachi positions cybersecurity and OT security as important components of HMAX. By ensuring the safety, security, and trust required for social infrastructure, Hitachi will promote the social implementation of AI.

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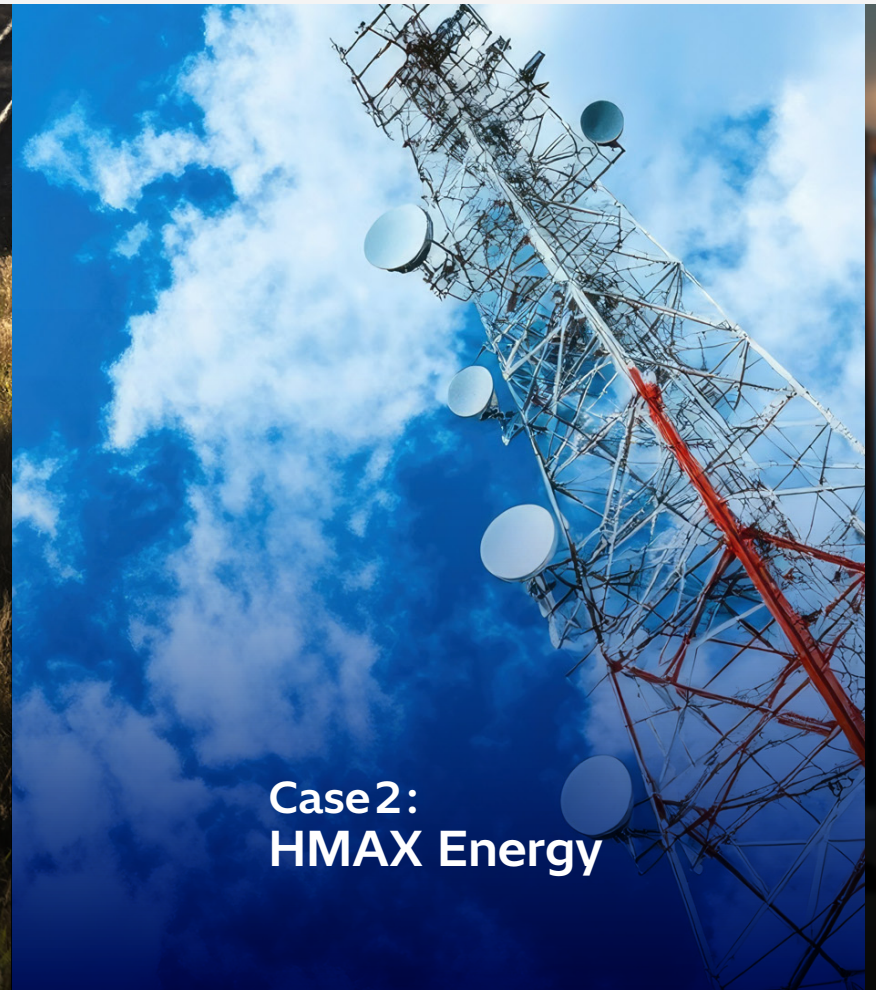
04.
Case Studies by Industry

**HMAX is delivering tangible results across a wide range of industries that support social infrastructure by combining field data, Hitachi's domain knowledge, and advanced AI.
This section introduces examples of how HMAX is being applied in three domains:
Mobility, Energy, and Industry.**

Case1:
HMAX Mobility



Case2:
HMAX Energy

Case3:
HMAX Industry

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Case1:
HMAX Mobility

Optimizing maintenance costs, increasing service availability for rail operators.

Results

HMAX for Rail, part of the HMAX Mobility solution family, is deployed across more than 2,500 trains and thousands of miles of railway infrastructure. It is helping transport operators around the world optimize their maintenance and energy costs by as much as 15%, while extending asset life and increasing service availability for passengers and freight.

Challenges

In the mobility sector, transport operators face the challenge of optimizing maintenance and energy costs while maintaining reliable and uninterrupted service. For rail operators, around 50% of the total cost of ownership of a railway comes from maintenance and energy activities.

Value Provided by HMAX

HMAX for Rail uses AI, advanced analytics and Hitachi's rail domain expertise to transform operational and asset data into actionable intelligence.

