

Uncertainty and AI

~Toward a New Era of Evolution and Adaptation~

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Corporate DX Promotion Committee

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I . Perspectives for consideration of recommendations and targets

Perspectives for consideration of recommendations

- The relationship between technology and consumers may change dramatically as we will be able to talk to AI using everyday words.

- The engine of economic growth, including sustained wage growth and a return to a world with interest rates, is in motion, but it is hampered by the normalization of a serious labor and human resource shortage, and the use of AI is not waiting.

- Lagging behind in the use of generative AI, and past failure to increase corporate value based on corporate strategies and tactics that leverage technology, which in the past have been slow to adopt the Internet and cloud computing and promote DX.

AI technology is still in its infancy, and the entrance to a major trend where software is changing to AI AI is a means to an end, and how to utilize and take advantage of this opportunity for change.

Co-creating with evolving AI to expand companies, organizations, and individuals to maximize corporate value

Targets

- The goal is to increase the ability of companies, governments, and individuals to respond to an uncertain environment with AI.

2. “bird's-eye view” of rapidly evolving AI

- To get a bird's eye view of AI, divide it into spatial and temporal overheads

■ What is AI?

- AI is a new type of intelligent processing that has become possible in our time.
- Over the past 60 years, software has continued to become more intelligent.

■ Taking a Structural View of AI

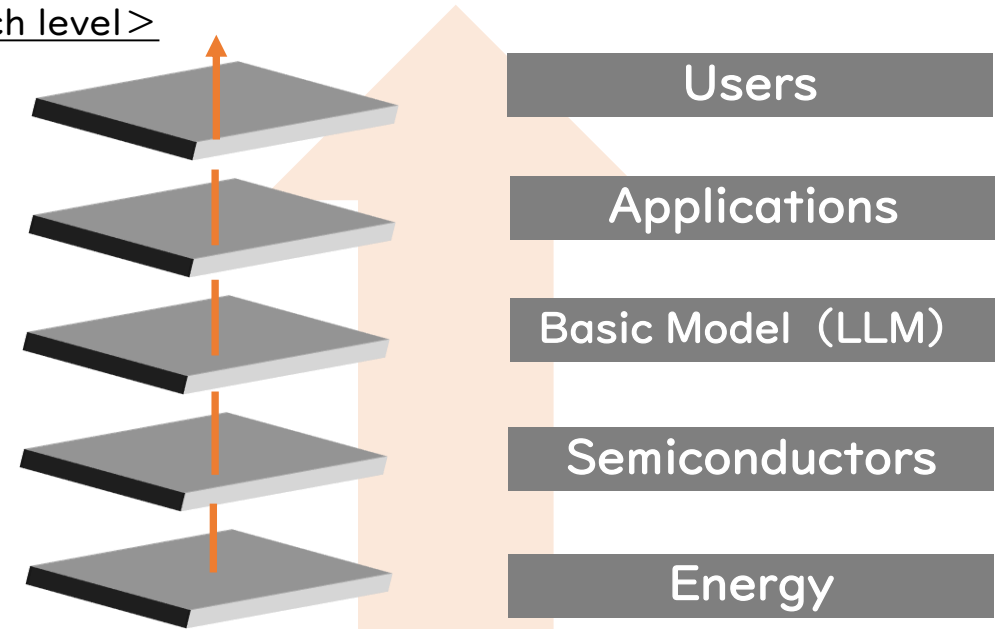
【Horizontal Axis – Time】 Temporal Overview
AI as the leading edge of the information
revolution AI in 2024

CUI → GUI → Browser → Phone → Generated AI



【Vertical axis – space】 Spatial bird's eye view
Energy/Semiconductors/Basic Model/Applications

<each level>



3. what is happening underfoot: what is the timing?

- At each layer, there is a surge in power consumption, competition at the national level in security, and the evolution of a wide variety of infrastructure models.

