

Three Horizons of AI-Enabled Work and Workers



Prepared for NTT DATA INSTITUTE OF
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NTT DATA

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About IFTF

[Institute for the Future \(IFTF\)](https://www.iftf.org) is the world's leading futures organization. For over 50 years, businesses, governments, and social impact organizations have depended upon IFTF global forecasts, custom research, and foresight training to navigate complex change and develop future-ready strategies. Our mission is to prepare the world to create better, more equitable futures by disrupting short-term thinking with visions of transformative possibilities. Institute for the Future is a registered 501©(3), women-led, nonprofit organization based in Palo Alto, California. **iftf.org**

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NTT DATA INSTITUTE OF MANAGEMENT CONSULTING, Inc. was established in 1991 as a 100% subsidiary of NTT DATA, the largest system integrator in Japan. With approximately 400 professionals and staffs, we deliver cutting-edge consulting and advisory services in areas such as the public, financial and industry sector. We are committed to provide strategic foresight and dedicated to empowering organizations with forward-thinking strategies, navigating complex challenges to drive transformative change and sustainable growth.

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Executive Summary

Organizations urgently need AI strategies. It is becoming increasingly clear that artificial intelligence isn't just another technological trend, but a force like the Internet, or even electricity, with the potential to thoroughly redefine how organizations and their workers get things done. This transformative potential and the pace at which it is advancing mean that organizations of all kinds cannot afford to hesitate in engaging with this emerging technology. However, engaging does not mean rushing to action. On the contrary, organizations must urgently start considering their AI futures because crafting effective strategies to responsibly harness the potential of the technology requires significant deliberation and foresight. While it's almost certain that this technology will be transformational, what that transformation will look like, and whether it is beneficial or harmful to organizations and humanity as a whole will be determined by the decisions we make today. Similarly, while nearly all organizations will be transformed, organizations in different industries and in different cultural contexts will be transformed in varied ways. This, again, makes it imperative for organizations to proactively create specific strategies rather than relying on generalized advice about the broad changes AI is likely to bring.

This report, "Three Horizons of AI-Enabled Work & Workers" was created to provide Japanese organizations with the foresight necessary to engage with the transformative potential of AI today. It was created collaboratively by NTT DATA INSTITUTE OF MANAGEMENT CONSULTING, Inc. and the Institute for the Future (ITFF), using ITFF's Prepare-Foresight-Insight-Action methodology for anticipating future change to generate strategic implications. Specifically, it was created to help organizations:

- Expand beyond mere technological innovation to fundamentally reshape work, communication, and decision-making across industries.
- Get up to speed on the current capabilities of AI.
- Anticipate how AI will change organizations in the next 5-10 years.
- Consider the unique ways these changes will play out in the cultural context of Japan.
- Explore the ways in which specific industries could be transformed in the next decade.
- Re-evaluate current assumptions about the future and long-term strategies of AI.
- Envision new possibilities for long-term change and create new strategies for thriving in an AI future.

Key Takeaways From This Report

This report delves into a comprehensive exploration of AI capabilities, use cases, affordances, and implications. Highlighted below are the key takeaways, summarizing the most critical aspects and insights:

- **Specific AI capabilities are changing rapidly, but within relatively stable categories:**
The number, quality, and versatility of foundation models increase almost every week, making it hard to pinpoint the possibilities opened up by AI at any given moment. But the main capacities of current AI systems can be classified into two broad categories that are important to understand:
 1. **Multimodal processing**, the capacity of AI systems to understand and generate information from multiple data sources, such as text, images, audio, and video and
 2. **Knowledge integration and reasoning**, the capacity of AI systems to model the real world via their training datasets, enabling them to integrate knowledge, develop reasoning, and make plans.
- **Current AI systems are incredibly powerful but have critical limitations:** AI systems are far from so-called Artificial General Intelligence and thus incapable of replacing human experts. Foundation models are still limited in two important respects: first, they are incapable of determining the truth of existing and generated statements, and second, current AI systems do not have the soundness and accountability to replace human judgment and creativity or to be entrusted with decision-making responsibilities. For these reasons, AI models are not yet ready to be deployed for high-stakes applications, particularly not without human guidance and supervision.
- **In the next 5-10 years we can expect more specialized solutions, machine autonomy, dynamic interfaces, and context awareness, and we will see the emergence of 'ecosystem models':** Sufficient signals of emerging capacities make it possible to provide a set of technological forecasts for roughly the next 5 to 10 years. AI systems will be more directly situated in the world, either through sensors and actuators (i.e., robotics) or through interactions with other AI and software systems. We can expect that AI systems will be increasingly fine-tuned, with verified and specialized knowledge bases to provide users with custom solutions. AI systems will be capable of intaking and outputting a larger variety of media and dynamically generating appropriate UI in

real-time for the task at hand, making them more like collaborators than tools. And we can anticipate that users will come to depend less on each separate [Large Language Models](#) (LLMs) and instead have access to ecosystems of multiple, interacting, large and small models.

- **The “hallucination problem” and need for human supervision are likely to persist over the next 5-10 years:** The problem of hallucinations that plague current LLMs, such as Open AI’s GPT, will most likely be tamed over the coming years, but, given how inherent this problem is to the current paradigm, it will not be fully solved. Statistical models are inherently unpredictable, and the associated risks, as captured in the above set of emerging technological capabilities, will most likely continue to grow, considering the expansion and evolution of their capabilities. AI systems will become more powerful, versatile, and autonomous. However, they will not be capable of fully automating or replacing existing human roles. They will continue to require humans in the loop.
- **Specialization will get outsourced to AI in many cases, making more workers into “versatilists”:** Over the next ten years, organizations will increasingly complement their use of large, generalized AI models, such as GPT, with specialized AI models. In this way, they will develop “AI specialists” optimized for various business activities by training algorithms on proprietary data. This will afford the development of professionals with a more “versatilist” profile, expanding their skill and knowledge sets to engage in more strategic, creative, and collaborative tasks.
- **AI will orchestrate the activities of many human customers and workers and vice versa:** By the end of this decade, a set of emerging technological capabilities of AI systems will converge to create service journeys filled with automated interactions and touch-points in various domains. Leaders will need to oversee hybrid teams comprising humans, AI-augmented workers, and autonomous agents. A critical role for leaders will be to facilitate effective collaboration between human and AI team members. This will include ensuring that AI systems complement human skills, allowing for a symbiotic relationship in which AI handles data-driven tasks and humans focus on areas requiring emotional intelligence, creativity, and ethical judgment.

- **Workers and leaders will leverage AI as “thought partners”:** Over the next ten years, organizations will embrace a new paradigm of discovery and innovation powered by AI-human collaboration. At the same time, leaders will rely heavily on AI for critical functions such as running complex simulations and providing situational analysis based on market dynamics, competition, and internal factors, thus enabling them to explore multiple scenarios and their potential effects. These AI tools, continuously trained on organization- and leader-specific historical data, will act as advanced sparring partners, offering insights tailored to the strategic context and illuminating upcoming challenges.
- **Machines will take action within organizations, not just provide advice:** AI models will have increasing agency over the next decade, heralding an era in which digital services become an “internet of actions,” shifting the focus from merely providing information to autonomously executing tasks. This shift will necessitate a new framework for decision-making, balancing human-to-human and machine-to-machine interactions.
- **AI will play out differently in Japanese organizations:** While we do present a set of global forecasts that explore changes in the nature of work and functions that characterize most contemporary organizations worldwide, these shifts will unfold differently in each region and country. Strategies for AI in Japanese organizations have to account for four cultural preferences:
 1. **continuity and stability:** placing a premium on workers and leaders staying with organizations for long periods of time and on retaining and leveraging existing knowledge and practices,
 2. **hierarchy and seniority:** maintaining distinct and often vertical roles within an organization that can sometimes overlap with stereotypes of traditional social roles, such as age- or gender-based roles,
 3. **consent and consensus:** prioritizing consensus-building across the organization, handling disputes in small, private conversations, and requiring consent from the larger group for decision-making, and
 4. **relationships and trust-building:** a preference for long-term, trust-based relationships over transactional interactions, both between people within an organization and among organizations.

Risks & Challenges Organizations Must Consider

While there are numerous positive potentials of AI adoption, the risks that the technology poses are worthy of special consideration. In this report we highlight three primary zones of risk:

- **Bias:** AI systems are only as good as the data they're trained on. If the data used to train AI systems reflects existing societal biases, those biases could be reproduced and possibly amplified in the system's operations. Algorithmic bias has already had obvious and disastrous consequences throughout the world in areas such as criminal justice and policing. But it also has the potential for subtler forms of discrimination. For example, in the process of personalizing recommendations, if the training data is skewed toward a certain demographic, the AI might not perform as well in catering to the needs and preferences of underrepresented groups. Personalized content can also lead to "filter bubbles" in which individuals are only exposed to information that aligns with their existing views, limiting exposure to diverse perspectives and potentially fostering polarization.
- **Privacy:** Data is the fuel that allows AI to grow more powerful and effective. The personalized services and recommendations that AI is able to provide are only possible through access to personal data. And there are substantial risks related to the collection, storage, and use of personal data. As AI grows more powerful, it is able to use data in ways that were not previously widely understood, meaning that it has the potential to use people's publicly available data in ways that they did not consent to when they initially shared it. For instance, a person may have made their writing, artwork, or photos available to the general public or to specific organizations, but could not have anticipated the ways AI could make use of that data, creating a sort of false consent.
- **Displacement:** Many have raised concerns that the adoption of AI technologies has potential to eliminate jobs and displace workers. This is, of course, a critical consideration for organizations. However, the potential for displacement does not end there. AI technologies could create situations where workers might retain their jobs, but critical aspects of their roles that they find enjoyable or meaningful could be replaced by technology, leaving them with tasks that feel tedious or alienating. . Similarly, AI could be deployed in ways that displace aspects of human communication in ways that undermine relationships between people within an organization and amongst organizations.

Strategies for Navigating an AI Future for Organizations and Workers

While this report is composed largely of information about the state of AI today and forecasts of how it will likely evolve and impact organizations over the next decade, this informational content is intentionally arranged in a manner to make the document function overall as a sort of guide for organizations to devise long-term AI strategies. To that end, we've included guidance in every section of the report on how to best utilize the content, and create your own, to inform strategy development. At a high level, we advocate approaching the future of AI with the following principles:

- **Think systematically:** When looking at a topic as broad and as important as the future of AI and organizations, being systematic is critical. Employing tested frameworks helps to simultaneously put boundaries on the areas you investigate while also ensuring your outlook is sufficiently broad and far-reaching. In this report, we utilize a number of frameworks that you can adopt in your own strategic thinking, primarily the “Three Horizons” framework, which help organizations differentiate and manage initiatives across different timeframes and ensure that long-term strategic thinking is not lost in the day-to-day demands of running a business.
- **Plan your transitions methodically:** This report also employs what is called the “Two Curves” framework, a tool to help organizations manage the transition between paradigms, from today’s “first curve” to tomorrow’s “second curve.” The report puts forth informed perspectives on what a “second curve” for many industries in Japan might be, given the changes we can expect AI to bring to organizations. We articulate these possibilities as “second curves” to highlight the importance of being proactive, patient, and methodical when crafting strategies for adapting to change. Critically, this framework reminds us of the importance of timing the transition: moving resources and focus from the first to the second curve without jeopardizing current operations, yet not waiting so long that the organization falls behind its competitors or fails to adapt to new market realities.

- **Evaluate assumptions consistently:** While this report covers a ten year period, from today well into the next decade, it is not meant to be the final word on the future. Futures thinking is a continuous process, in which assumptions are consistently evaluated and revised, creating a dynamic, living picture of future possibility. We put great focus on the methodologies used to produce these perspectives because we want organizations to use these methodologies themselves to do their own work revising these perspectives as time goes on, so that their strategies are robust and aligned with future possibilities as they can best be understood at the given moment.

Introduction

In the rapidly evolving world of AI, we stand at a pivotal juncture. Today's AI technologies are not just innovative tools; they are transformative forces reshaping the landscape of work, communication, and decision-making as we know it. AI is revolutionizing industries and redefining the boundaries of what is possible. From sophisticated machine learning algorithms that can predict market trends to AI-driven automation transforming manufacturing floors, its effects are profound and pervasive.

The pace of this change is not without its challenges. It demands adaptability from businesses, policymakers, and workers alike. The swift progression of AI technologies requires us to be agile, to learn and unlearn at an unprecedented rate. However, this urgency to adapt must be tempered with caution. The rush to integrate AI into every facet of work must be balanced by careful consideration of ethical implications, societal effects, and long-term sustainability.

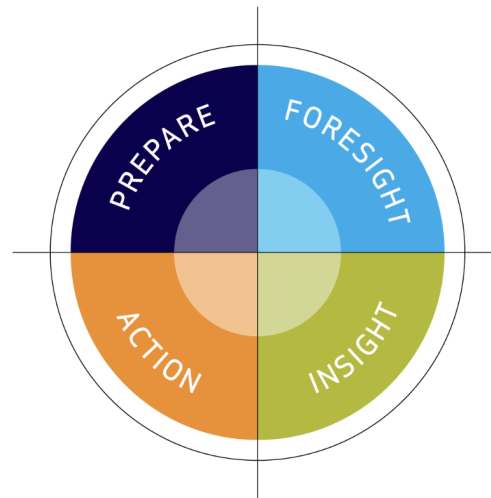
Project Overview

NTT DATA INSTITUTE OF MANAGEMENT CONSULTING, Inc. initiated a collaboration with IFTF to develop a comprehensive foresight report on the future impact of AI on work and workers structured around IFTF's Prepare-Foresight-

Insight -Action methodology. This framework provides a way of thinking about the future in order to make better decisions in the present. It involves preparing by understanding the current context (drivers and signals of change), generating provocative and plausible forecasts about possible futures, gaining insights from this foresight, and then taking action based on these insights. It is a comprehensive method that assists organizations in anticipating and adapting to future changes.

Gather evidence,
frame futures questions,
collect signals,
prepare your mind.

Based on your insights,
frame and prioritize
possible actions.



Using your prepared
evidence, develop
plausible, provocative
visions (not predictions)
of multiple futures.

Use your foresight
to **provoke meaningful**
implications.

This report investigates the transformative role that AI will play in the future of work and workers, with a focus on large-scale Japanese organizations. The goal of the report is to provide an understanding of the present, mid-term, and long-term impact of AI on work and is structured around Three Horizons:

- **Horizon One:** existing AI capabilities and business-use case studies.
- **Horizon Two:** emerging AI capabilities and forecasts around AI's impact on different business functions over the next five years.
- **Horizon Three:** scenarios investigating how AI might play out in different industries over the next decade.