Following the Sense, Store, Think, Act framework, data is continuously collected from trains, infrastructure and operational systems along the railway corridor and stored for analysis. Hitachi's proprietary machine learning and AI algorithms analyse asset condition and operating patterns to identify anomalies, predict future performance and prioritize actions.

These insights are then integrated into maintenance planning and operational decision-making, enabling operators to move from reactive to more predictive and condition-based approaches.

Figure 6: Application of HMAX in the Railway Business

Maintenance & Energy Costs
Reduced by 15%

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Case 2: HMAX Energy

Towards Autonomous Optimization of Increasingly Complex Power Systems

Results

In the Baltic Cable* case, a comprehensive digital twin consolidating data, analytics, and real-time operational insights reduced incident response time by 90%. In the case of an energy-related company, the digitization and optimization of inspection and maintenance operations reduced on-site inspection time by 35%. HMAX Energy strengthens energy security and resilience by improving uptime, improving operational efficiency and safety, and extending the lifetime of assets across critical infrastructure.

Challenges

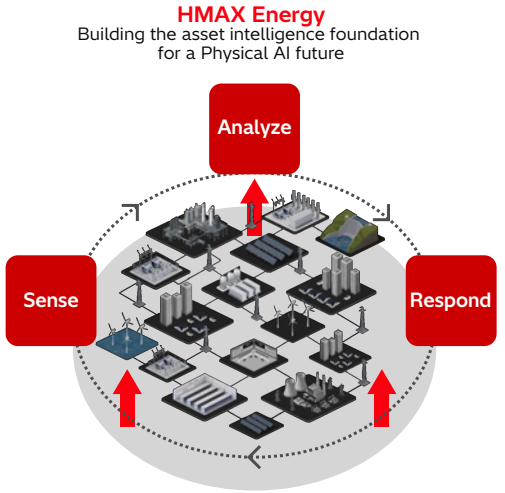
With surging energy demand from data centers and AI, the expansion of renewable energy, the spread of distributed power sources, and increasing fluctuations in demand, power systems are becoming more complex and dynamic than ever before. It is now necessary to manage supply-demand balance, equipment conditions, grid abnormalities, and maintenance planning at a higher level while maintaining a stable power supply and safeguarding the critical energy infrastructure that society depends on.

Value Provided by HMAX

HMAX Energy supports the optimization of increasingly complex power systems through a suite of AI-powered services and solutions. Delivered through lifecycle service partnerships tailored to each customer's needs, HMAX Energy offers asset health, asset monitoring, and infrastructure monitoring, combining AI-powered intelligence with extensive domain expertise and expert services to improve operational performance, identify issues early, reduce risk, and extend asset life. At the same time, HMAX Energy enables the asset intelligence needed for a Physical AI future. By combining connected infrastructure, deep domain expertise, and AI-powered insights, it lays the foundation for more adaptive, autonomous, and resilient energy systems that can sense, predict, and respond in real time. Today, AI-powered intelligence helps analyze asset conditions and identify signs of potential issues, supporting maintenance and operational decision-making. By continuously applying these insights, HMAX Energy supports more stable, efficient, and resilient power system operations.

*Baltic Cable:
A 250-kilometer high-voltage direct current submarine power cable connecting Sweden and Germany.