【Domestic Data Center Power Consumption Forecast】

What is happening at each layer

● Power: Rapid increase in power consumption

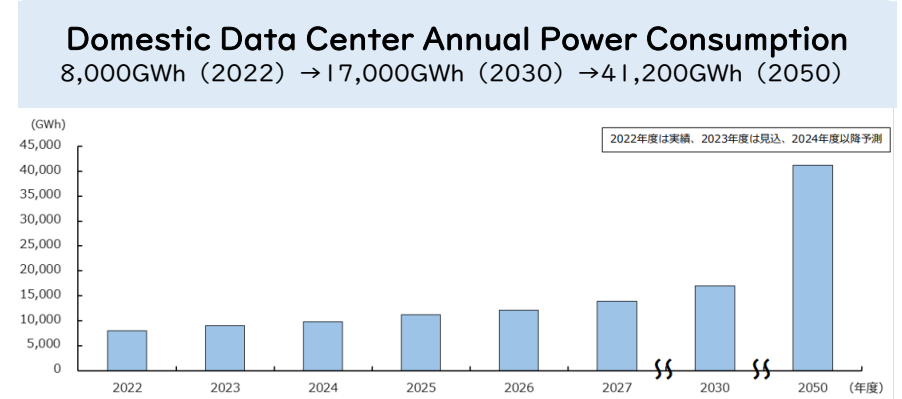
Power consumption of data centers in FY2030 is expected to more than double compared to FY2022, and power consumption in FY2050 is expected to increase more than five times compared to FY2022.

● Semiconductors: competition at the national level, including security

Attracted TSMC to compete for NVIDIA's GPUs and to secure a manufacturing base, and supported Rapidus to secure next-generation semiconductors and a mass production manufacturing base.

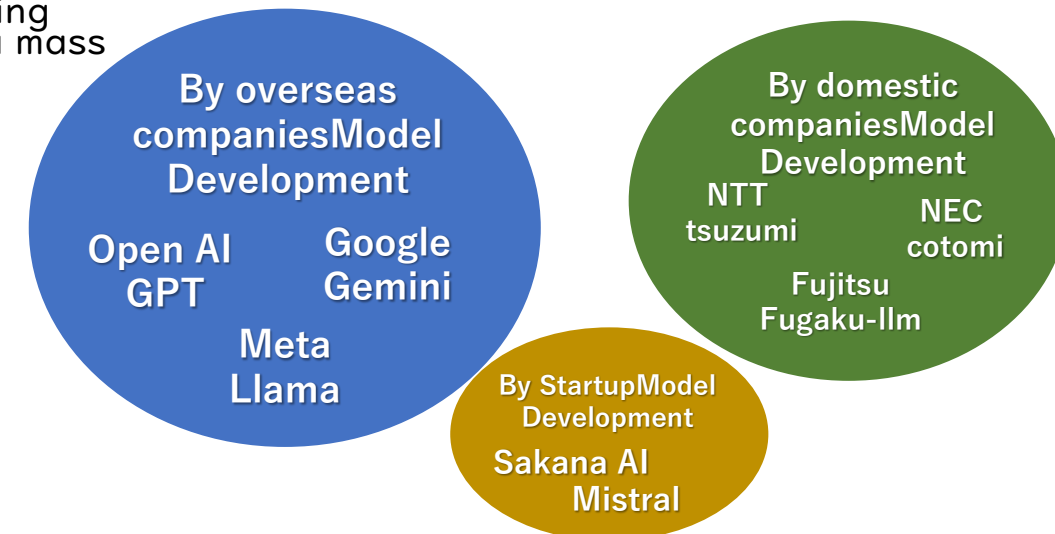
● Base model: Evolution of a wide variety of giant and specialized models

Google, Open AI, and others have invested huge amounts of money to build huge infrastructure models, and in Japan, language- and domain-specific infrastructure models have emerged, while LLM black box is an issue.



Source: 7th Expert Group Meeting on Digital Infrastructure (DC, etc.) Development

【Classification of each base model】



3. what is happening underfoot: what is the timing?

- While there are delays in our country's utilization, the regulatory search and various predictions are becoming apparent amidst rapid technological progress.

Global trends in utilization and regulation

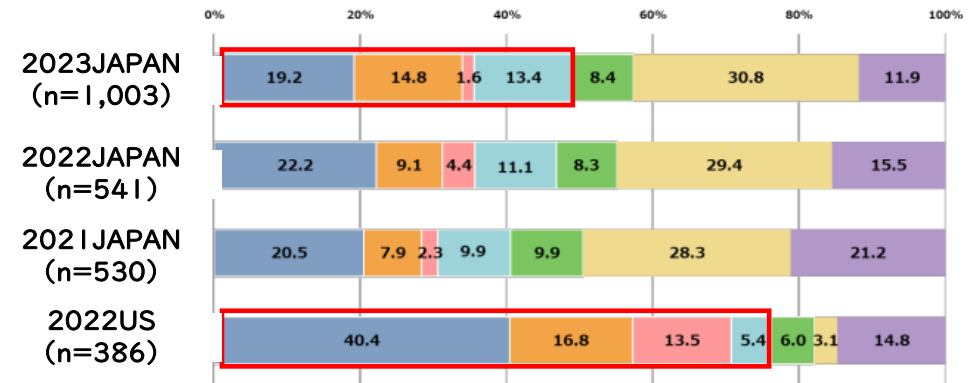
- **Utilization: Lagging in Generative AI**
Compared to the U.S., the use of generative AI is lagging behind, and in many cases, the use of AI is limited to improving document creation efficiency.
- **Regulations: Regulatory trends are being sought in different countries and regions.**