The value of the Three Horizons framework lies in its ability to help organizations differentiate and manage initiatives across these timeframes. It also ensures that long-term strategic thinking is not lost in the day-to-day demands of running a business.

Project Methodology: Two Curves and Three Horizons

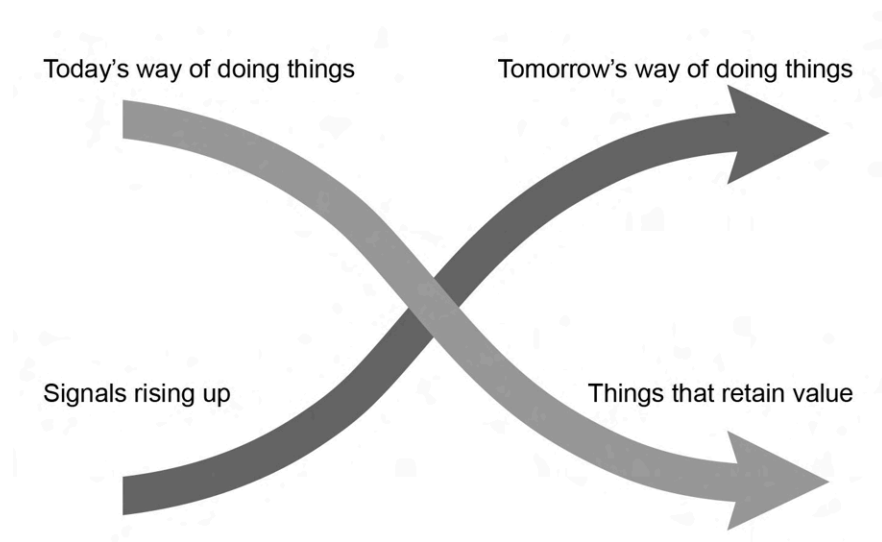
Framing the report and research around the Three Horizons stems from [Amara's Law](#), which states that “**we tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run.**” This implies that while people often expect quick, revolutionary changes following the introduction of a new technology, the immediate effects are usually less dramatic than anticipated. However, over a longer period, the cumulative effects of these technologies can be profound, often surpassing initial expectations. Amara's Law

highlights the challenges of accurately predicting technological change and its societal impacts.

One way to address the challenge of Amara's Law is to use the **Two Curve framework** developed by Ian Morrison, an author, futurist, and former president of Institute for the Future. The framework is a strategic tool for understanding and navigating change, particularly in business and organizational contexts. The concept revolves around the idea of two curves:

The First Curve represents the current business model or the status quo. It is the existing way of doing things, which has brought the organization to its current level of success. However, this curve is typically in a state of decline or will eventually decline as market conditions, technologies, and customer preferences change.

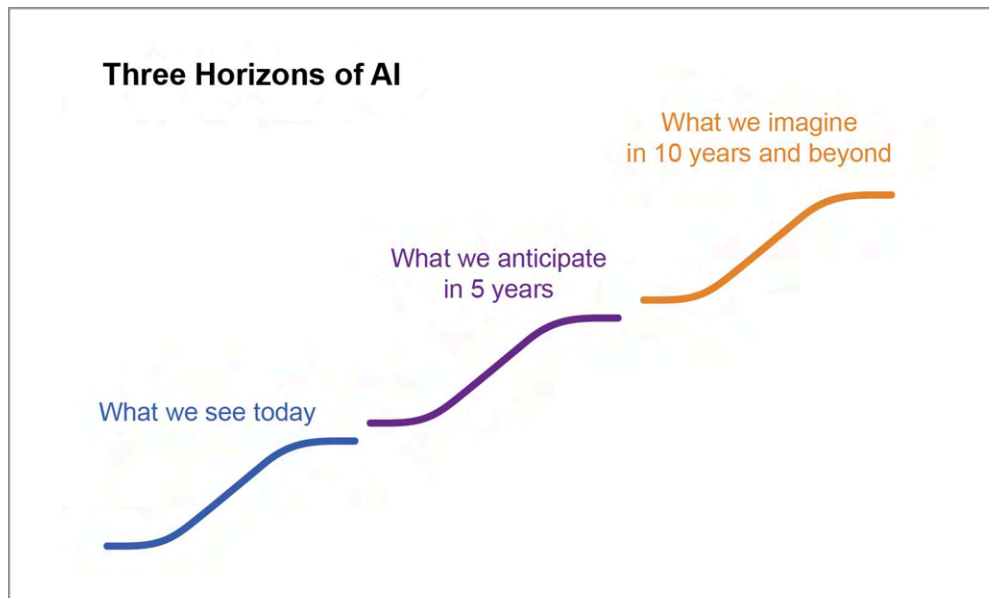
The Second Curve symbolizes the future. It represents new ideas, innovations, and business models that are on the rise. These emerging trends have the potential to become the primary sources of future success, growth, and relevance.



The central premise of the Two Curve framework is that organizations need to manage both curves simultaneously. They must continue to optimize and extract value from the first curve while it is still viable, but they also need to invest in and develop the second curve. The challenge lies in timing the transition: moving resources and focus from the first to the second curve without jeopardizing current operations, yet not waiting so long that the organization falls behind its competitors or fails to adapt to new market realities.

Essentially, Morrison's Two Curve framework is a tool for strategic thinking, helping leaders and businesses navigate change, plan for the future, and avoid being trapped by their past successes.

One way to identify the second curve/new paradigms is to forecast using the Three Horizons framework.



The **Three Horizons framework** is a model for thinking about the future and managing innovation over different time scales. It helps organizations balance the need to maintain current operations while exploring new opportunities and preparing for the future. The Three Horizons represent different time periods:

Horizon One – The Present: This horizon represents the current state of the ecosystem. This is where we looked at current AI capacities and how organizations in general are adopting AI into their businesses today. IFTF worked together with NTT DATA INSTITUTE OF MANAGEMENT CONSULTING, Inc. to identify signals and drivers of change related to AI and specific business functions (sales and marketing, HR and operations, customer service, R&D and innovation, and strategy and leadership). During a collaborative session, we clustered signals and drivers to create a set of forecast drafts specifically related to the business functions.

Horizon Two – The Transitional Future (five years): This horizon involved building on the forecast drafts created in the collaborative session in Horizon 1. By drawing out the consequences of the initial forecasts and consulting internal and external experts, we were able to push the timeframe of the impact of AI on the business functions and create a set of robust provocative forecasts. We identified insights around challenges and opportunities specifically related to Japanese organizational culture and values.

Horizon Three – The Long-term Future (10 years): This horizon envisioned the long-term future and explored radically new ideas and innovations that could transform industries. IFTF and NTT DATA INSTITUTE OF MANAGEMENT CONSULTING, Inc. collaborated on mapping cross impacts between the identified forecasts and six key Japanese industries (railway, air travel, real estate, insurance, telecommunications, and TV and media). By synthesizing the output, we identified a second curve for each industry and developed a set of scenarios that take place a decade into the future. Using the scenarios, we extracted insights on what this means specifically for Japanese workers and organizations, how tasks and roles are changing, and what privacy, bias, or displacement issues might arise.

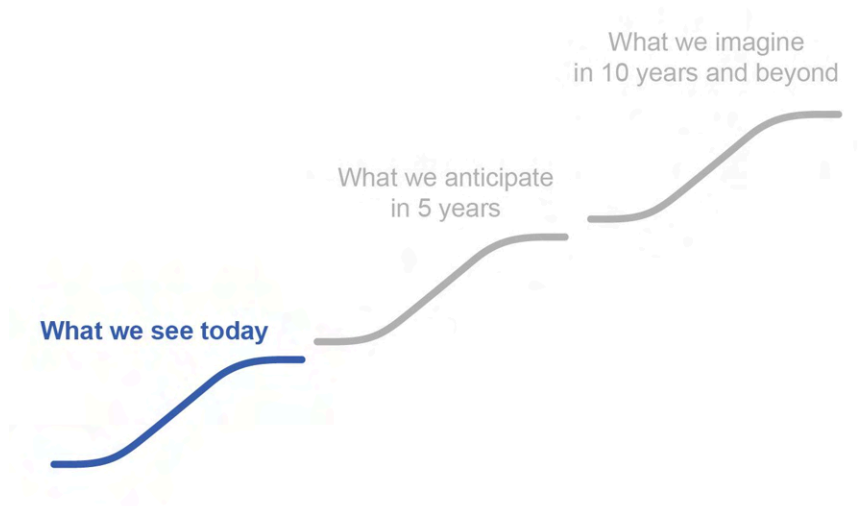
How To Use This Report – Call to Action

Leverage the forecasts, scenarios, and insights presented in this report to expand your perspective and foster a more strategic approach to imminent changes. These narratives are designed not just to inform but to stretch your thinking, pushing you to consider a broader range of possibilities and potential outcomes. By embracing these tools and methodologies, you are equipped to craft your own detailed scenarios. This proactive exercise is crucial in systematically exploring and preparing for future possibilities. It enables you to anticipate and strategically plan for various potential futures, ensuring that you are not just reacting to changes as they occur, but actively shaping your response in a thoughtful and informed manner. The goal is to turn

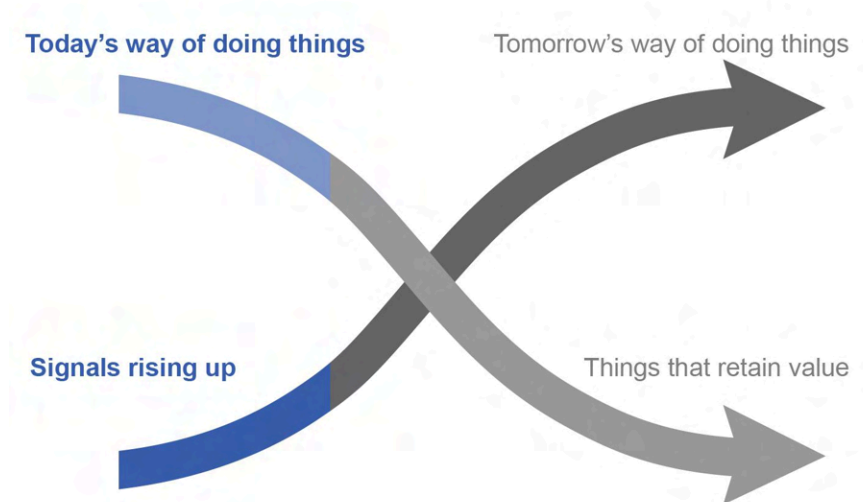
foresight into a practical resource for decision-making, helping you navigate uncertainties with greater confidence and clarity.

Horizon One: AI-Enabled Work and Workers

This horizon represents the current state of the ecosystem. This is where we see current AI capacities and how organizations in general are adopting AI into their businesses today.



Within the Two Curve framework, this section represents the very beginnings of the second curve, in which today's paradigm, or way of doing things, remains dominant, although we can see signals that point to a new, emerging paradigm.



We describe the first horizon and first portion of the second curve in this section through:

- **Existing technological capabilities** that will make a new paradigm possible
- **Case studies of AI-enabled work and workers** that provide present-day examples of how organizations are starting to use these capabilities

These aspects provide a solid foundation for forecasting what the emerging paradigm, or second curve/third horizon, might look like.

Existing Technological Capabilities

The present and future of AI-enabled work and workers is possible thanks to a technological foundation that has been laid out over a span of more than 50 years, slowly, at first, and then very rapidly over the last five years.

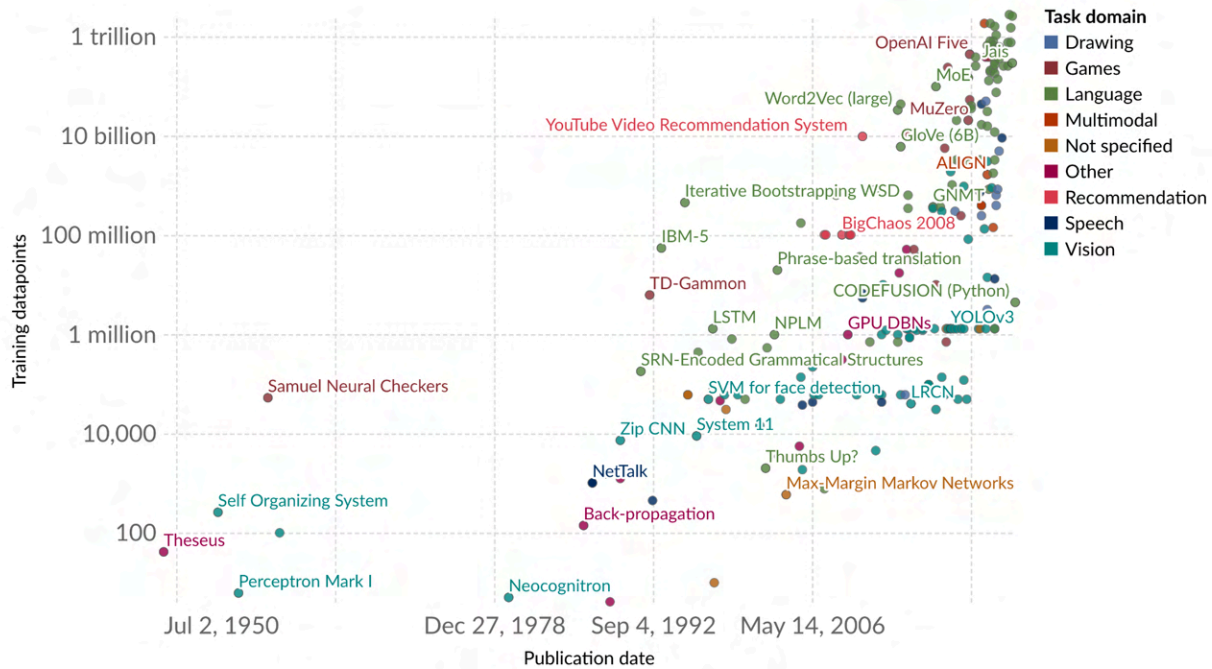
The first layer of this foundation results from the triumph — at least for now — of machine learning over alternative approaches to AI, such as expert systems, [Bayesian networks](#), evolutionary algorithms, and, most notably, symbolic or [Good Old-Fashioned AI \(GOFAI\)](#). This latter approach uses explicit, human-defined symbols and rules to represent knowledge. It relies on symbolic representations, such as logic, predicates, and rules, to encode knowledge about the world. In machine learning, however, knowledge is typically learned directly from data. Models extract patterns from data to make predictions or decisions. Knowledge representation is implicit, based purely on the statistical relationships within datasets.

Considering the centrality of data for the machine learning approach, it is easy to recognize the next layer in this technological foundation: the availability of massive datasets accumulated over the last few decades, including the diverse and extensive range of text, images, audio, and video available as books, articles, and websites on the public internet.