Figure 7: Application of HMAX in Power Systems



Incident Response Time	On-site Inspection Time
Reduced by 90%	Reduced by 35%

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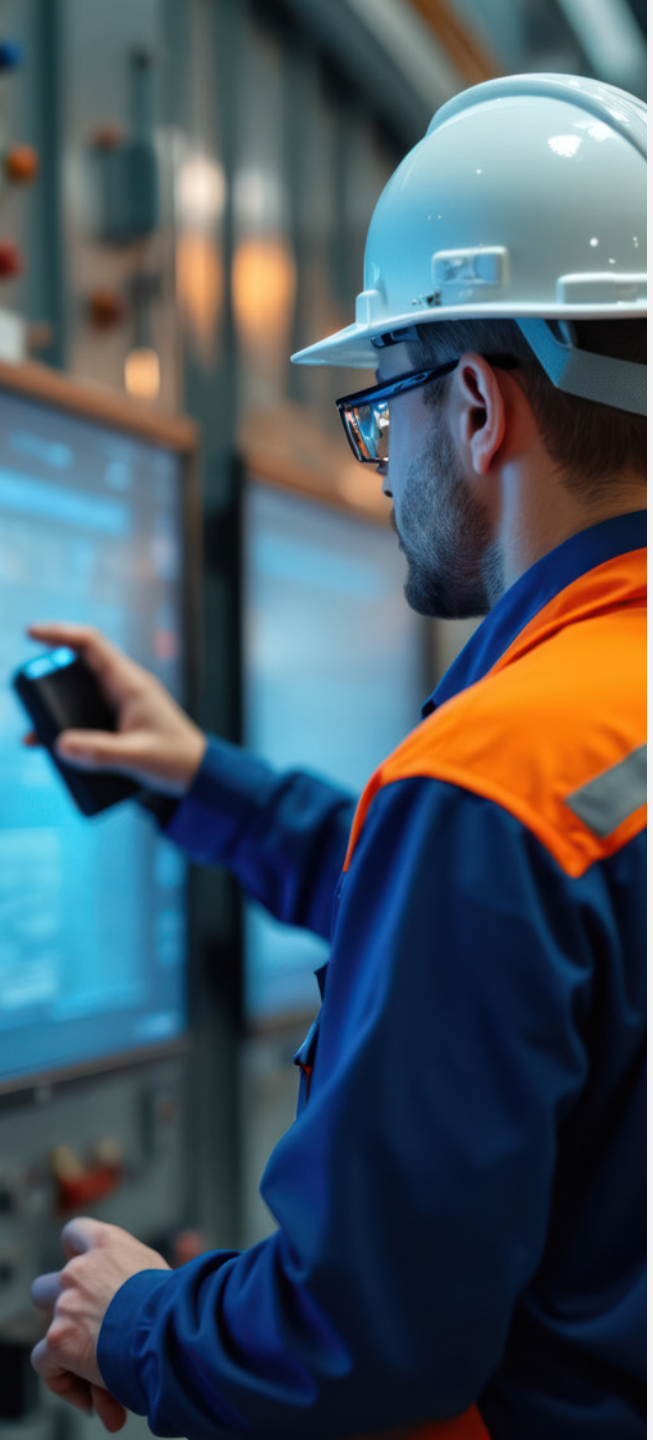


Case 3:
HMAX Industry

Optimizing Facility Operation, Maintenance, and Energy Use to Enhance People's Well-being

Results

HMAX Industry supports the advancement of operation, maintenance, and energy management across a wide range of industrial domains, including buildings, factories, industrial equipment, pharmaceutical manufacturing, and semiconductors, by connecting front-line data, domain knowledge, and AI.

One of its representative focus areas is HMAX for Buildings, which is designed for facilities. HMAX for Buildings combines data from building equipment, such as elevators, air-conditioning systems, access control systems, and surveillance cameras, with OT knowledge cultivated through Hitachi's extensive track record in building equipment implementation. This enables the stable operation, safe management, and energy saving of building equipment. For example, it has achieved a predictive diagnosis accuracy of over 95% and a reduction of approximately 16% in energy usage.

Challenges

In buildings, factories, and industrial facilities, aging equipment, labor shortages, the increasing sophistication of maintenance operations, and rising energy costs are making it difficult to maintain operational quality and efficiency through conventional labor-intensive management alone. Future facility operations require a mechanism that can understand the status of equipment and people flow in real time, detect signs of abnormalities at an early stage, and optimize maintenance, operation, and energy management in an integrated manner.