The EU regulates through hard law, focusing on AI law, while the U.S. regulates through hard law based on soft law. Japan is considering discussion around soft law

- **Other: Various projections**

Reality to AGI (Artificial General Intelligence) and ASI (Artificial Super Intelligence), questions about human beings themselves, such as ethics and values.

【Status of AI adoption (change over time and comparison with the U.S.)】



<Source> IPA DX Trends 2024

4. what may happen in the future

- Predicting the future based on the technological progress of AI today.

A few predictions for the future based on the current technological progress of AI, for example, the following could happen.

● Accelerated investment and increased competition on a global scale to secure computing capacity

- Data center investment is expected to grow, and tech companies are expected to focus on securing power, including nuclear power.
- The U.S. restricts exports to China of memory and semiconductor manufacturing equipment for AI, and China regulates exports of mineral resources such as gallium.
- In the future, semiconductor-related export restrictions may be further tightened under the Trump administration.

● Rapidly increasing software intelligence and decreasing software development costs

- AI performance is expected to improve two to three times annually over the next decade, an evolution that exceeds Moore's Law.
- As LLMs continue to grow in scale, the cost of inference for smaller models could drop significantly each year, leading to reduced software development costs and encouraging companies to adopt AI.

● Connecting AI and Hardware: The Rise of a New Industry of Intelligent Machines

- The connection between actuators and AI could lead to the widespread use of intelligent machines such as self-driving cars and humanoid robots in the real world.

● Accelerated rate of invention in multiple areas of science: drug discovery / new materials development / molecular structure analysis

- The scientific fields that researchers have spent years researching and inventing will see rapid development. Examples include drug discovery, new materials development, and molecular structure analysis.

5. how to leverage Japan's strengths

- Japan has strengths in AI areas such as hospitality and harmony, AIoT, semiconductor global value chain, and labor shortage, and will form a unique positioning by leveraging its advantages over other countries.
- **AI applications that take advantage of the uniquely Japanese way of perceiving AI: Omotenashi/Nagomi**
 - Japanese people tend to have a positive image of coexistence with AI and robots due to the influence of Doraemon and Astro Boy.
 - The Japanese are expected to take a creative approach to incorporate their own intrinsic values into AI applications by utilizing their craftsmanship and spirit of “omotenashi/warmth” .
- **AIoT: Japan's ability to build devices as AI of Things**
 - Japan's AIoT strength lies in the fusion of manufacturing technology and infrastructure. Smart factories and smart home appliances are becoming popular, taking advantage of high-quality IoT devices and communication technology. It is also expected to contribute to disaster countermeasures and aging society, and the market is expected to expand both domestically and internationally.
- **Leveraging Japan's Positioning in the Semiconductor Global Value Chain**
 - Japan has international strengths in semiconductor materials and manufacturing equipment. In addition to miniaturization, advanced packaging that integrates multiple chips is becoming increasingly important, and the back-end process of wafers is also becoming more important. Japan is strengthening its partnerships with contract manufacturing companies to build its own competitive advantage.
- **Rising demand for AI triggered by labor shortages**

The proposal to reduce the number of people by investing in IT has been taboo, but the labor shortage and aging society have led to a growing awareness that Japan will not be able to survive without replacing people. On the other hand, globally, the population is still growing in many countries, including the United States. Thus, it is possible to replace manpower with digital and AI, and take advantage of the advantage that there is little backlash against it.

6. Recommendation: To improve the ability of AI to respond to uncertain environments

- The company's recommendations are based on thorough AI utilization and aim to enhance the company's competitiveness.