Datapoints used to train notable artificial intelligence systems

Our World
in Data

Each domain has a specific data point unit; for example, for vision it is images, for language it is words, and for games it is timesteps. This means systems can only be compared directly within the same domain.



Data source: Epoch (2023)

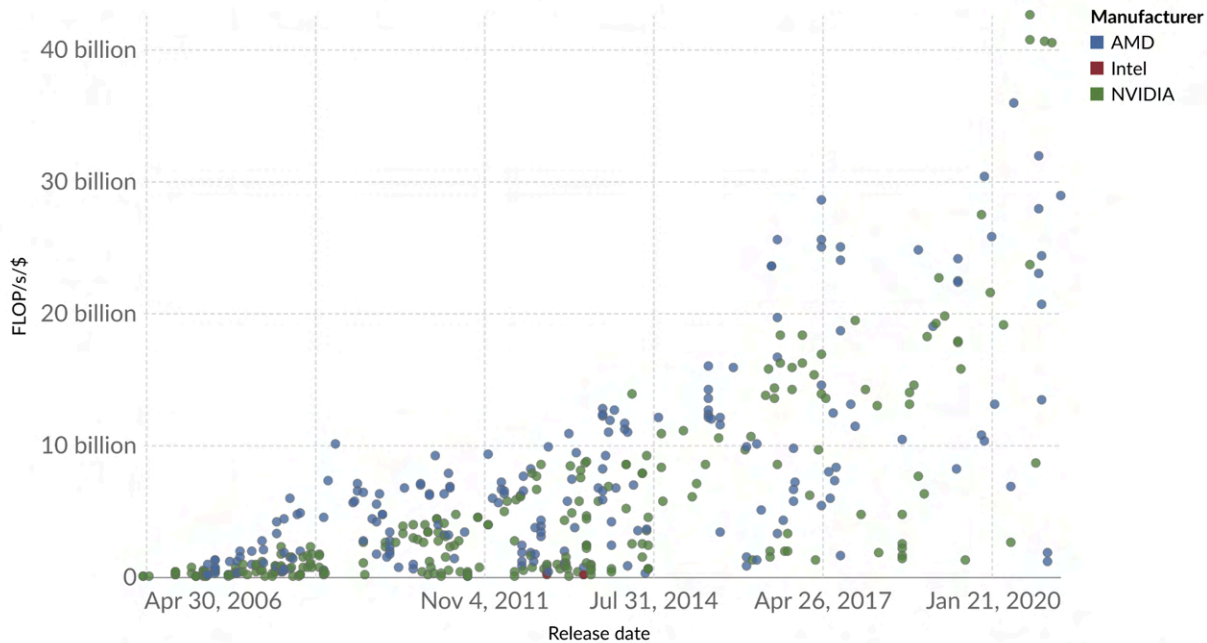
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However, to leverage these vast datasets for training machine learning models, it is also necessary to have a powerful computing hardware platform, which became available at the right time thanks to the development and widespread adoption of Graphics Processing Units. GPUs are essential for training machine learning models due to their parallel processing power, speed, scalability, and cost-efficiency. They have enabled researchers, data scientists, and developers to work with complex models and large datasets, making machine learning more accessible and efficient.

GPU computational performance per dollar

Graphics processing units (GPUs) are the dominant computing hardware for artificial intelligence systems. GPU performance is shown in floating-point operations¹/second (FLOP/s) per US dollar, adjusted for inflation.

Our World
in Data



Data source: Sun et al., Median Group via Epoch (2022)

Note: FLOP/s values refer to 32-bit (full) precision.

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1. Floating-point operation: A floating-point operation (FLOP) is a type of computer operation. One FLOP is equivalent to one addition, subtraction, multiplication, or division of two decimal numbers.

All these pieces coalesced and reached maturity at the turn of this decade, thanks to the development of so-called *foundation models*. These are large machine learning models trained on vast datasets, usually from the public internet. They can serve as the foundational building block for a wide range of downstream applications due to their capacity to not only understand or classify data but also to generate it. The most recent and notable examples of these applications, which arguably have been the main forces behind the current AI revolution, include OpenAI's GPT-n series (the basis for ChatGPT) and DALL-E, Anthropic's Claude, Meta's Llama, Midjourney, and Stability AI's Stable Diffusion.

The number, quality, and versatility of foundation models increase almost every week, giving the field of AI a dynamism that is practically unparalleled in the history of computing and, perhaps, technology more generally. This complicates the task of pinpointing the possibilities opened up by AI at any given moment. However, the main capacities of current AI systems can be classified into two broad categories:

1. Multimodal processing: the capacity of AI systems to understand and generate information from multiple data sources, such as text, images, audio, and video. This capacity can be applied in specific ways, such as:

- **text summary**, e.g., asking a chatbot to provide a summary of an article or website.
- **text generation**, e.g., asking a model to write an article or essay with specific content and style.
- **knowledge access and synthesis**, e.g., using an app to request specific information rather than using a web search engine.
- **human language translation**, e.g., translating an article or conversation.
- **image recognition and classification**, e.g., analyzing a set of images to find people, animals, or objects.
- **multimedia generation**, e.g., creating illustrations with specific content and styles.
- **sensing and interacting with the real world**, e.g., deploying a warehouse robot to pick and sort objects.
- **software coding**, e.g., prompting a chatbot to program a website.

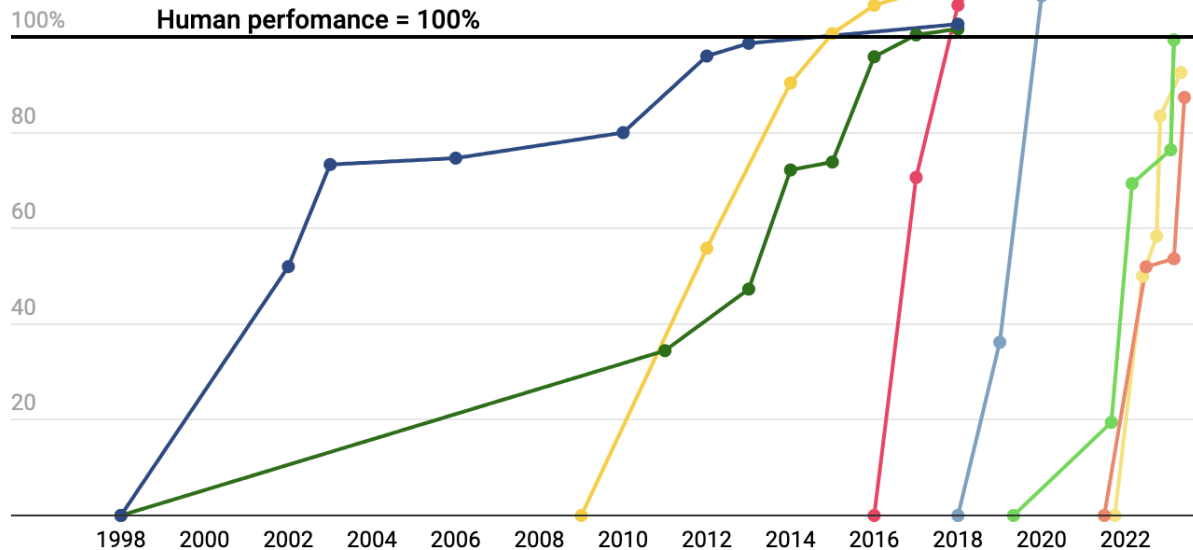
2. **Knowledge integration and reasoning:** the capacity of AI systems to model the real world via their training datasets, enabling them to integrate knowledge, develop reasoning, and make plans. Examples include:

- **mapping the world**, e.g., understanding physical relations and interactions between objects from text and images.
- **integrating knowledge**, e.g., incorporating information from various domains and sources.
- **specialization and transfer**, e.g., using broad patterns of knowledge for specific tasks.
- **generalization**, e.g., applying specific knowledge for tasks not seen during model training.
- **divergent thinking**, e.g., exploring possibilities, generating novel ideas, and identifying possible problem solutions.
- **reasoning**, e.g., evaluating and deducing conclusions from rules, drawing conclusions from available information, and forming hypotheses based on incomplete information.
- **making plans**, e.g., creating alternative courses of action, evaluating their consequences, and selecting the most suitable plan.

AI has surpassed humans at a number of tasks and the rate at which humans are being surpassed at new tasks is increasing

State-of-the-art AI performance on benchmarks, relative to human performance

● Handwriting recognition
 ● Speech recognition
 ● Image recognition
 ● Reading comprehension
 ● Language understanding
 ● Common sense completion
 ● Grade school math
 ● Code generation



For each benchmark, the maximally performing baseline reported in the benchmark paper is taken as the "starting point", which is set at 0%. Human performance number is set at 100%. Handwriting recognition = MNIST, Language understanding = GLUE, Image recognition = ImageNet, Reading comprehension = SQuAD 1.1, Reading comprehension = SQuAD 2.0, Speech recognition = Switchboard, Grade school math = GSK8k, Common sense completion = HellaSwag, Code generation = HumanEval.

Chart: Will Henshall for TIME • Source: [ContextualAI](#)

TIME

Considering this set of powerful capacities, it is nevertheless important to note that current AI systems are still far from so-called Artificial General Intelligence and thus incapable of replacing human experts. Foundation models are still limited in two important respects: first, they are incapable of determining the truth of existing and generated statements, that is, of distinguishing between fact and fiction. In fact, as most users of applications like ChatGPT have realized, these systems are prone to generating incorrect information (i.e., hallucinations) and presenting it in a confident way. Second, current AI systems do not have the soundness and

accountability to replace human judgment and creativity or to be entrusted with decision-making responsibilities. For these reasons, AI models are not yet ready to be deployed for high-stakes applications, particularly not without human guidance and supervision.

In 2018, tech analyst Benedict Evans [proposed](#) an interesting frame to capture both the impressive capacities and significant limitations that characterize current AI by comparing it to working with “infinite interns, or, perhaps, infinite ten-year-olds.” This year, WIRED magazine [updated](#) this image in the following way: “In 2023, those interns will be world-class copywriters, illustrators, and more—perhaps scientists, data analysts, or even negotiators.” Indeed, an excellent way to grasp the transformation already underway in the world of work is to look at a set of companies currently experimenting with their share of infinite, world-class AI interns.

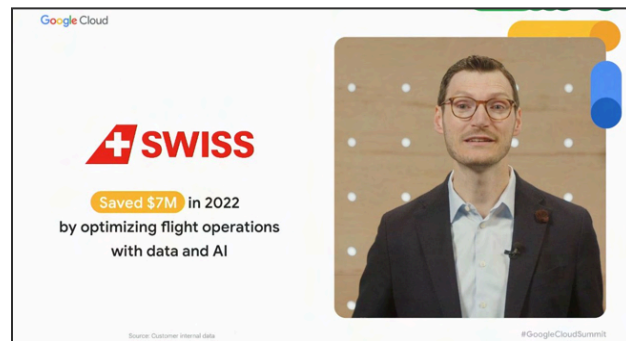
Case studies of AI-Enabled Work and Workers

To put the AI capacities into context, this section examines four case studies of organizations integrating AI into their workflows, highlighting potential future directions.

Case Study: AI in Aviation – Swiss International Air Lines

Swiss International Air Lines (SWISS) has [embraced AI and Google Cloud technology](#) to enhance its flight operations' stability, efficiency, and sustainability. Under a strategic partnership with Google Cloud, SWISS is developing a platform that integrates data from various company units—such as passenger itineraries, aircraft assignments, crew rostering, and maintenance. This platform assists the Operations Control team at Zurich Airport in making optimal decisions for global flight operations.

The AI system collates and processes diverse datasets, allowing SWISS to dynamically determine the most efficient aircraft for specific routes based on such factors as passenger and cargo demand or aircraft performance. This approach not only streamlines operations but contributes to fuel savings and reduced carbon dioxide emissions.



Furthermore, the system can predict individual connecting times for travelers at Zurich Airport, offering rapid, alternative solutions in case of delays. For example, if a passenger misses a connection due to a delayed departure, the system quickly proposes efficient rebooking options across the Lufthansa Group's network.

AI CAPACITIES

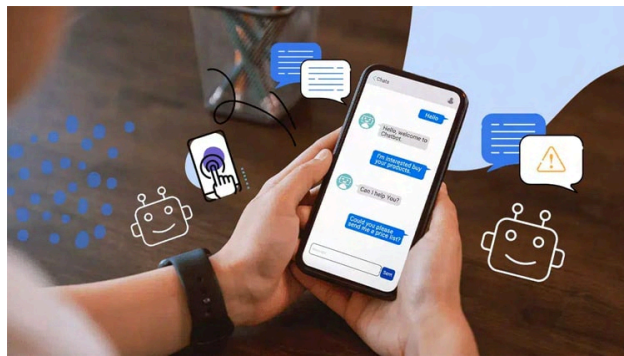
- **Knowledge Access and Synthesis:** SWISS's AI platform synthesizes data from varied sources such as passenger itineraries, crew rostering, and aircraft maintenance.
- **Reasoning:** the system evaluates multiple scenarios to optimize flight operations, considering such factors as aircraft performance and passenger demands.
- **Mapping the World and Integrating Knowledge:** By understanding the complexities of flight paths, aircraft capabilities, and airport logistics, the AI system integrates this knowledge to optimize operations.

Case Study: AI in Retail Interior Design – IKEA

IKEA has embarked on an innovative journey by [integrating AI into its customer service and interior design services](#). The AI bot, named Billie, is inspired by IKEA's iconic Billy bookcase range and represents a significant step in the company's digital transformation.

Billie is designed to handle 47% of customer queries, a task it has accomplished efficiently over the past two years. This AI system is not just a tool for answering questions; it is an intelligent interface that understands and processes customer language in real-time.

Billie's impact extends beyond customer service efficiency. By taking over routine inquiries, Billie frees up human staff to undertake more complex and creative tasks. Since 2021, IKEA has trained 8,500 call center workers as interior design advisers. These employees, now equipped with more time and resources, provide personalized interior design consultations via video calls. Customers receive tailored advice, floor plans, and 3D visuals.



IKEA's interior design service has been remarkably successful, with sales through this remote channel contributing significantly to the company's revenue. This shift toward virtual services is a strategic move to cater to future Gen Z customers, demonstrating IKEA's foresight in adapting to changing consumer behaviors.

AI CAPACITIES

- **Human Language Translation and Multimedia Generation:** IKEA's AI bot, Billie, handles customer queries, translating and interpreting diverse languages and generating appropriate responses.
- **Knowledge Access and Synthesis:** Billie synthesizes a vast amount of customer interaction data to improve service efficiency.
- **Reasoning:** AI enhances decision-making in interior design consultations, utilizing customer input to suggest design options.