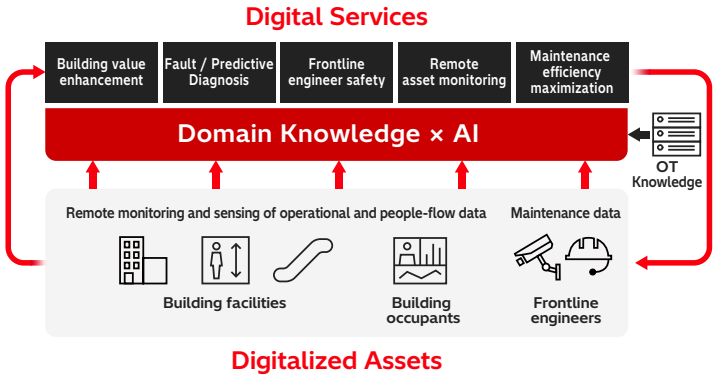
Value Provided by HMAX

HMAX for Buildings is not simply an equipment monitoring system. It supports the stable operation and safe management of building equipment, the efficiency of building management operations, the assurance of security, and the promotion of energy saving in an integrated manner, thereby contributing to the enhancement of the value of the building itself.

A key component of HMAX for Buildings is the company's BuilMirai. BuilMirai - AI Solution for engineers analyzes video footage from maintenance sites using AI, supports improvements in the efficiency and safety of work performed by front-line engineers. By applying AI to a mechanism that analyzes hazardous locations and unsafe actions from video, it enables real-time and advanced on-site safety management, improves the efficiency of periodic inspection work by approximately two times, and contributes to the prevention of accidents.

HMAX Industry advances safety, productivity, quality, and environmental sustainability in buildings and factories, driving innovation for frontline workers and improving people's wellbeing.

Figure 8: Application of HMAX in Factory and Maintenance Operations



Predictive Diagnosis Accuracy	Energy Usage
95% or higher	16% reduction

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05.
Physical AI FDE Supporting HMAX

Implementing AI in social infrastructure requires the capabilities of Physical AI FDE which deeply understands the front lines and works alongside customers from issue definition through implementation.

Connecting the Front Lines with AI and Accelerating Implementation in Social Infrastructure

To deploy HMAX across diverse domains of social infrastructure and connect it to real-world value, introducing advanced AI alone is not enough. What is required is the capability to enter customers' front lines and implement AI in a usable form while understanding existing systems, business processes, data, equipment, and operational constraints. At the core of this capability is Physical AI FDE（Forward Deployed Engineer), an organization of highly-skilled Hitachi engineers.

From Development to Implementation

AI technologies are evolving at an unprecedented speed. In the rapidly changing AI era, it is becoming difficult to respond sufficiently through the conventional "development-type" approach of defining requirements, spending time on development, and delivering a completed solution.

What is now required is a shift toward an "implementation/deployment-type" approach, in which challenges are identified on customers' front lines, data is prepared, AI is embedded, and value is created through repeated verification and improvement. Physical AI FDE drives this shift. Rather than relying solely on the capabilities of individual specialists, Hitachi rapidly solves customers' highly complex, mission-critical challenges through Physical AI FDE.

Diverse Expertise and a Deep Understanding of the Front Lines

Physical AI FDE brings together diverse specialists, including a team leader, AI specialists, domain experts, data scientists, security engineers, and project managers. In addition to expertise in AI and digital technologies, Hitachi's Physical AI FDE is characterized by its deep understanding of OT, products, and the front lines of social infrastructure. The strength of Hitachi's Physical AI FDE lies in its ability to define challenges based on an understanding of the characteristics of real-world equipment and systems, such as power generation facilities, railways, factories, and buildings, as well as operational constraints and front-line business processes; implement AI; handle operation and continuous improvement end to end; and work alongside customers until tangible results are achieved on the front lines.

Turning Front-Line Knowledge into Value That AI Can Utilize

Working alongside customers at their front lines, Physical AI FDE acquires domain knowledge from customers' sites and organizes knowledge related to business operations and equipment into forms that AI can easily utilize in order to embed AI into actual business operations and processes and drive continuous improvement. By connecting, contextualizing, and ontologizing* data formats and levels of granularity that differ by industry and customer through a Data Fabric, Physical AI FDE establishes a foundation that enables AI to understand front-line contexts.

Furthermore, through the use of digital twins, Physical AI FDE leverages customer and simulated data to digitally depict the customer's equipment and operations to gauge the effectiveness and efficacy of potential AI tools and processes that could improve front-line decision making, control, maintenance, and optimization.