Companies

item	Key points
<p>① Reform the human resource system and training system to a form that evaluates and promotes the use of software and AI.</p>	<ul style="list-style-type: none"> A system should be established to ensure that personnel who can utilize AI and digital technology are evaluated fairly. In the conventional personnel system, people who have been involved in a job for a long time tended to be highly evaluated, but new evaluation criteria are needed to cope with the digital age. Specifically, a flexible personnel system should be established, including job-based personnel management, point-based evaluation, selection of personnel, and review of appointment criteria. In addition, a human resource development model should be established, including digital utilization and education. Keizai Doyukai has made recommendations on the state of the employment system and human resource development to promote reskilling in previous proposals <p>✓Recommendations on the true revitalization of the external labor market through a breakthrough in the introduction of a “Shin-Japan-style employment system” (April 2023)</p> <p>✓Signing a strategic partnership between the Japan Reskilling Consortium and Keizai Doyukai (October 2023)</p>
<p>② Establish CAIO to quickly break away from external dependency model for software and AI design</p>	<ul style="list-style-type: none"> A CAIO should be established to assume central responsibility for the rapidly developing AI initiatives. (Full-time or concurrently as CDO, depending on the organization) Current AI project teams are often a hodgepodge of various business units and technical teams, and need a dedicated person to be responsible for AI because of its rapid technology speed, broad business scope in maximizing AI value, and high importance of risk management. The role is expected to <ul style="list-style-type: none"> ✓Present and collaborate with top management on the overall AI concept and discuss AI strategies, investments, etc. ✓Work with the technology department to coordinate the design, development, testing, and deployment of AI technology ✓Develop and deploy AI policies with legal, risk and compliance in mind ✓Work with business operations and finance departments to measure the business and financial impact of AI technology

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Companies

item	Key points
<p>③Strengthen competitiveness by utilizing AI not only in “non-core operations” but also in “core operations</p>	<ul style="list-style-type: none"> • Top management should use AI strategically to strengthen core competencies, not for the absence of purpose or to improve operational efficiency. • The greatest impact of AI implementation will be realized when it is used in the core of the main business to maximize business value. • Sumitomo Corporation: Investigating the use of AI to assist in decision making based on historical data for investments and loans as an advanced decision-making solution.
<p>④Need to continue to set and update governance rules for AI utilization</p>	<ul style="list-style-type: none"> • Governance rules for I utilization should continue to be set and updated with an eye to maximizing stakeholder benefits in the face of unforeseeable risks. • The technological innovation and diffusion of AI is very rapid, and in this context, it is nearly impossible to predict the social impact of AI, which is technically difficult to foresee or explain. It is also expected to create ethical and other challenges. As such, the risk situation and environment surrounding AI systems may constantly change, and governance that “firmly adheres to the rules once set” will not be sufficient to deal with the situation. • The key point is the “double loop. The double loop refers to (1) the feedback cycle at the “field level,” where risks and impacts posed by AI systems are assessed and countermeasures are implemented, and (2) the feedback cycle at the “management level,” where rules, organizations, and systems to implement such assessments and countermeasures are assessed and improved. In other words, agile governance is important. • Efforts in cyber security are also important. Keizai Doyukai (Japan Association of Corporate Executives) has made recommendations that include raising management awareness in cyber security. ✓Recommendations: The Era of “Cyber Security Everywhere” - Eight Actions for Management and Six Recommendations for the Government (October 2024)

6. Recommendation: To improve the ability of AI to respond to uncertain environments

- Government proposals are aimed at (1) increasing national strength and (2) creating a business infrastructure and environment for companies.

Government

item	Key points
①Strengthening cross-sectional collaboration in the three fields of AI, semiconductors, and energy	<ul style="list-style-type: none">• The government is moving quickly with regard to the current AI Strategy Council and semiconductor strategy. In the future, it is important for security reasons to further strengthen cross-sectoral cooperation in the three areas of AI, semiconductors, and energy, including the formation of strategic global value chains.• What is important in this process is to consider the essence of what AI should be used for in the first place. To this end, it is necessary to take a bird's-eye view of the five layers of AI and incorporate them into a strategy.• The government should strengthen cross-sectoral collaboration in the three areas of AI, semiconductors, and energy, and should better explain to the public, for example, its huge investment in semiconductors, the purpose of the semiconductors it has invested in, and the intended use of the semiconductors, including use cases. For this purpose, the Cabinet Office, which is the command post function for AI, should be asked to take a stronger leadership role.
②Promote industrial investment in AIoT areas that leverage Japan's strengths	<ul style="list-style-type: none">• We believe that the potential for AI in our country is high in all aspects.• Therefore, the government should promote industrial investment in AIoT areas where Japan can better leverage its strengths. For example, investment should be accelerated with an emphasis on the AI Embedded Machine area, represented by robots and humanoids.• Although the technological emphasis has been on robots as hardware, control utilizing software has become necessary in line with this emphasis. In this context, Japan's industry in software-based control has not yet developed, and this area should be strengthened.