Case Study: AI in Consumer Goods – Procter & Gamble”

Procter & Gamble (P&G), a leading consumer goods company, is [embracing artificial intelligence](#) to transform its operations across various domains. With a strategic focus on becoming an “AI-first” business, P&G is leveraging AI to enhance product and package innovation, media planning, distribution, retail activities, manufacturing, and back-office operations.

One of the key initiatives under this strategy is the development of Pampers MyPerfectFit. This AI-based tool within P&G's Pampers Club Mobile application recommends the right diaper size for babies, boasting a 90% accuracy rate.

Parents can input such details as the baby's date of birth, weight, height, and current diaper fit, and the algorithm provides a tailored size recommendation. This tool is a result of P&G's AI Factory, a proprietary machine learning platform that accelerates and simplifies data processing.



The AI Factory's impact is not limited to consumer-facing applications. It also enhances internal processes, making data scientists up to 10 times faster and more efficient. This efficiency is evident in P&G's fragrance development initiatives, in which AI-based algorithms control digital scent creation. This technology not only accelerates the process but improves precision in product design.

P&G's investment in AI is comprehensive, focusing on such key areas as articulating business purpose, building organization-wide AI fluency, and standardizing AI developments. The company emphasizes aligning technology with clear business value, not digitizing for the sake of it. Furthermore, P&G is committed to building AI fluency across its workforce, viewing AI as a tool to augment human efforts rather than replace them. This approach is evident in its internal training program, in partnership with Harvard Business School, which focuses on demystifying AI and encouraging its successful replication across the company.

AI CAPACITIES

- **Reasoning and Specialization and Transfer:** P&G's AI applications in product recommendation and fragrance development demonstrate advanced reasoning and the ability to apply specialized knowledge to specific tasks.
- **Knowledge Integration and Mapping the World:** the AI Factory integrates various data sources for product innovation, reflecting an understanding of complex real-world consumer needs and preferences.
- **Generalization:** P&G's AI leverages specific knowledge across a broad range of applications, from diaper sizing to fragrance development, showing a high degree of generalization.

Case Study: AI in Construction – Takenaka Corporation

Takenaka Corporation, a venerable player in Japan's construction industry, has partnered with AWS to [revolutionize its operational efficiency through AI](#). The company's collaboration focuses on developing the Building 4.0 Digital Platform, an innovative initiative leveraging data and analytics to drive new value across its business operations.

This digital transformation is centered on enhancing productivity and accelerating business developments in architecture, engineering, and construction. A key component of this initiative is the use of [Amazon Bedrock](#) and [Amazon Kendra](#), which enable employees to efficiently access a wealth of information, including an extensive array of construction industry laws, regulations, internal guidelines, and best practices. The AI system is designed to assist in making smarter, faster business decisions and improving work-life balance by providing easy access to crucial information.



Takenaka Corporation's approach represents a significant step in digitizing the entire spectrum of construction operations, including on-site activities. By integrating generative AI services from AWS, the company is positioning itself to reap significant efficiency gains, a core aspect of its digital transformation efforts.-

AI CAPACITIES

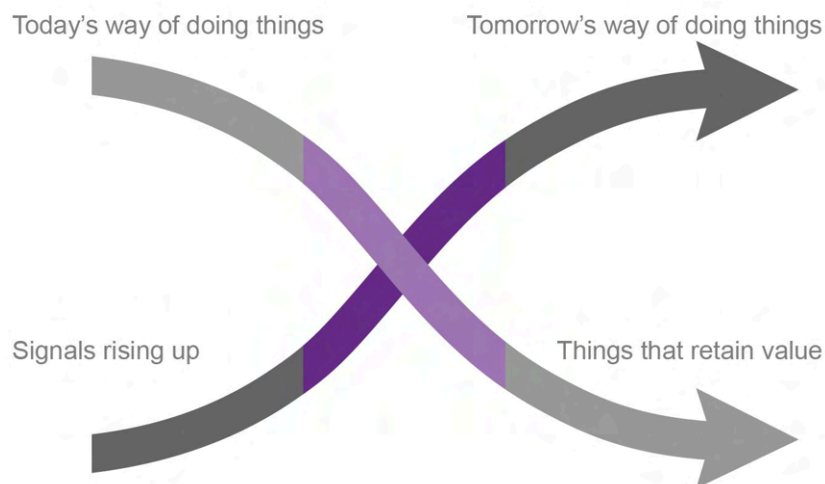
- **Text Generation and Knowledge Access and Synthesis:** the AI tools at Takenaka Corporation enable efficient information retrieval and synthesis from vast datasets, including laws, regulations, and internal guidelines.
- **Reasoning:** The AI's ability to suggest the best operational scenarios demonstrates advanced reasoning capabilities, crucial for complex construction projects.

Horizon Two: AI-Enabled Work and Workers: Tomorrow

This horizon covers development we anticipate in the next five years, when we see today's developments mature into new models that upend the status quo.



Within the Two Curve framework, this section represents the transition between the two paradigms, in which the new way of doing things surpasses the old paradigm.



It describes the second horizon, and middle portion of the second curve, in this section through:

- **Emerging technological capabilities** that will mature to the point that their impact will be clear in the next five years and will fully mature in the five years that follow.
- **Forecasts for the future of AI-enabled work and workers** that explore how the capabilities of AI may enable shifts in the type of work that professionals will be required to perform, the new skills and profiles that they may come to embody, and the new organizational features that may unfold following these transformations.

Together, they provide a preview of where we are headed and the kinds of preparations we might have to make to navigate the transition.

From → To: Emerging Technological Capabilities

At IFTF, we use the formula “from → to” as a shorthand for capturing the direction of change and potential impacts of the shifts we observe in any domain. As previously noted, change in the AI field is so dynamic that it is not only difficult to pinpoint the capacities of AI systems today but also to forecast the end state of these capacities in a decade’s time. Nonetheless, sufficient signals of emerging capacities make it possible to provide a set of technological forecasts for Horizon Two, roughly the next five years. We present them here in “from → to” statements to highlight their open-endedness in longer timeframes. These technological forecasts will serve as the basis for the forecasts of AI-enabled work and workers that we present in the next section.

1. **From generic knowledge to specific solutions:** AI systems will be increasingly fine-tuned with verified and specialized knowledge bases to provide users with custom solutions. These custom models will be trained more efficiently with smaller but more relevant datasets that may run on less powerful computing devices.
2. **From monolithic models to ecosystems of models:** large foundation models will continue to be foundational. However, users will come to depend less on each of them separately and will expertly leverage ecosystems of multiple, interacting large and small models to achieve their goals.
3. **From static disembodied models to dynamic situated models:** AI systems will be more directly situated in the world, either through sensors and actuators (i.e., robotics) or through interactions with other AI and software systems. Thus, they will be capable of updating their models dynamically.

4. **From conventional interfaces to ephemeral experiences:** AI systems will be designed to interact in much richer ways than the current dominant paradigm of conversational user interfaces. They will be capable of intaking and outputting a larger variety of media and dynamically generating appropriate UI in real-time for the task at hand.
5. **From responsiveness to agency:** AI systems will be capable of receiving and understanding high-level instructions, making decisions, and interacting autonomously with the world (real or informational) to achieve the specified goals. These agentic systems will be more like collaborators than tools.

These five technological forecasts capture the main dimensions in which the capabilities of AI systems will expand. Just as important, though, are the dimensions in which, according to current signals, the capacities of AI models will remain limited in Horizon Two. Therefore, we add two additional forecasts:

6. **From hallucination machines to unpredictable genies:** this year, a New York lawyer was [fined for including false information generated by OpenAI's ChatGPT](#) on a legal brief. The problem of hallucinations that plague current [Large Language Models \(LLMs\)](#), such as Open AI's GPT, will most likely be tamed over the coming years, but, given how inherent it is to the current paradigm, it will not be fully solved. Statistical models are inherently unpredictable, and the associated risks, as captured in the above set of emerging technological capabilities, will most likely continue to grow, considering the expansion and evolution of their capabilities.
7. **From naive users to cyborgs and centaurs:** AI systems will become more powerful, versatile, and autonomous. However, they will not be capable of fully automating or replacing existing human roles. They will continue to require humans in the loop. Humans, in turn, will be transformed by their interactions with AI. In this way, AI systems will afford the emergence of new modes of human+machine collaboration on a spectrum ranging from automation to augmentation. A team of researchers has [recently proposed](#) the metaphors of “centaurs” and “cyborgs” to denote two of the existing modalities of AI-enabled workers characterized by different levels of human+machine integration.

What possibilities might these existing and emerging capacities open up for how people work? How might they affect the nature of work, collaboration, and organizations? This section presents five forecasts for the future of AI-enabled work and workers. Each explores how the capabilities of AI may enable shifts in the type of work that professionals will be required to perform, the new skills and profiles that they may come to embody, and the new organizational features that may unfold following these transformations.

We show how specialist professionals may become generalists or *versatilists*, how service providers may evolve into trusted partners, how individual contributors may become orchestrators, how innovators may become discoverers, and how team leaders may become organizational stewards. We describe these shifts in the context of the business functions where they will most likely play out: **(1) marketing and sales, (2) customer services, (3) human resources and operations, (4) research, development and innovation, and (5) strategy and leadership**. These shifts will impact organizations across all their activities.

We also present a set of global forecasts that explore changes in the nature of work and functions that characterize most contemporary organizations worldwide, although these shifts may unfold differently in each region and country, depending on local conditions. Japan has a rich and unique culture that is singularly expressed in a set of particularly Japanese organizational features:

- **continuity and stability:** placing a premium on workers and leaders staying with organizations for long periods of time and on retaining and leveraging existing knowledge and practices
- **hierarchy and seniority:** maintaining distinct and often vertical roles within an organization that can sometimes overlap with stereotypes of traditional social roles, such as age- or gender-based roles.
- **consent and consensus:** prioritizing consensus-building across the organization, handling disputes in small, private conversations, and requiring consent from the larger group for decision-making.
- **relationships and trust-building:** a preference for long-term, trust-based relationships over transactional interactions, both between people within an organization and among organizations.



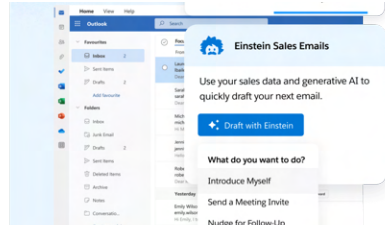
1. Generalization: Versatilists Enabled by AI Specialists

Over the next five years, workers will increasingly leverage AI for tailored information and advice. This shift will be enabled by the emerging capability we call “*from generic knowledge to specific solutions*.” Organizations will increasingly complement their use of large, generalized AI models trained on massive datasets (so-called “data lakes”), such as GPT, with specialized AI models trained with smaller datasets (“data puddles”). In this way, they will develop “AI specialists” optimized for various business activities by training algorithms on proprietary data.

This shift may become particularly relevant in business functions that depend on a constant stream of data, information, and insights, such as **marketing and sales**. For example, companies will deploy AI models trained or fine-tuned with their customer data, including preferences, behaviors, and historical interactions, to provide sales and marketing teams with hyper-specific customer insights and recommendations. By securing internal data within specialized AI assistants, organizations will better leverage their specific intelligence and competitive advantages.

Moreover, implementing these AI specialists may afford the development of professionals with a more “versatilist” profile, expanding their skill and knowledge sets to engage in more strategic, creative, and collaborative tasks. In **marketing and sales**, this may allow them to not only monitor and intervene across larger sections of the marketing funnel but also to collaborate closely with other areas of the organization. In this way, deploying specialized AI models may create the opportunity for organizations to break down organizational silos to become more responsive and competitive.

Signals: where do we see the future today?

<u>Unlocking generative AI for enterprises</u>	<u>Reducing the computing costs of AI</u>	<u>AI for Customer Relationship Management</u>
		
<p>WHAT: VMware and NVIDIA have announced an expansion of their partnership to prepare enterprises for the era of generative AI. The collaboration will enable enterprises to customize models and run generative AI applications, such as chatbots and assistants, by combining VMware Cloud Foundation with NVIDIA's generative AI software and accelerated computing.</p>	<p>WHAT: Mistral AI, a French AI startup, has released its first Large Language Model, Mistral 7B, for free. Mistral 7B is a refinement of other "small" Large Language Models like Llama 2, offering similar capabilities (according to some standard benchmarks) at a considerably smaller compute cost. In fact, the model can run on a smartphone.</p>	<p>WHAT: Salesforce AI is an extensible AI solution grounded in the Salesforce Platform. Customers can leverage AI in their customer data to create customizable, predictive, and generative AI experiences to fit different business needs. The platform can also be used to integrate conversational AI to any workflow, user, department, and industry.</p>
<p>SO WHAT?: This partnership has significant implications for enterprises looking to integrate generative AI into their businesses. By leveraging this joint solution, enterprises will be able to customize models, ensure data privacy and security, and optimize generative AI workloads.</p>	<p>SO WHAT?: Foundation models like GPT-4 can do much more, but are far pricier and difficult to run, leading them to be made available solely through APIs or remote access. By making this language model freely available, Mistral AI is democratizing access to powerful AI capabilities. This could empower a wide range of users, from hobbyists to large corporations and government entities, to leverage language generation capabilities for various applications.</p>	<p>SO WHAT?: With the advancements in generative AI, solutions like Salesforce AI could enable companies to generate trusted content grounded in customer data. This could revolutionize content creation and marketing, allowing for more personalized and productive interactions at scale.</p>

CHALLENGES AND OPPORTUNITIES FOR JAPANESE ORGANIZATIONS

- **Stability and continuity:** adopting specialized AI models trained on proprietary data may be compatible with the Japanese organizational preference for stability and continuity. Japanese firms might see this as an opportunity to enhance their existing processes and knowledge base without disrupting their established way of doing business.
- **Consent and consensus:** the shift toward leveraging AI for tailored information and advice might challenge the traditional consensus-driven decision-making process. The rapid and potentially unilateral insights provided by AI could conflict with the slower, more inclusive decision-making processes in Japanese organizations.
- **Hierarchy and seniority:** implementing AI specialists might lead to a redefinition of roles within the organizational hierarchy. While seniority and established hierarchies are important in Japanese culture, the introduction of AI might empower more junior employees with specialized knowledge, potentially challenging traditional seniority systems.
- **Relationships and trust-building:** By breaking down organizational silos, as the forecast suggests, there might be a stronger emphasis on cross-functional collaboration, which could align well with the Japanese value placed on relationships and trust-building.