Advancing the Implementation Process Through Human–AI Collaboration

Hitachi aims to support and enhance not only the capabilities of Physical AI FDE professionals, but also FDE process itself through AI. AI will support not only the analysis, decision-making, and execution of customers' operations, but also the processes carried out by Physical AI FDE, including issue identification, data organization, use case design, implementation,

*Ontologizing: Structuring the meaning and relationships of front-line data so that AI can understand the context of equipment, operations, conditions, and decisions.

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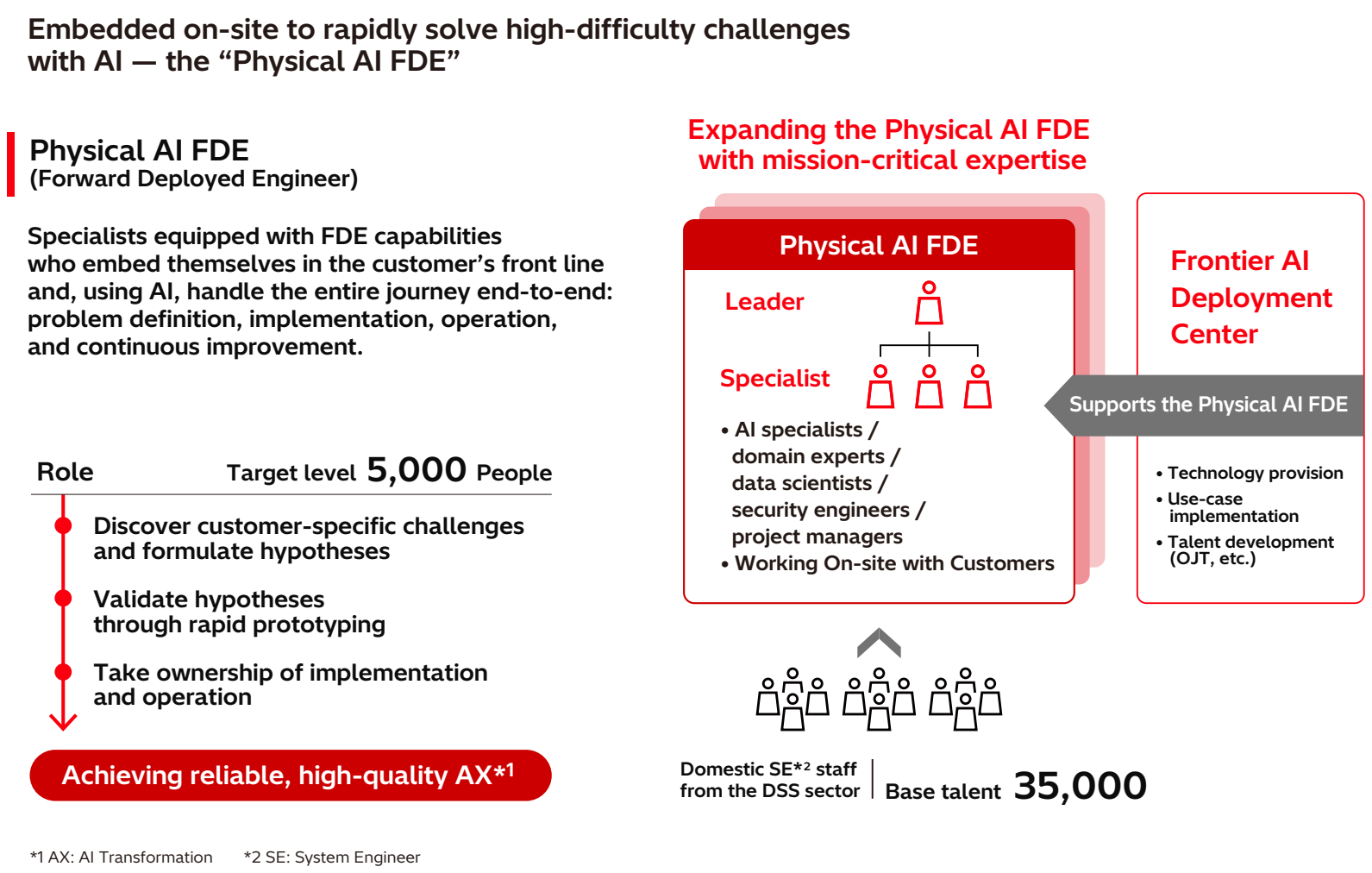
and improvement. By enabling Physical AI FDE professionals and AI to work together on the front lines and continuously create solutions together with customers, HMAX can generate sustained value.