6. Recommendation: To improve the ability of AI to respond to uncertain environments

- Government proposals are aimed at (1) increasing national strength and (2) creating a business infrastructure and environment for companies.

item	Key points
<p>③Update to the Data Use and Personal Information Protection Act to promote the use of AI</p>	<ul style="list-style-type: none"> • The Data Use and Privacy Act should be updated for the use of AI. • As the resolution of social issues through data utilization becomes an important issue, systems for data utilization are rapidly being developed in the medical, financial, industrial, and other fields in a manner consistent with personal information protection legislation in the EU and other countries. • In Europe, for example, the European Data Act treats non-personal data as a kind of public good, ensuring fairness in the distribution of data values and promoting access to and use of data. • In the medical field, we are building an information infrastructure based on the European Health data Space (EHDS), the European Commission's data space concept, and constructing a system that can use data on 440 million people across the EU, depending on the purpose of use.
<p>④Connect the DFFT flow to the data network structure launch</p>	<ul style="list-style-type: none"> • The DFFT flow should be connected to the launch of a data network structure. • DFFT (Data Free Flow with Trust) has been proposed by Japan and is being embodied in the DFFT community, IAP, with OECD approval. • At the May 2024 OECD Ministerial Council DFFT session, participating ASEAN ministers expressed their expectations for Japan's support in the “transborder transfer of data. • For example, the establishment of a data network concept centered on Asia for medical information, etc., should be considered to connect data and industry, for example, in collaboration with the healthcare industry, such as drug discovery.
<p>⑤Further enhancements to digital and AI literacy</p>	<ul style="list-style-type: none"> • Further reinforcement to digital and AI literacy should be made. The Ministry of Education, Culture, Sports, Science and Technology (MEXT), Ministry of Economy, Trade and Industry (METI), and others are working together to train 2.3 million digital human resources, as set forth in the Digital Rural City concept. • On the other hand, the establishment and progress of 2.3 million KPIs is important, especially how they will be utilized in the future must be examined and revised. Various best practices have emerged in industry and education over the past few years. The government should further strengthen its activities from dots to lines and from lines to planes by sharing these best practices and further promoting private-sector human resources.

6. Recommendation: To improve the ability of AI to respond to uncertain environments

- Individual recommendations aim to improve mindset for the AI era

Individual

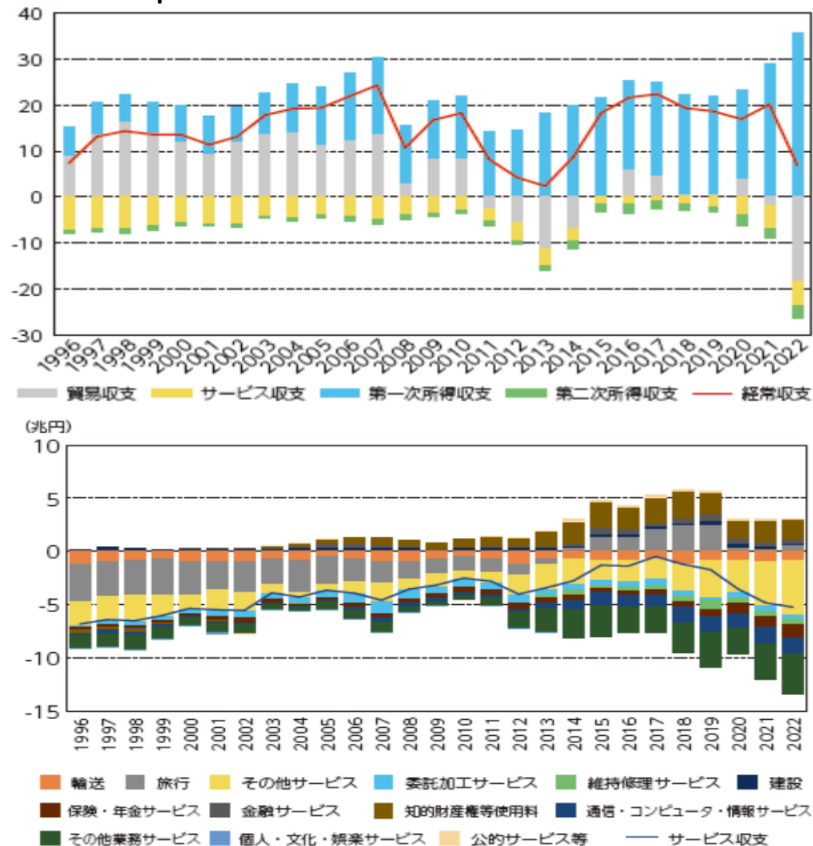
item	Key points and future considerations
①Increased importance of curiosity and critical thinking	<ul style="list-style-type: none">• We should develop curiosity and critical thinking to master the new technology, AI.• In the coming AI era, “the ability to set problems” is more important than “the ability to solve problems. For this purpose, it is important to keep learning (reskilling, recurrent). Society may be polarized into “those who use AI” and “those who are driven by AI.” If we do not continue to learn, it may lead from the digital divide to the AI divide.
②What to entrust AI with and what not to entrust it with	<ul style="list-style-type: none">• Thinking of AI as a tool, individuals may expand their abilities and talents by delegating to AI those areas in which they are weak. Therefore, we should consider the line between what to entrust and what not to entrust to AI.• AI literacy education is needed there. In the case of children in compulsory education, the role of parents and supporters, as well as ethics, will be important.