2. Partnership: Advisors Enabled by Automated Journeys




By the end of this decade, a set of emerging technological capabilities of AI systems, such as ***ecosystems of models, ephemeral applications, and autonomous agents***, will converge to create service journeys filled with automated interactions and touch-points in various domains. AI assistants and bots will guide individuals through various experiences, including managing work projects, navigating healthcare treatments, and pursuing education. These AI-enabled journeys, programmed with human intentions, values, and preferences, will create a seamless blend of machine efficiency and human-centric decision-making.

We may see this shift play out in various domains, such as **Customer Service**. Companies will leverage various autonomous agents — such as autonomous stores, delivery robots, and

customer service bots – throughout the customer journey. For consumers, this will mean a more tailored and efficient experience in virtually every aspect of life. The role of these AI assistants will be to curate personalized paths and provide guidance based on individual needs and preferences. From a business perspective, this AI revolution will redefine external stakeholder interactions. AI-guided systems will enable more efficient and responsive logistics, helping companies streamline their purchasing and distribution processes.

For professionals and managers in customer service divisions, this shift will represent both a challenge and an opportunity to reskill and redefine their roles to move further up the value ladder to roles that require empathy and creativity. For example, they may focus on identifying unfulfilled needs, creating personalized solutions, and providing advice for key customers, thus becoming trusted partners for clients. This shift may help the organization as a whole to explore new opportunities for value generation and growth.

Signals: where do we see the future today?

AI-powering the shopping experience	Livestreaming deepfake influencers	Automating CX with generative AI
		
<p>WHAT: Shopify has introduced a new feature for its app Shop, called Shop's AI-powered shopping assistant. The chatbot interface allows users to engage with an AI assistant to help them find products sold by Shopify sellers. The assistant understands user needs and provides relevant product recommendations.</p>	<p>WHAT: Chinese e-commerce platforms are utilizing deepfake technology to create AI-generated clones of influencers for livestreaming purposes. These AI clones, trained to mimic the speech and movements of real streamers, are being used to promote products and engage with viewers in real-time.</p>	<p>WHAT: Laivly is an AI technology that automates business functions, including writing, communication, and problem-solving, with the aim of optimizing customer experience and reducing customer interaction time. This is an example of the growing use of conversational AI in agent interactions, with a predicted increase from 1.6% to 10% in the next four years.</p>

<p>SO WHAT?: As AI-powered assistants become more advanced and intuitive, they have the potential to reshape how consumers interact with online platforms and make purchasing decisions. Along with potential convenience for customers, this shift may lead to increased customer satisfaction and a competitive edge for businesses utilizing such technology.</p>	<p>SO WHAT?: This development highlights the growing integration of AI in customer journeys and shopping experiences. This trend could lead to a shift in the influencer marketing landscape, with AI clones becoming a cost-effective alternative to human streamers. However, it also raises ethical concerns regarding authenticity, trust, and potential misuse of deepfake technology in the e-commerce industry.</p>	<p>SO WHAT?: By leveraging digital automation, machine learning, and AI, Laivly streamlines support workflows, leading to reduced agent effort, increased accuracy, and improved customer satisfaction. The use of generative AI in email and chat responses enables real-time interaction with customers, empowering agents to supervise and enhance the AI-generated content.</p>
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CHALLENGES AND OPPORTUNITIES FOR JAPANESE ORGANIZATIONS

- **Stability and continuity:** automating service journeys using AI aligns with the Japanese preference for meticulous organization. Japanese companies could see this as an opportunity to enhance their services while maintaining operational stability.
- **Hierarchy and seniority:** the empowerment of AI in decision-making roles could disrupt traditional hierarchical norms. As AI takes on more advisory and autonomous roles, it might challenge the conventional seniority-based decision-making process in Japanese organizations.
- **Consent and consensus:** integrating AI into customer service and logistics could streamline operations but might conflict with the consensus-driven approach. Japanese organizations will need to find a balance between leveraging AI for efficiency and maintaining their inclusive decision-making processes.
- **Relationship and trust-building:** This shift presents an opportunity for Japanese organizations to strengthen their high value on relationships. By shifting roles toward more empathetic and creative tasks, employees can focus on deepening client relationships and trust, aligning well with traditional Japanese business practices.

3. Orchestration: Managers Enabled by Agentic Systems

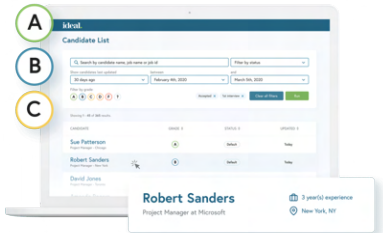
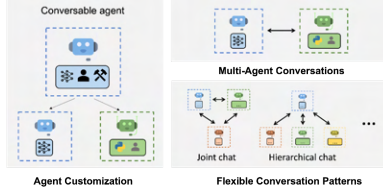
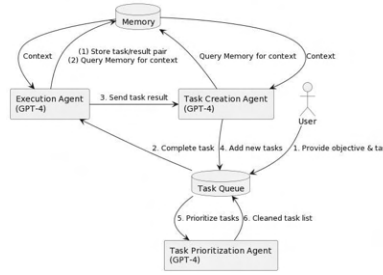
In the mid-term horizon, AI models will transition *from responsiveness to agency*, heralding an era in which digital services become an “internet of actions,” shifting the focus from merely providing information to autonomously executing tasks. This shift will necessitate a new framework for decision-making, balancing human-to-human and machine-to-machine interactions.

The business functions of **human resources and operations** will be particularly affected. Advanced AI systems will autonomously handle tasks such as analyzing resumes, assessing skills, and conducting initial interviews, under the supervision of human professionals. In **operations**, these advanced AI systems will autonomously manage a range of tasks, from inventory management and logistics to workflow optimization and quality control. The AI's ability to process vast amounts of data in real-time will enable it to make quick decisions, identify inefficiencies, and predict future challenges, thereby enhancing operational efficiency significantly.

Human resources and operations professionals will need to develop a nuanced understanding of how to delegate and supervise AI systems effectively. HR teams will play a crucial role in fine-tuning selection criteria, ensuring that AI-driven hiring decisions align with company values and culture. Operations professionals will need to develop skills in overseeing AI systems, ensuring that these systems execute tasks in alignment with the company's strategic goals and operational standards.

For organizations, the main effect of this shift will be a significant increase in agility and efficiency, particularly in routine activities. This will enable faster decision-making and more streamlined operations. However, alongside these benefits, there will be the risk of job displacement as AI takes over more operational tasks.

Signals: where do we see the future today?

Automation-assisted recruiting platforms	Orchestrating workflows with AI	Everybody becoming a manager
		
<p>WHAT: Ideal is a recruitment automation platform that works as a virtual assistant connected to an applicant tracking system to help HR professionals process and automate some recruiting tasks. It has four components: screening, matching, a chatbot to communicate with candidates, and automation.</p>	<p>WHAT: AutoGen is a framework developed by Microsoft Research that simplifies the orchestration, optimization, and automation of Large Language Model workflows. It enables the creation of customizable and conversable agents that leverage the capabilities of advanced LLMs like GPT-4, while integrating with humans and tools to facilitate multiagent conversations.</p>	<p>WHAT: Baby AGI is a fully autonomous task manager powered by artificial intelligence. Baby AGI utilizes OpenAI and Pinecone APIs, along with the LangChain framework, to create, organize, prioritize, and execute tasks based on predefined objectives and the outcome of previous tasks.</p>
<p>SO WHAT?: For many talent acquisition professionals, the hardest part of recruitment is identifying the right candidates from a large applicant pool. Tools such as Ideal are designed to add AI to the recruiting process, helping HR professionals to automate time-consuming manual tasks but to augment them by supporting human decision-making.</p>	<p>SO WHAT?: By automating complex workflows and allowing for dynamic conversations between different agents, AutoGen creates possibilities for developing advanced AI assistants, optimizing tasks in various domains, and enhancing collaboration between humans and machines.</p>	<p>SO WHAT?: Baby AGI has the potential to autonomously complete tasks, generate new ones, and prioritize them in real-time, freeing up human resources for more complex endeavors. According to Yohei Nakajima, the developer of Baby AGI: "The future of autonomous agents looks like everybody becoming a manager."</p>

CHALLENGES AND OPPORTUNITIES FOR JAPANESE ORGANIZATIONS

- **Stability and continuity:** the increase in operational efficiency and agility aligns with existing practices of continuous improvement. AI systems could streamline routine activities, allowing humans to focus on more strategic and value-added tasks.
- **Hierarchy and seniority:** the shift to AI systems autonomously executing tasks might challenge the established hierarchical structures in Japanese organizations. Managers traditionally accustomed to overseeing human teams may need to adapt to supervising AI-driven operations.
- **Consent and consensus:** the speed and autonomy of AI in decision-making will require adaptations to the consensus-driven approach prevalent in Japanese organizations. Balancing rapid AI-driven decisions with the collective agreement process might be a significant challenge.
- **Relationship and trust-building:** With AI taking over routine tasks, human managers in Japanese organizations might need to focus more on building relationships and trust, both within the organization and with external stakeholders.

4. Discovery: Explorers Enabled by AI Probes




As datasets expand in scale and complexity and computational capabilities advance *from monolithic models to ecosystems of models*, organizations will embrace a new paradigm of discovery and innovation powered by AI-human collaboration. Increasingly dynamic foundation and specialized AI models will become central to **research, development and innovation** teams, not just as tools for inspiration but as integral partners.

These AI systems will serve as “possibility probes,” delving into vast arrays of data – from news reports and scientific papers to patents and experimental data. Their role will be to identify emerging technologies and untapped innovation opportunities, scanning and mapping extensive possibility spaces with unprecedented speed and depth. This AI-powered divergence will set the stage for groundbreaking discoveries and the generation of a multitude of innovative concepts and solutions.

Complementing these expansive AI capabilities, human professionals in these fields will act as “critical discoverers” guiding the AI-driven explorations and pinpointing the most promising ideas. This process represents a transformative approach to innovation: AI systems, akin to cognitive prosthetics, extend and enhance human capabilities, allowing for a broader exploration of possibilities. At the same time, human insight, with its inherent understanding of complex social, cultural, and ethical dimensions, merges these possibilities into feasible, impactful innovations.

The synergy between AI-powered divergence and human convergence will be a defining feature of future organizational innovation. AI systems will push the boundaries of what is possible, while human professionals will provide the essential context, judgment, and values-driven focus. This process of AI-powered divergence plus human convergence may help organizations provide more value for a world in urgent need of creative solutions.

Signals: where do we see the future today?

<u>Rapidly exploring the chemical space</u>	<u>Creating the taste of the future</u>	<u>Using data and AI to redesign offices</u>
		
<p>WHAT: Scientists have used AI to discover a new antibiotic that can fight a drug-resistant superbug called <i>Acinetobacter baumannii</i>. By leveraging machine learning, researchers from McMaster University and the Massachusetts Institute of Technology were able to screen thousands of molecules and identify a new compound named abaucin, which shows promise in treating infected wounds in mice.</p>	<p>WHAT: Coca-Cola used AI to create its newest flavor, called "Y3000." The beverage is billed as the first futuristic flavor co-created with both human and artificial intelligence. Coca-Cola's researchers collected flavor preferences and trends from consumers to understand their vision of the future taste. This information was then processed by an AI system to develop flavor profiles and pairings.</p>	<p>WHAT: Zaha Hadid Architects has created a dedicated in-house team called ZHAI that utilizes data and AI to design office spaces that cater to the individual needs of workers. By employing algorithms and machine intelligence, the team can analyze real-time data regarding staff movements, environmental conditions, and other factors to optimize the layout and functionality of office buildings.</p>
<p>SO WHAT?: The ability of AI to rapidly explore chemical space and identify potential candidates for drug development opens up new avenues for finding solutions to antibiotic resistance. By combining human expertise with AI-driven exploration, companies can expand the possibilities for innovation and address critical challenges in fields like healthcare.</p>	<p>SO WHAT?: The Y3000 project highlights the application of AI in the innovation process, allowing companies like Coca-Cola to explore and discover new flavor possibilities. By leveraging AI technology, Coca-Cola was allegedly capable of tapping into AI and the collective imagination of consumers to envision what they believe the taste of the future should be.</p>	<p>SO WHAT?: The use of AI in workplace design allows architects to explore a wide range of innovative possibilities for offices that address the evolving needs of workers. While AI plays a crucial role in generating these design options, the final selection and evaluation of innovative ideas remain in the hands of human architects.</p>

CHALLENGES AND OPPORTUNITIES FOR JAPANESE ORGANIZATIONS

- **Stability and continuity:** fully embracing AI as integral partners in design and R&D could be considered overly disruptive to established processes. However, portraying AI tools more as “cognitive prosthetics” that extend human capabilities for exploring broader possibility spaces, with human professionals still guiding selections, may help address such concerns. Ensuring AI clearly complements rather than replaces human judgment could gain more acceptance.
- **Hierarchy and seniority:** the role of human professionals as “discerning critics” can be integrated into the existing hierarchical structures of Japanese organizations. Experienced professionals and leaders can guide AI-driven explorations, ensuring that innovations align with organizational goals and cultural values.
- **Consent and consensus:** the emphasis on a multitude of ideas generated respects Japanese preferences for consensus over single decisive choices. As long as options are not narrowed too quickly, and worker input remains pivotal in convergence, this model aligns well with seeking broad collaboration.
- **Relationships and trust-building:** the forecast suggests a balanced approach to innovation, in which human insight is vital. This resonates with the Japanese emphasis on human relations and ethical considerations in business, potentially leading to innovations that are not only technologically advanced but culturally and socially relevant.

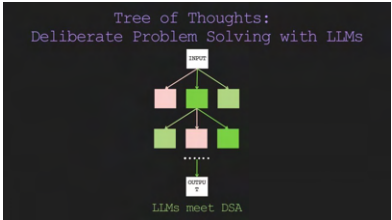


5. Stewardship: Leaders Enabled by AI Partners

By the late 2020s, the capabilities of AI systems for divergent thinking, reasoning, and integrating knowledge will be greatly expanded, thanks to the emerging capabilities we have called “*from generic knowledge to specific solutions*” and “*from monolithic models to ecosystems of models*.” Based on these capabilities, organizational leadership will be deeply intertwined with artificial intelligence, fundamentally changing the nature of the **strategy and leadership** business function.

On the one hand, leaders will need to oversee hybrid teams comprising humans, AI-augmented workers, and autonomous agents. A critical role for leaders will be to facilitate effective collaboration between human and AI team members. This includes ensuring that AI systems complement human skills, allowing for a symbiotic relationship in which AI handles data-driven tasks and humans focus on areas requiring emotional intelligence, creativity, and ethical judgment. On the other hand, leaders will rely heavily on AI for critical functions such as running complex simulations and providing situational analysis based on market dynamics, competition, and internal factors, thus enabling them to explore multiple scenarios and their potential effects. These AI tools, continuously trained on organization- and leader-specific historical data, will act as advanced sparring partners, offering insights tailored to the strategic context and illuminating upcoming challenges.