Combining Global Expertise and Implementation Capabilities

Hitachi is expanding its Physical AI FDE capabilities in collaboration with GlobalLogic and others. By combining GlobalLogic's agile implementation capabilities and digital engineering expertise with Hitachi's OT, project management capabilities, and domain knowledge in social infrastructure, Hitachi is accelerating the social implementation of HMAX.

Hitachi has also established the Frontier AI Deployment Center as a global organization that supports Physical AI FDE activities on the front lines. The Frontier AI Deployment Center supports Physical AI FDE by providing technologies, accumulating use cases, and developing talent. By identifying how AI can be applied to create value for the challenges faced by each industry and front line, and by advancing implementation together with business divisions and customers, the Center supports the global deployment of HMAX.

Figure 9: Physical AI FDE and the Frontier AI Deployment Center



*1 AX: AI Transformation *2 SE: System Engineer

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06.
The “Harmonized Society” Shaped by HMAX

HMAX will evolve beyond individual optimization into an OS that connects social infrastructure as a whole, supporting stable operation and enhanced value creation.

From Individual Optimization to Society-Wide Optimization

HMAX is a suite of solutions that transforms data obtained from digitalized assets into value through AI, enabling the optimization of social infrastructure. Its value is not limited to one-time operational improvements or the efficiency enhancement of individual equipment. As its scope of application expands, HMAX will evolve from individual optimization at the front-line level, to overall operational optimization that connects multiple facilities and business operations, and further to industry-wide optimization through collaboration among companies and organizations that operate social infrastructure.

At the stage of individual optimization, HMAX addresses front-line challenges such as equipment anomaly detection and work support. In the next stage, data collected from multiple facilities and operations will be integrated, and AI agents will analyze and make decisions to optimize operations as a whole, including maintenance, operation, and planning.

In the future, by enabling multiple companies and organizations operating the same social infrastructure to collaborate while sharing knowledge and data on a common platform, HMAX will develop toward industry-wide optimization.

Toward an OS for Social Infrastructure

Hitachi does not view HMAX as simply a collection of industry-specific solutions. It positions HMAX as a common platform that connects diverse domains of social infrastructure, including mobility, power, industry, and finance, through data and AI, enabling continuous value creation.

For example, the optimization of energy supply and demand, the advancement of mobility operations, the stable operation of industrial equipment, and the efficiency enhancement of urban functions. By enabling these domains not only to evolve individually, but also to connect with one another, HMAX makes it possible to achieve more advanced decision-making and execution across society as a whole.

HMAX will evolve into an OS for social infrastructure that supports such cross-domain optimization.

Toward a New Operating Model in Which People and AI Collaborate

What HMAX aims to realize is a world in which social infrastructure combines the power of AI with the insightful knowledge and judgement of front-line workers.

Digital twins reproduce real-world equipment and operations in digital space, AI agents analyze and make decisions based on conditions, and Physical AI connects those decisions to real-world control and operation. By adding the knowledge and judgment that people have cultivated on the front lines, a new operating model emerges in which people and AI collaborate to evolve social infrastructure.

HMAX is both a mechanism for autonomizing and optimizing social infrastructure through AI, and a foundation for enhancing value across society as a whole through collaboration between people and AI.

At the core of the HMAX solution family are the strategy and architecture that support its continued evolution. Just as operating systems have continued to evolve in response to changes in society and technology, Hitachi will continue to evolve and expand HMAX services to enable the safe and trusted deployment of AI in society.