Reference data

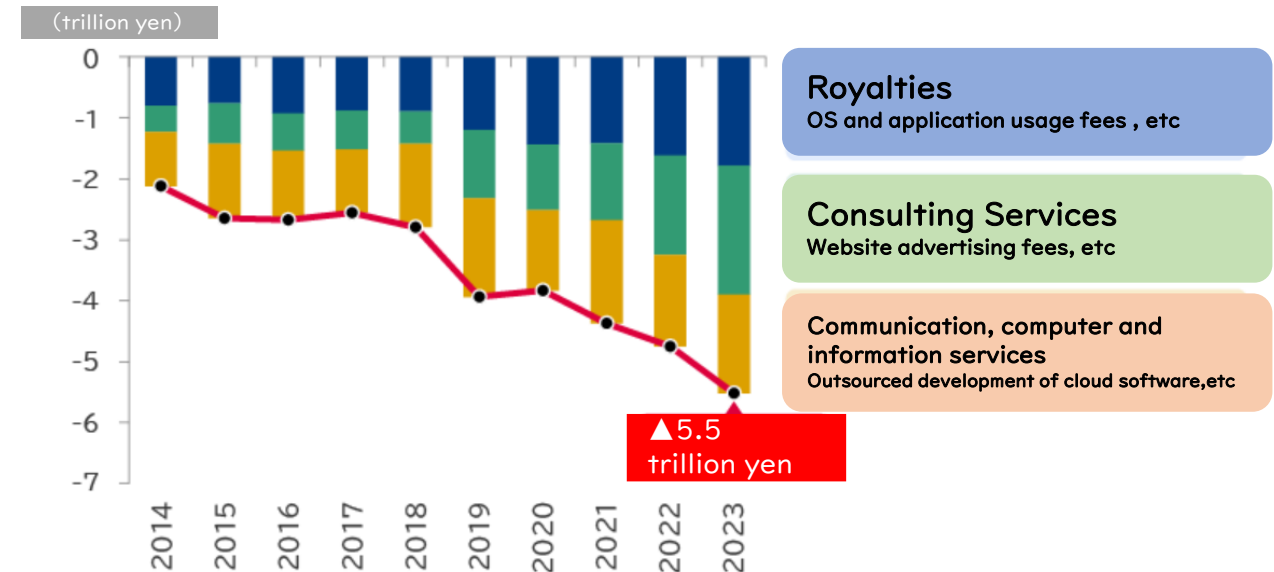
(Reference) Digital deficit

- Japan's current account balance has shifted to a primary income balance since the late 2000s
- Japan's digital balance more than doubled in 10 years to -5.5 trillion yen in 2023 and -2.1 trillion yen in 2014
- If we do not improve corporate value and create industries, the digital deficit could become a major factor in our country's current account balance.