This kind of augmented leadership may result in more imaginative and adaptable strategic decision-making. Considering an increasingly turbulent world outside — and more complex dynamics inside companies — the role of leaders as organizational stewards for protecting the integrity and evolving the purpose of organizations will grow in importance. They will play a pivotal role in integrating AI into the workforce in a manner that enhances productivity while maintaining a focus on human values, ethics, and well-being.

Signals: where do we see the future today?

<u>Tree of Thoughts method for deliberate problem-solving</u>	<u>McKinsey unveils generative AI tool</u>	<u>AI oversight tasks negating productivity gains</u>
		
<p>WHAT: A research paper from Princeton University and Google DeepMind proposes a way to make AI models better at problem-solving by letting the models explore different ways to solve a problem and reason about the best approach. This approach, they posit, could make AI better at tasks that “require exploration, strategic lookahead, or where initial decisions play a pivotal role.”</p>	<p>WHAT: Consulting firm McKinsey and Company has debuted its own generative AI tool, Lilli, a chat application for providing information, insights, data, plans, and even recommendations for the most applicable internal experts for consulting projects. The firm describes it as a “thought-sparring partner.”</p>	<p>WHAT: CNN recently ran an article highlighting the perspective of workers who say that AI is creating oversight work for them that reduces or even negates the productivity gains associated with its use.</p>
<p>SO WHAT?: The paper shows one of the ways in which LLMs could be developed so that their capabilities expand and intersect with some skills associated with strategy and management professionals. This shift could transform the way those professions leverage technology and push forward the human skills associated with them.</p>	<p>SO WHAT?: This announcement by McKinsey highlights the growing integration of AI technologies within the consulting industry. Lilli, presented as a “thought-sparring partner,” acts as a critical thinking companion for consultants. By leveraging Lilli’s capabilities, consultants can anticipate questions, enhance the quality of their expertise, and make original connections between different project areas.</p>	<p>SO WHAT?: While AI is expected to enhance productivity and enable people to work more efficiently, the reality may be more complex. Unintended consequences, such as the burden of sifting through low-quality AI-generated content, can hinder productivity and point to the way in which the deployment of AI systems may require a shift in the roles and responsibilities of managers tasked with auditing such systems.</p>

CHALLENGES AND OPPORTUNITIES FOR JAPANESE ORGANIZATIONS

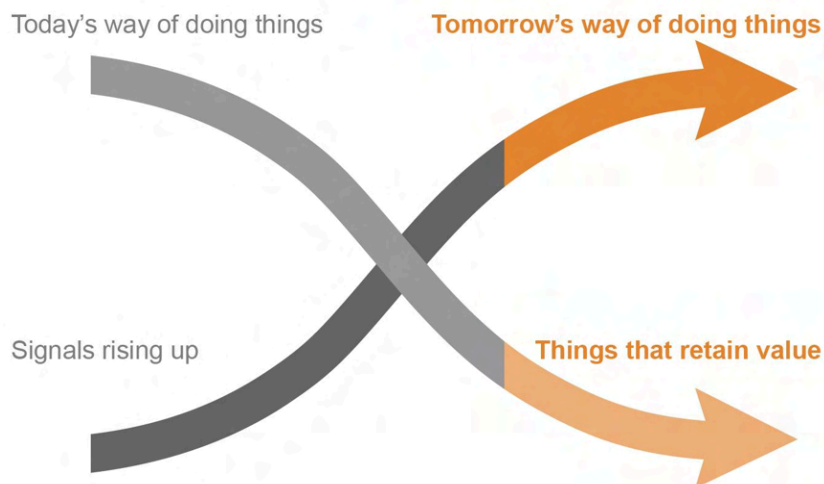
- **Stability and continuity:** Japanese organizations, known for their methodical approach, may find strategic decision-making enhancement through AI appealing. AI's ability to run simulations and provide detailed analyses aligns with the preference for thorough, data-driven planning.
- **Hierarchy and seniority:** the introduction of AI as a key component in leadership and decision-making may challenge traditional hierarchical structures, particularly if AI recommendations conflict with senior leaders' views. Additionally, integrating AI into consensus-based decision-making could be complex, requiring a balance between AI-driven insights and collective human judgment.
- **Consent and consensus:** leaders acting as stewards to integrate AI while protecting human values will be important for gaining worker acceptance. However, over-reliance on AI simulations alone, without explaining how worker input was considered, could undermine trust in leadership. Transparency and collaboration between human and AI "team members" will be key.
- **Relationship and trust-building:** having AI systems that continually train on historical data and provide strategic simulations could promote more imaginative thinking, but it may also introduce new forms of uncertainty. Leaders will need to gain trust in AI recommendations over time and show how they strengthen stability rather than disrupt it.

Horizon Three: The Future of AI-Enabled Work and Workers

This horizon covers developments we anticipate in the next 10 years. Here we see today's technologies upend the status quo and transform work and organizations.



In this section, the Two Curve framework represents the far future, in which the second curve becomes the clearly dominant paradigm.



Here we describe the Third Horizon and final portion of the second curve, describing **industry scenarios** that depict a new paradigm for each industry ushered in by AI. They represent forecasts about the far future that are not predictions, but rather plausible, internally consistent descriptions of future possibility.

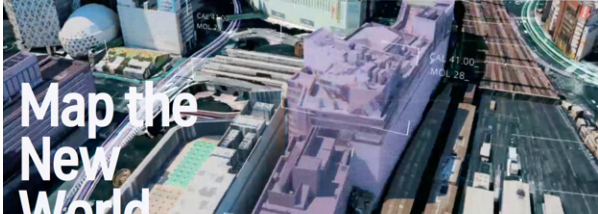

They are meant to be taken as provocative examples to help people working in these industries imagine the level of change that is possible and begin to plan today.

Industry Scenarios

Real estate: from property development to community development

In 2033, the real estate industry in Japan underwent a significant transformation due to the adoption of an AI-driven, community-optimized approach. Changes in societal demographics and economic conditions, including decreased real estate buying power and an aging population, have combined with advancements in AI to shift the focus of the industry from helping **individuals** find and finance properties to buy and toward cultivating **communities** by building sustainable, inclusive, and collective living spaces. In this new paradigm, AI-powered platforms begin to reshape the industry, providing personalized housing recommendations that align with individual needs and community compatibility. New housing projects leverage AI to optimize design for community interaction, incorporating such features as shared spaces and community-centric amenities such as time-banking platforms, co-working spaces, hobby-matching, community kitchens, and medical equipment libraries. AI leverages large datasets to provide accurate and instant property valuations and largely automates many tasks, such as lease and purchase agreements, while chatbots handle initial customer service inquiries, providing immediate responses to common questions and are used to match individuals or families with properties based on their specific needs and preferences.

Signals: where do we see the future today?

<u>Digital twin cities</u>	<u>Co-living as a new normal</u>
	
<p>WHAT: PLATEAU is a transformative urban management platform that uses digital tools, including 3D urban modeling, to promote sustainable and efficient city planning.</p>	<p>WHAT: In December 2022, Hines entered Japan's multifamily sector, acquiring 11 properties in Tokyo, Nagoya, and Fukuoka, totaling over 400 units. This marked the start of its strategy to build a rental multifamily asset portfolio in Japan, highlighting the region's market strength.</p>
<p>SO WHAT?: By visualizing and integrating urban data, we are now armed with tools that aim to address social and regional challenges and lay the groundwork for Society 5.0, fostering a sustainable, livable, and inclusive future society.</p>	<p>SO WHAT?: In the APAC region, co-living is increasingly embraced by young professionals as a cultural norm, offering them affordable and convenient housing that blends modern technology with shared spaces such as kitchens and lounges. This fosters social connections and community among residents.</p>

How are workers impacted?

■ **Augmented capacities: insights and inspections**

While AI can provide data-driven insights, human advisors can use these insights to provide personalized advice to clients. AI can assist with home inspections by identifying potential issues based on data analysis, but human inspectors will still be needed to physically check the properties. AI can provide data to support negotiations, but the negotiation process itself will still require a human touch.

- **New roles in AI: design, interpretation and oversight**

New roles to manage and maintain the AI systems will emerge. With the increased use of AI, there will be a greater need for data analysts to interpret and make use of the data being collected. As AI and data-driven decision-making become more prevalent, AI system oversight will be key, and professionals will need to navigate ethical considerations involving privacy, fairness, and transparency.

- **New focuses for workers: community-building and customer interaction**

With a focus on community-building, skills related to emotional intelligence, such as empathy, social awareness, and relationship management, would be in high demand. Despite the rise of AI, excellent customer service skills would still be in demand to provide high-level support and build strong relationships with clients. As the industry focuses more on community-building, the task of property development will need to be reimagined to consider factors such as shared spaces, accessibility, and community engagement. With AI handling initial inquiries, customer service representatives can focus on providing higher-level support and building relationships with clients

How are organizations Impacted?

- **New models: community-oriented real estate**

Companies will need to transition from transaction-based models to service or community-oriented models. The focus might shift from individual properties to holistic community solutions.

- **New training: AI roles and community builders**

As automation takes over certain tasks, organizations will need to reskill or upskill their workforce. New roles may emerge, such as AI specialists or community builders, and the demand for certain traditional roles may decrease.

- **New partnerships: community organizations and government agencies**

To deliver community-optimized solutions, organizations may need to form partnerships with other stakeholders, such as local government, community organizations, or other businesses.

CHALLENGES AND OPPORTUNITIES FOR JAPANESE ORGANIZATIONS

- **Bias:** the use of AI in assessing social compatibility is incredibly fraught. Issues such as discrimination in housing allocations or pricing are a huge risk. Ensuring that AI systems are transparent, fair, and accountable will be a major challenge. Many current-day examples show the consequences of getting it wrong.
- **Privacy:** the use of AI involves the collection and analysis of large amounts of data, raising concerns about data privacy and security. The industry will need to ensure it is adhering to all relevant laws and regulations, and taking all necessary steps to protect sensitive information.
- **Displacement:** There are numerous ways in which workers could get displaced in this future, and efforts would need to be made in advance to ensure that they are reskilled or otherwise guaranteed security and a livelihood. Another risk that might be less obvious is displacing human workers prematurely. Successfully building communities is about more than just technology. It requires a deep understanding of human behavior and social dynamics. While AI can help optimize certain aspects, it cannot fill the need for genuine human connection and community engagement.



Air travel: from transportation to experience

In 2033, worsening climate events, increased pressure on individuals and organizations to minimize climate effects, and economic challenges have lessened the frequency of commercial air travel. In Japan, airlines utilize AI and other emerging technologies, as well as their extensive capabilities and knowledge in logistics, to create premium and exclusive customer experiences. Airlines use these technologies to understand consumer desires and aspirations around travel and provide new kinds of travel experiences, including some that do not involve boarding an aircraft at all. Airlines have expanded their services to include premium ground transportation, which might involve high-speed rail, luxury bus services, or private car hire, all coordinated with the same level of service as a first-class flight. Leveraging their loyalty programs, airlines offer comprehensive travel planning and concierge services, arranging accommodation, local experiences, dining, and transportation according to individual preferences. Many also offer

virtual reality (VR)-based travel services that allow customers to “pre-visit” and plan travel to desired destinations without leaving their homes. These range from tours of iconic landmarks to immersive cultural events.

AI chatbots and virtual assistants manage routine customer inquiries and complaints, providing 24/7 support. Ground transportation logistics, such as scheduling and route optimization, are largely automated.

Signals: where do we see the future today?

<u>Virtual Travel</u>	<u>Bans on short-haul flights</u>
	
<p>WHAT: ANA has partnered with JP GAMES to launch ANA NEO, a virtual platform that offers travel experiences and online shopping. Key to the platform is “SKY WHALE,” which aims to recreate the joy of travel and cultural connections digitally. ANA NEO will provide realistic recreations of tourist sites and unique shopping experiences, accessible via connected smart devices, marking a significant step in virtual travel innovation.</p>	<p>WHAT: France has passed a law banning short-haul flights when a train alternative under 2.5 hours exists, a move initially linked to Air France’s pandemic bailout agreement to meet environmental goals. While hailed as a pioneering environmental step, critics argue that the law has been significantly diluted.</p>
<p>SO WHAT?: As environmental and economic challenges reshape air travel, airlines are likely to pivot toward providing unique, nonflight travel experiences. Utilizing AI and VR technologies, they could offer immersive virtual tours and cultural events, allowing customers to explore destinations virtually.</p>	<p>SO WHAT?: Although the initiatives to ban short-haul flights have been criticized for being watered down, the climate impact of flying is pushing top-down initiatives to decrease the effect of air travel on the environment.</p>

How are workers impacted?

■ **Augmented capacities: customer support, planning, and logistics**

AI could augment the task of making travel recommendations by analyzing customer data and preferences to offer highly personalized suggestions. While AI handles routine inquiries, human customer service representatives, aided by AI tools, could handle more complex or sensitive issues. AI also could augment tasks related to safety and security, such as monitoring for safety issues in ground transportation or detecting potential security threats.

■ **New roles in AI: building simulation systems**

One of the biggest new roles that AI brings to the industry could be in creating, maintaining and operating simulation systems. These include systems used by workers for planning purposes, as well as to create more vivid, immersive simulations that workers could share with their customers to help explain trip-planning processes and destinations.

■ **New focuses for workers: holistic experience design**

With AI's data analysis capabilities, concierges could offer highly personalized service, transforming the task from simply responding to customer requests to proactively anticipating and fulfilling customer needs. Concierges could understand customers' larger goals and priorities and design an optimal travel experience for them, with or without air travel as part of the itinerary. With VR, the task of designing travel experiences could be transformed. Instead of arranging physical experiences, travel designers could work with VR developers to create immersive virtual experiences.

How are organizations impacted?

■ **New models: comprehensive travel support**

Airlines would need to adapt their business models significantly, moving away from a focus on air travel to a more diverse range of services. They would need to manage their brand identity and reputation during this transition and convince customers to see them not just as airlines, but as comprehensive travel providers. As airlines move into new sectors, they could face increased competition from existing providers in those sectors, such as rail companies, travel agencies, and VR entertainment companies. This means

airlines would have to differentiate themselves through superior service and unique offerings, while at the same time partnering with these providers.