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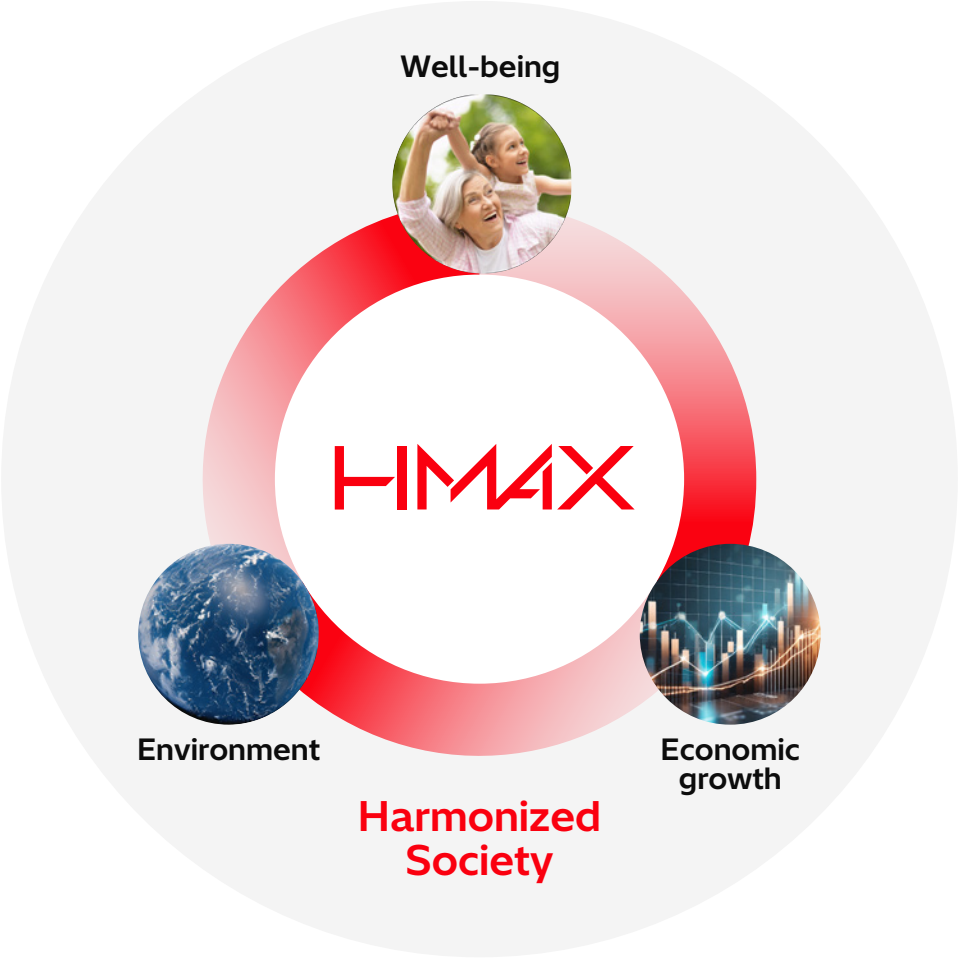
Toward the Realization of a “Harmonized Society”

Advancing the environment, our well-being, and economic growth simultaneously cannot be achieved by optimizing each in isolation. A sustainable society that enhances multiple values at the same time will be achieved by enabling social infrastructure as a whole — including energy, transportation, industry, cities, and healthcare — to evolve while working in coordination with one another.

HMAX is a mechanism and approach that connects data, AI, and human knowledge to continuously evolve social infrastructure. By bringing together the collective capabilities of One Hitachi, Hitachi will promote society-wide optimization beyond individual optimization through HMAX and drive the realization of a “Harmonized Society” in which environment, well-being, and economic growth are in harmony.

Figure 10: Hitachi’s Vision for a Harmonized Society



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Epilogue:

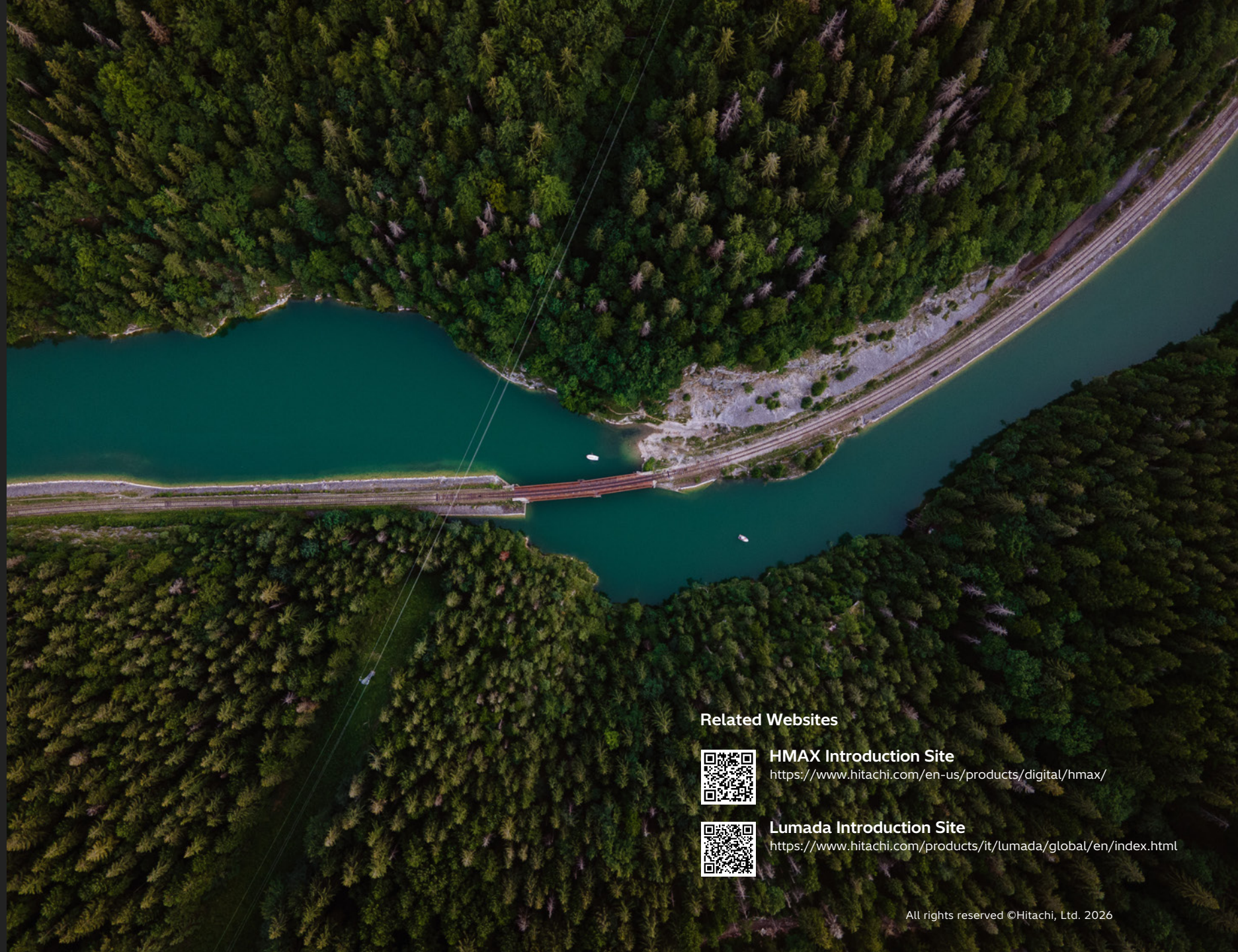
In this white paper, we have introduced the transformative potential that HMAX brings to social infrastructure, as well as the path toward realizing a “Harmonized Society” in which environment, well-being, and economic growth are in harmony.

Since its founding, Hitachi has continued to address the challenges facing society under its corporate philosophy of contributing to society through the development of superior, original technologies and products. Hitachi has also continued to take on the challenge of creating new value while cherishing its founding spirit of “Harmony, Sincerity, and Pioneering Spirit.”

Even in the new AI era, this philosophy and spirit remain unchanged. Indeed, in a world where AI adoption is advancing, it becomes even more important to consider how technology should be used in society, and how people and AI should collaborate.

Hitachi will bring together OT, IT, products, domain knowledge, advanced AI, and global implementation capabilities as One Hitachi to accelerate the introduction and evolution of HMAX. Through HMAX, Hitachi will work together with customers and partners to transform the future of social infrastructure and co-create new value.

Even in the new AI era, Hitachi aims to remain a trusted partner in realizing Social Innovation together with customers and partners.



Related Websites

HMAX Introduction Site
https://www.hitachi.com/en-us/products/digital/hmax/

Lumada Introduction Site
https://www.hitachi.com/products/it/lumada/global/en/index.html

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