(trillion yen) 【Japan's Current Account Balance】

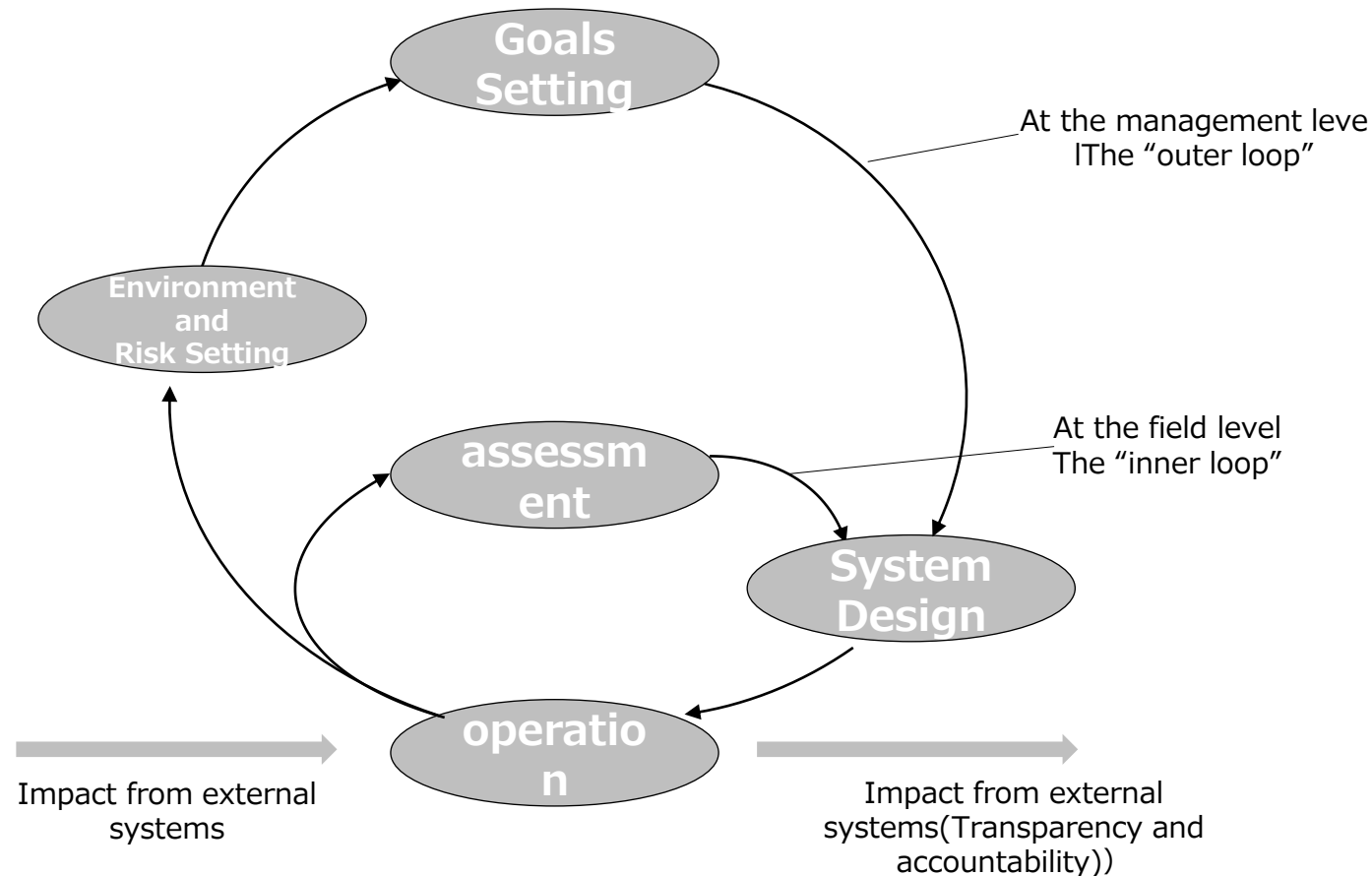


【Japan's digital-related balance of payments】



(Reference) Double Loop in Governance

- The dual loop is (1) a feedback cycle at the “field level” to assess the risks and impacts posed by AI systems and take countermeasures, and (2) a feedback cycle at the “management level” to assess and improve the rules, organization, and systems to implement such assessments and countermeasures.



(Reference) Policy Trends – Japan

Promote Innovation

Goals:

- *Improve citizens' lives*
- *Enhance international competitiveness (economic & national security)*
- *Respond to social & demographic challenges, and respond to disasters*

Measures:

- *Promote R&D and infrastructure expansion & sharing*
- *Upgrade aging infrastructure*
- *Human resources development*
- *Expand public-private partnerships*

Policy:

- *Whitepapers of 2023 & 2024*
- *Bill on Promotion of AI R&D (introduced)*
- *7th STI Basic Plan (in progress)*
- *Interim Report (Cabinet AI Strategy Council)*

Mitigate Negative Risk

Goals:

- *Utilization of AI while protecting rights*
- *Acceptance of some risks & experimentation (Responsible AI)*
- *Enhance public trust in AI*

Measures:

- *Collect information on use cases*
- *Human resources development*

Policy:

- *METI – Voluntary guidelines for businesses*
- *Transformation of more than 10k analog laws*
- *AI Safety Institute – knowledge sharing*