- **New training: concierge services, simulations, and sustainability**

As airlines expand their offerings, new roles may be created in areas such as virtual reality content creation, logistics coordination for ground transportation, and personalized concierge services. Existing roles may also evolve, requiring workers to develop new skills. For instance, flight attendants might transition into roles on high-speed trains or luxury buses, or take on more customer service-oriented roles. Upskilling and reskilling programs would become crucial. There could be decreased demand for jobs directly related to air travel, such as pilots, airport staff, and certain air traffic control roles. Given the increased focus on sustainability, new roles could arise related to measuring and reducing the environmental impact of the company's operations.

- **New partnerships: staking a location in a new transportation ecosystem**

In this future, the role of many players in transportation would be transformed. With air travel representing a smaller portion of travel overall, airlines would leverage their premium experience design capabilities to give them a right of way to expand into other areas of premium travel. This will necessitate good relationships between other industries.

CHALLENGES AND OPPORTUNITIES FOR JAPANESE ORGANIZATIONS

- **Bias:** AI systems are trained on data, and if the data contains biases, the AI can perpetuate or even amplify these biases. For example, in the process of personalizing travel recommendations, if the training data is skewed toward a certain demographic, such as high-income travelers, the AI might not perform as well in catering to the needs and preferences of underrepresented groups. Bias could also occur in customer service. For example, if an AI chatbot is trained primarily on data from certain regions or demographics, it might not understand or respond appropriately to inquiries from customers outside those groups.
- **Privacy:** Because AI systems in this scenario would likely rely on analyzing extensive personal data to provide personalized services, there are significant privacy concerns. There could be risks related to the collection, storage, and use of personal data. If not properly protected, sensitive information could be vulnerable to data breaches. There may be concerns about how much personal information the airlines are collecting and how it is being used. For instance, customers might be uncomfortable with the idea of a company knowing their travel habits, preferences for experiences, dining habits, etc.
- **Displacement:** the introduction of AI and automation could lead to job displacement. Jobs related to certain aspects of air travel, such as pilots and flight attendants, could decrease as the demand for air travel falls. As AI and automation take over tasks such as booking, customer service, and logistics, employees in these areas could face job losses. On the other hand, new jobs could be created in areas such as VR content creation, AI management, and integration of various systems. However, these new roles might require different skills, leading to a potential skills gap.

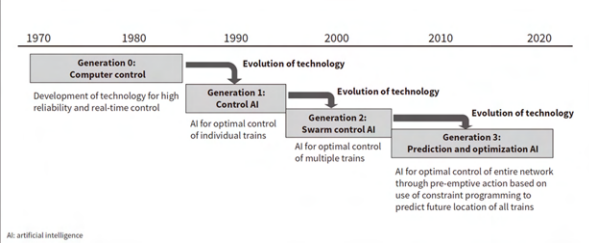

Railways: from transportation to coordination

In 2033, Japan's railway industry has evolved from a focus on transportation to a sophisticated system of coordination, integrating AI to optimize “people routing” across urban landscapes. This transformation is not just about moving people from point A to point B, but dynamically orchestrating their movement through cities to meet various goals, both individual, such as meeting with other people or getting a bite to eat, and on a societal/systems level, such as reducing congestion, enhancing public safety, and improving the overall quality of urban life.

Japanese railway companies utilize AI technology to develop advanced scheduling and routing systems that adapt in real-time to the flow of people, traffic conditions, and city events, and they coordinate with other means of transportation, such as ride-share services. The system supports the elderly and those with mobility challenges, offering personalized travel assistance and optimizing routes for ease of access.

People often do not start with a destination in mind and look up transit options for how to get there, but instead set larger goals and priorities. Personalized transit options become available based on their wants and needs in relation to other users of transit systems.

Signals: where do we see the future today?

<p>AI traffic management system</p>	
 <p>1970 1980 1990 2000 2010 2020</p> <p>Generation 0: Computer control Development of technology for high reliability and real-time control</p> <p>Evolution of technology</p> <p>Generation 1: Control AI AI for optimal control of individual trains</p> <p>Evolution of technology</p> <p>Generation 2: Swarm control AI AI for optimal control of multiple trains</p> <p>Evolution of technology</p> <p>Generation 3: Prediction and optimization AI AI for optimal control of entire network through pre-emptive action based on use of constraint programming to predict future location of all trains</p> <p>AI: artificial intelligence</p>	
<p>WHAT: Hitachi has developed a hybrid railway traffic management AI to assist in the complex task of replanning train timetables, especially during service disruptions caused by weather or accidents.</p>	<p>WHAT: CityData uses AI to analyze and understand the movement patterns of people in urban environments. Utilizing AI algorithms, it processes vast amounts of data from sources such as GPS, mobile devices, and sensors to gain insights into urban mobility.</p>
<p>SO WHAT?: This innovation addresses the challenge of passing on timetable recovery expertise in the railway industry, a sector facing labor shortages. The advanced machine learning techniques enhance railway convenience and safety amid increasing direct train services and operational complexities.</p>	<p>SO WHAT?: This analysis helps identify traffic trends, pedestrian flows, and public transportation usage, enabling better urban planning and infrastructure development allowing for more efficient city management.</p>

How are workers impacted?

- **Augmented capacities: scheduling and routing**

Many aspects of scheduling, routing, and customer service are automated by AI systems, but this does not mean that humans are taken out of the loop. In fact, the work could become more complex and demanding, as workers would need to understand and work with sophisticated AI systems and handle a broader range of tasks. However, this kind of augmentation pushes workers' focus away from rote work and onto more strategic and meaningful tasks.

- **New roles in AI: systems design and management**

Workers assume new roles such as data analysts, AI system managers, requiring skills in AI technology, advanced data analytics, and a comprehensive understanding of urban transit systems and individual mobility needs. Some traditional jobs might be reduced or eliminated due to automation.

- **New focuses for workers: tech support and human assistance**

We can assume significant gaps in tech-savvy and know-how among transit users, which would necessitate that customer service agents become experts at guiding passengers on using new personalized transit planning tools. In general, when a transit user has any issues with using digital tools, human staff will have to be proactive in providing immediate assistance.

How are organizations impacted?

■ **New models: people-routing service**

Railway companies would need to shift from a traditional transportation model to a more comprehensive people-routing service model. This would involve changes in many areas, from service offerings and customer relationships to revenue streams and partnerships.

■ **New partnerships: other transportation systems and community stakeholders**

Railway companies would need to collaborate more closely with a range of other transportation providers, city planners, and community stakeholders. This could lead to more complex business relationships and the need for skills in collaboration and partnership management. As railway companies take on a bigger role in managing people's movements around cities, they could face increased scrutiny and higher expectations from the public and other stakeholders. Building and maintaining trust would be crucial in this new role.

■ **New training: service, systems design, and safety**

As railway companies work more closely with other transportation providers and stakeholders, new roles could emerge to manage these relationships and integrate various systems and services. With the increased use of AI and data analytics, there would be a need for roles focused on ensuring compliance with data privacy regulations and ethical standards. There would be a need for professionals who can manage the AI systems used for scheduling, routing, and other tasks, ensuring that they operate correctly and ethically.

CHALLENGES AND OPPORTUNITIES FOR JAPANESE ORGANIZATIONS

- **Bias:** AI systems are only as good as the data they're trained on. If the data used to train AI systems reflects existing societal biases, those biases could be reproduced and possibly amplified in the system's operations. For instance, the AI could favor certain routes or neighborhoods over others based on the historical data it has been trained on. There could be bias in the accessibility of such advanced systems. People who are not tech-savvy, including many elderly people or those from disadvantaged backgrounds, might find it challenging to interact with these AI systems, leading to a potential digital divide.
- **Privacy:** to provide real-time, personalized transit planning, the AI system would need to collect and use a significant amount of personal data, raising concerns about privacy. Even with anonymization, there could be risks of data breaches or misuse of data. The system's ability to track and predict people's movements could be considered invasive and could potentially be misused for surveillance purposes, either by the government or by other entities.
- **Displacement:** AI could automate many tasks in the railway industry, potentially leading to job displacement. While new jobs would likely be created, these might require different skills, and there could be a painful transition period for workers in the industry. The shift to a more sophisticated system of coordination could disrupt traditional economic patterns. For instance, if people are routed away from certain areas, businesses in those areas might suffer. Moreover, the increased efficiency of public transit might affect other sectors, such as the taxi or ride-share industry.

Insurance: from risk assessment to risk reduction and resilience-building

In 2033, what was once an insurable asset is now too risky to underwrite. Worsening environmental and economic conditions, combined with more sophisticated AI-driven risk modeling, has significantly shrunk the pool of properties, projects, and people the industry assesses as an insurable asset. And many of those deemed a sufficiently safe investment are not in need of a third-party policy. Because of this, insurance companies use AI to help governments, companies, and even individuals identify forms of risk, as well as the optimal points of intervention to reduce risk, running simulations to identify a retrofitting the property needs to make it an insurable asset. Because often, the person or company seeking a policy has trouble financing retrofits on their own, insurance companies have developed new services to facilitate the financing or retrofits or other transitions, such as relocations. They are particularly skilled at identifying where multiple stakeholders share risk and can benefit from specific interventions that they cannot afford on their own, but that make for good collective investments. In this way, they have become a key part of “multisolving” initiatives.

Signals: where do we see the future today?

Resilient community housing	Digital twins of systems
 <p>A photograph showing a group of children standing at a counter labeled 'Croquette stand' in a community housing complex. The stand is part of a larger facility with a sign that reads '春日台' (Haruhidai) and 'シロキヤ' (Shirokiya).</p>	 <p>A photograph showing a child pushing a small, wheeled robot on a green field. The robot is a small, white, rectangular device with two large wheels and a smaller front wheel. The child is wearing a blue shirt and dark pants. The background shows a lush green field with trees and a building in the distance.</p>
<p>WHAT: An innovative nursing home in Kanagawa seeks to address multiple social issues at once. It contains a candy store, laundromat, and play center for children that is staffed by nursing home residents. It is part of a larger complex with all sorts of facilities that serve different functions for both the residents and the local community, including people with intellectual disabilities and immigrants who are learning the Japanese language.</p>	<p>WHAT: Cooling Singapore, a multi-institutional project, aims to build a computer model of Singapore's urban climate, called a "digital urban climate twin." The project seeks to assess different strategies for mitigating urban heat. This would allow policymakers to analyze the effectiveness of various heat mitigation measures before funding specific solutions.</p>
<p>SO WHAT?: Intergenerational housing models present an opportunity to bundle different types of risks so that all benefit from the same protective upgrades. Insurers could provide premium discounts or direct funding support to intergenerational hubs that invest in multiuse infrastructure retrofits. Their facility upgrades could earn rewards by addressing risks across eldercare, childcare, and vocational programs all at once, diversifying the insurer's overall exposure.</p>	<p>SO WHAT?: The research being conducted by Cooling Singapore could significantly affect how insurance companies evaluate and price risk in the future. As temperatures continue rising due to climate change, areas previously considered low-risk for extreme heat are becoming higher risk. By developing a more comprehensive understanding of how urban design and other environmental factors influence localized temperature variations, insurers may be able to more accurately map heat risk zones within cities.</p>

How are workers impacted?

■ **Augmented capacities: advanced risk-assessment and intervention identification**

While AI could automate basic risk assessment, humans would still be needed for advanced risk modeling, working alongside AI to interpret and apply the results, especially for complex cases that involve multiple stakeholders or kinds of risk. AI could provide tools to help humans coordinate multisolving initiatives, such as platforms for collaboration and data sharing, or tools for tracking and assessing the impact of interventions. The role of insurance would shift from simply assessing and insuring risk to actively helping stakeholders mitigate risk. AI could transform this task by providing sophisticated tools for identifying risk factors and optimal points of intervention.

■ **New roles in AI: analysis and strategy**

Roles like risk mitigation strategists, data analysts, or AI system managers will be necessary. These roles would require skills in AI technology, advanced data analytics, and understanding of complex risk factors across multiple domains, including environmental, economic, and societal. There would be a need for professionals who can manage the AI systems used for risk modeling and other tasks, ensuring that they operate correctly and ethically.

■ **New focuses for workers: relationship-building and systems thinking**

New roles might emerge to manage the multisolving initiatives that insurance companies become involved in. These roles would involve coordinating between multiple stakeholders, monitoring the implementation and impact of interventions, and continually adjusting strategies based on new data and insights. The relationship between insurers and their customers would evolve from a simple transactional relationship to a more collaborative one. AI could transform this task by enabling more personalized and proactive customer service.

How are organizations impacted?

■ **New models:** risk-mitigation service and financing

Insurance companies would need to shift from a traditional insurance model to a risk-mitigation service model. This would involve changes in many areas, from product offerings and customer relationships to revenue streams and partnerships. To drive these changes, insurance companies would need to make substantial investments in AI and data analytics capabilities.

■ **New training:** working with AI and connecting multiple stakeholders

Some traditional insurance jobs could become less relevant or obsolete due to AI automation. For example, certain aspects of policy underwriting, claims processing, and risk assessment might be automated. Insurance underwriters or claims adjusters might need to reskill or upskill to adapt to the new model. For instance, they might need to learn how to interpret AI-driven risk assessments or coordinate multisolving initiatives. Job quality might improve for some workers as they take on more strategic roles, working with AI rather than against it. There also would be a need for roles focused on ensuring compliance with data privacy regulations and ethical standards. Outside of AI, new roles around stakeholder relationship-building and management would be key.

■ **New partnerships:** connecting customers with governments, other businesses and with one another

Insurance companies would need to work more closely with a range of stakeholders, from government agencies to businesses to individual policyholders. This could lead to more complex business relationships and the need for skills in collaboration and partnership management. As insurance companies take on a bigger role in identifying and mitigating risks, they could face increased scrutiny and higher expectations from the public and other stakeholders. Building and maintaining trust would be crucial in this new role.

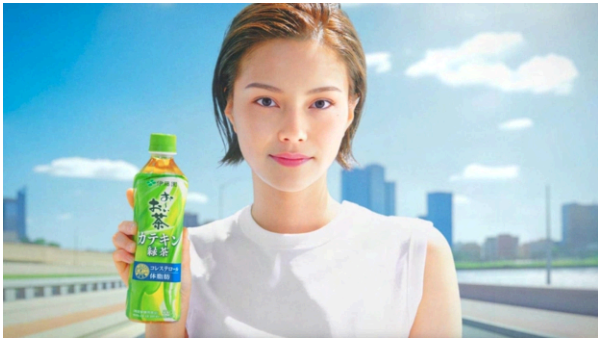

CHALLENGES AND OPPORTUNITIES FOR JAPANESE ORGANIZATIONS

- **Bias:** AI-driven risk modeling could be biased if it is trained on incomplete or skewed data. For example, certain geographical areas or demographics might be unfairly categorized as “high risk” based on past data, even if current conditions have changed. There could be a reinforcement of existing biases or stereotypes if AI models are built on unchecked assumptions. For instance, the perception of certain areas as “unsafe” might not account for the resilience or adaptability of local communities.
- **Privacy:** the use of AI in risk assessment would likely involve collecting and analyzing vast amounts of data, including potentially sensitive information about individuals, companies, and communities. This could raise significant privacy concerns. The assessment of risk at an individual level could lead to invasive surveillance practices, especially if insurance companies are incentivized to constantly monitor individuals to update their risk assessments.
- **Displacement:** The shift to AI-driven risk modeling could displace jobs in the insurance industry, particularly those related to traditional risk assessment and underwriting. If only a small pool of individuals and properties are deemed “safe” for insurance policies, this could lead to financial displacement for those deemed “high risk.” They might struggle to access affordable insurance or financial services, exacerbating socioeconomic inequality. If insurance companies take a significant role in identifying and mitigating risk, this could displace or undermine the role of government agencies traditionally responsible for these tasks. In multisolving initiatives, there may be a risk of diluting or displacing accountability. If many stakeholders are involved, it might be challenging to hold any single entity accountable for the outcomes of risk interventions.

TV and Media: from targeting demographics to contextual engagement

In 2033, generative AI has transformed the TV industry and the media landscape more generally. TV networks making narrative content typically employ generative AI around the edges, using it to assist in the ideation process, providing input and suggestions to human creative teams working on dramas, comedies, and other story-driven content. However, news media use it much more actively to personalize news and other informational content. Within media organizations, AI systems take charge of personalizing content to match the interests, context, and preexisting knowledge of individual viewers or specific viewer groups. This significant shift has transformed the role of news organizations from mere information providers to creators of bespoke news narratives. These narratives, tailored to individual viewer profiles, deliver a more personalized and engaging news consumption experience.

Signals: where do we see the future today?

<u>Commercial AI actress</u>	<u>AI-generated personalized news</u>
	
<p>WHAT: Beverage company Ito En launched a 15-second commercial for Oi Ocha Catechin Green Tea featuring an AI-generated actress.</p>	<p>WHAT: BuzzFeed plans to utilize AI tools to enhance and personalize its content. This initiative, considered a major trend shaping digital media's future, will involve AI in content creation. This includes improving quizzes, aiding brainstorming, and customizing content for audiences.</p>
<p>SO WHAT?: The usage of AI-generated visuals is part of a growing trend in marketing and creative fields. However, it has sparked mixed reactions, as highlighted by the backlash faced by Shueisha for its AI-generated model and a survey revealing widespread worries about AI's impact on employment and copyright in the arts and entertainment industries.</p>	<p>SO WHAT?: The trend of using AI to enhance personalization content envisions an industry shift from AI-powered curation to AI-powered content creation.</p>

How are workers impacted?

■ **Augmented capacities: AI ideation and review partners**

While AI might not fully automate the ideation process for creative content (e.g., TV shows), it will augment it by providing suggestions or insights based on data. AI also will assist in the process of editing by highlighting potential issues or suggesting improvements.

■ **New roles in AI: making the models**

In this future, creating, curating, and fine-tuning the models used to generate content will be a constant and laborious process. Many workers will be needed to maintain and improve the models that are then used by other workers to personalize the content.

■ **New focuses for workers: setting the storytelling templates**

The role of content creators, such as journalists or scriptwriters, could transform from that of creating content from scratch to that of overseeing and editing AI-generated content. These skills are more akin to game design or interaction design, for which media content producers set the template for a story and identify variables that need to be tailored to a specific user. They work in tandem with AI, using their human touch to ensure the quality, relevance, and ethical standards of the content produced.

How are organizations impacted?

- **New models: providing personalized information flows**

At the organizational level, media companies find themselves at the nexus of technology, news, entertainment, and education. They have to innovate their business models, invest in new tech infrastructure, and navigate the regulatory and ethical challenges that come with AI use. They also have to foster partnerships with tech companies and educational institutions to keep up with the rapid advances in AI and the evolving expectations of their audience.

- **New training: generative AI technical and creative skills**

Workers in the media and education industries would need to develop new skills to work with generative AI. This could include technical skills such as AI programming or data analysis, as well as softer skills, such as understanding how to blend informational and entertainment content effectively. Some traditional roles might change or become obsolete. For example, news reporters might shift from writing articles to overseeing the creation of personalized news stories by AI systems. New jobs could emerge that did not exist before. For instance, there could be a rise in demand for AI trainers who specialize in fine-tuning generative AI models, or AI ethics officers who ensure that AI-generated content is unbiased and respectful of privacy.

- **New partnerships: blurring the lines between media and education**

There could be increased collaboration between media and education organizations, as well as with tech companies that provide AI solutions. This could lead to the formation of new partnerships, alliances, or even mergers. The power to generate personalized content comes with the responsibility to use this power ethically. Organizations would need to ensure that they respect user privacy, avoid amplifying harmful biases, and provide value to users without manipulating them.

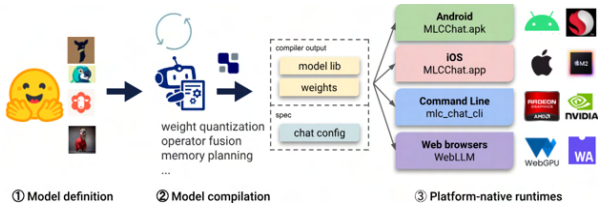

CHALLENGES AND OPPORTUNITIES FOR JAPANESE ORGANIZATIONS

- **Bias:** biased data or algorithms in AI systems could lead to the propagation of misinformation, stereotypes, or discriminatory views. Personalized content can also lead to “filter bubbles” in which individuals are only exposed to information that aligns with their existing views, limiting exposure to diverse perspectives and potentially fostering polarization.
- **Privacy:** to personalize content, AI systems need access to detailed data about users' interests, knowledge, and consumption habits. There are significant privacy concerns associated with collecting, storing, and processing such data. Personalized content based on a person's interests and knowledge level could be considered an invasion of “mental privacy,” particularly if it feels intrusive or manipulative.
- **Displacement:** The automation of content generation and personalization could displace jobs in journalism, content creation, and education, particularly for those unable to adapt to new roles involving AI. As AI plays a larger role in content creation, there may be concerns about the loss of human creativity and cultural nuance. AI-generated content may lack the depth, subtlety, and cultural context that human creators bring. Organizations that fail to adapt to the new landscape of AI-generated and personalized content could struggle to compete, leading to potential business displacement.

Telecommunications:
from expanding bandwidth to expanding edge-power

In 2033, Japan's telecommunications industry has embraced the next frontier: integrating AI with edge computing to revolutionize data processing and network management. Building on its historic strengths in pioneering mobile technology and robotics, Japan has set a new benchmark in decentralized, AI-driven telecommunications infrastructure. In this new era, where AI models run locally on devices, critical data processing happens closer to where it is needed, significantly reducing latency and enhancing the user experience. This evolution is particularly pivotal in such areas as autonomous vehicle coordination, real-time health monitoring, and smart city management, for which immediate data processing is crucial. Telecom companies leverage the data processed at the edge to provide valuable insights to businesses. For example, real-time data from IoT devices is analyzed locally to generate insights related to consumer behavior, predictive maintenance, or energy management. Alongside these developments, edge computing has profoundly affected cloud storage strategies. By processing data locally at the edge, there is a significant reduction in the volume of data that needs to be transmitted to central cloud storage facilities, thus moderating cloud growth, a market in which Japan traditionally has been a global leader. This has forced the country to rethink its larger telecommunications infrastructure and ecosystem.

Signals: where do we see the future today?

Generative AI without internet connection	The chip race
 <p>① Model definition ② Model compilation ③ Platform-native runtimes</p>	
WHAT: A new open-source project, MLC LLM, allows AI chatbots to run locally on devices with limited processing power, such as iPhones or old PCs,	WHAT: Apple's launch of its latest M3 chip, which integrates CPU, GPU, and RAM into a single chip, emphasizes performance, power efficiency, and

without needing an internet connection.	security, while continually improving core counts and performance per watt. Apple's entry into the chip market marked a significant shift in the PC chip landscape, traditionally dominated by Intel.
SO WHAT?: This technology can make sophisticated AI chatbots accessible to a broader range of users, even those with older or less powerful devices or poor access to network connectivity. This democratization of AI tools could lead to more widespread use of AI in various regions and socioeconomic groups.	SO WHAT?: Apple's development of powerful chips like the M3 underscores a key industry focus: equipping edge devices with the capability to independently handle AI tasks. This shift promises to reduce reliance on cloud computing, enhance data privacy, and bring advanced AI functionalities directly to consumer and enterprise devices, reshaping the landscape of AI integration and usage.

How are workers impacted?

■ **Augmented capacities: AI advice and security assistance**

While AI can automate some aspects of network management, human oversight and decision-making would still be necessary. AI could assist network engineers by providing recommendations for network optimization based on real-time data. AI could augment cybersecurity efforts by continuously monitoring for unusual activity, but security professionals would still be needed to investigate and respond to potential threats. AI can provide insights into customer usage patterns and preferences, helping product teams to design better services. However, the creative and strategic aspects of product development would still require human input.

■ **New roles in AI: training AI and ensuring privacy and ethics**

New roles could emerge that are focused on developing, deploying, and maintaining AI models and edge computing systems. This could include roles like AI ethicists, who ensure AI systems are used responsibly. With AI processing sensitive data on edge devices, there would be increased demand for professionals who can ensure data privacy and regulatory compliance. As AI takes a more central role in telecommunications, there would be a need for professionals who can train and fine-tune AI models based on ongoing data inputs and performance feedback.

■ **New focuses for workers: helping customers, and each other, navigate transition**

With the shift from centralized cloud storage to edge computing, data management tasks would transform. Instead of managing data in large, centralized data centers, IT professionals would need to manage data distributed across numerous edge devices.

As AI becomes more integrated into products and services, the nature of customer relationships could change. For instance, customer success teams might need to focus more on educating customers about AI features or handling AI-related concerns.

How are organizations impacted?

■ **New models**

Companies might need to restructure to accommodate new business models and technologies. For example, they might need to create new departments or roles focused on AI and edge computing, or to integrate these technologies more deeply into existing roles and departments. Companies would need to develop new strategies to capitalize on the opportunities presented by AI and edge computing. This could require a shift in organizational culture toward more innovation, agility, and a focus on data and AI.

■ **New training**

Workers would need new skills to thrive in this transformed industry. This could include technical skills, such as knowledge of AI and edge computing, as well as “soft” skills, such as the ability to work in cross-functional teams or to navigate ethical, and privacy issues related to AI.

■ **New partnerships**

Companies might need to build new partnerships to succeed in this new landscape. For instance, they might partner with AI technology providers, edge computing hardware manufacturers, or specific industries that are heavy users of edge computing. As telecom companies form new partnerships with AI technology providers or industries reliant on edge computing, there would be a need for roles focused on managing these partnerships.

CHALLENGES AND OPPORTUNITIES FOR JAPANESE ORGANIZATIONS

- **Bias:** AI systems trained on biased data or improperly regulated algorithms could lead to unfair or discriminatory outcomes in various applications, such as personalized content delivery or customer service. The digital divide could be exacerbated if AI and edge computing services are not evenly accessible or affordable for all users, leading to further socioeconomic disparities.
- **Privacy:** as more data is processed locally on edge devices, there could be increased risks for data privacy. For example, if an edge device is physically compromised, locally stored data could be exposed. Moreover, as AI systems become more integrated into everyday life, they could collect and process sensitive personal data, raising concerns about how this data is used and protected. It might be challenging to ensure that users fully understand and consent to how their data is being used, especially when complex AI algorithms are involved. This could lead to violations of user consent and ownership rights.
- **Displacement:** The automation of certain tasks by AI could lead to job displacement, particularly for roles focused on routine network maintenance, data processing, or customer service. While new jobs could also be created, these might require different skills, potentially leaving some workers behind. The shift to AI and edge computing could disrupt traditional business models in the telecommunications industry. Companies unable to adapt quickly enough might be displaced by more agile competitors or new entrants. If AI and edge computing lead to more personalized and targeted services, this could displace more generic services. While this could improve user experiences, it might also reduce user choice or lead to more fragmented markets.

Conclusion: A Beginning, Not An End

This report represents the culmination of a multimonth collaboration between NTT DATA INSTITUTE OF MANAGEMENT CONSULTING, Inc. and IFTF. While its forecasts, scenarios, and implications are the result of substantial and rigorous research, and its insights can be of immediate benefit, foresight is a continuous process.

Embrace the methodologies and tools presented in this report to conduct your own insight sessions or foresight studies, and systematically explore and prepare for future possibilities. Here are some ways to do this:

Map your current strategies against the forecasts and scenarios: evaluate your current assumptions and compare them to the forecasts and scenarios you see here. Question how you need to adjust strategies to thrive in these futures.

Create alternative scenarios: as we look farther into the future, the range of possibilities expands exponentially. This report's Horizon Three scenarios represent a small subset of plausible futures. Use foresight methodologies outlined here to create alternative Horizon Three scenarios that act as useful contrasts to those contained in the report.

Deep-dive into other industries or domains: our Horizon Three scenarios focus on a specific set of industries. But the information in the Horizon One and Horizon Two sections can be used as a basis for forecasting scenarios for any industry or domain.

Whatever your next steps are, we hope that you take action based on what is outlined in this report and bring foresight into the way you understand the present and view your organization and the world.

Glossary

Amara's Law

- Roy Amara was a futurist and past president of the Institute for the Future (IFFF).
- Amara's Law states, "We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run."

Amazon Bedrock

- Amazon Bedrock is a fully managed service that makes base models from Amazon and third-party model providers accessible through an API.

Amazon Kendra

- Amazon Kendra is an easy-to-use enterprise search service that is powered by machine learning. It allows developers to add search capabilities to their applications, so their end users can discover information stored within the vast amount of content spread across their company.

Bayesian Network

- A Bayesian network is a mathematical model used to represent causal relationships among random variables through conditional probabilities, structured in a directed acyclic graph.

GOFAI (Good Old-Fashioned Artificial Intelligence)

- GOFAI refers to the traditional approach to artificial intelligence, also known as Symbolic Artificial Intelligence, focusing on symbolic processing and rule-based systems.

Large Language Model (LLM)

- Large Language Models are advanced AI models designed to understand, generate, and interact with human language. They are trained on vast amounts of text data and can perform various language-related tasks.

Morrison's Two Curves Model

- Ian Morrison is an author, futurist, and former president of the Institute for the Future (IFFF).
- The Two Curves model illustrates the transition from an old curve (representing current trends and practices) to a new curve (representing future trends and innovations).