International Rule-making

Goals:

- *Leadership in international cooperation*
- *Contributing to development of international standards*
- *Strategic cooperation (supply chains & national security)*
- *Strengthen coordination with allies (including ASEAN & Global South) on R&D*
- *Ensuring safety & security (cybersecurity, disinformation, IP)*

Policy:

- *OECD AI Principles*
- *G7 Hiroshima AI Framework (Friends of Hiroshima)*
- *UNESCO Recommendation on AI*
- *Council of Europe Treaty on AI*
- *UN CCW negotiations on AI in weapons*

(Reference) Policy Trends – Japan

Whitepapers 2023 & 2024 from LDP AI Project Team

Bill on Promotion of AI R&D (introduced to Diet in Feb 2025, expected to pass by July 2025)

- *Set up Cabinet AI Headquarters (Prime Minister and all ministers)*
- *An AI Strategy Plan will be published later*
- *Cooperation with government on information about major incidents, but without legal sanctions. No prohibitions.*
- *If a major incident occurs, government can investigate root causes, provide guidance, and disclose info to public*
- *DX for public services; Draft guideline open for public consultation for procurement of AI by public sector*

7th Science, Technology and Innovation Basic Plan (in progress – AI will be one part of this strategy)

- *Investment & action to increase human resource capability and research*
- *Investment into energy, datacenters, datasets*

METI_ Voluntary Guidelines for Businesses (risk-based approach AI governance guidance)

Existing regulations

- *Rely on existing sector-specific laws*
- *Transform more than 10k analog laws to allow for digital tools & services*

AI Safety Institute

- *Conduct surveys on AI safety, examine evaluation methods, create standards*
- *Consolidate latest information on AI safety by industry & academia, and promote collaboration*
- *Work with international AI safety institutes for research sharing and consensus building*

(Reference) Comparison of Trends in Other Countries

	Risk categories	Prohibitions	Key requirements	Assessments (Risk, Bias, Human Rights, Security)	Transparency & Explainability	Reporting	Penalties
EU	Unacceptable, High, Limited, Minimal	Harmful manipulation, deception & exploitation of vulnerabilities; Social scoring; Real-time biometric mass surveillance (exceptions apply); Predictive policing; Emotion recognition (in workplace & education); Biometric categorization	Risk assessment, human oversight, transparency, data governance	Risk identification, mitigation & ongoing risk monitoring systems. Ex-ante fundamental rights impact assessment; Conformity assessment	Require traceability & explainability	Technical documentation; Register details in EU AI database	Up to €35 million or 7% of global annual turnover
China* (multiple AI regulations)	Focuses on "public opinion attributes" and "social mobilization capabilities" rather than explicit risk levels	N/A, but strong emphasis on content management, algorithmic governance, and national security – which generally prohibits generation of fake news, and use of AI to generate any discriminatory content or decision based on identity elements	Watermarking / labeling of generated content; Security assessments, data management audits	Risk identification, mitigation & ongoing risk monitoring. Bias assessment. Privacy impact assessments	Disclose information about models, algorithms, and data collection. AI systems should have explainable decision-making processes	Self-assessment report, algorithm security monitoring policy. Establish complaint & reporting mechanisms to handle public feedback	Personal liability for executives; up to RMB 50 million or 5% of the previous year's turnover

*Interim Measures for Administration of Generative AI Services (Generative AI Measures), the Administrative Provisions on Deep Synthesis of Internet-based Information Services (Deep Synthesis Provisions), the Trial Measures for Ethical Review of Science and Technology Activities (Ethical Review Measures) and the Administrative Provisions on Algorithm Recommendation for Internet Information Services (Algorithm Recommendation Provisions).

(Reference) Comparison of Trends in Other Countries

	Risk categories	Prohibition	Key requirements	Assessments	Transparency & Explainability	Reporting	Penalties
US – Colorado	High-risk systems	N/A	Prevent algorithmic discrimination, risk management	Annual impact assessment, including risk analysis and mitigation steps	Publish summary of bias testing ; summary of training data types; disclose AI use	Disclose AI' s role & degree of influence in the decision	Up to \$20,000 per violation
US – California*	No risk categories	Non-consensual deepfake pornography; “Materially deceptive” content in elections	Training data transparency, AI detection tools, content watermarking	Impact assessments	Info on training data; offer a free, publicly accessible AI detection tool		Penalties differ for each legislation
US – Utah	Only for Generative AI	Deceptive business practice using GenAI	Companies cannot “blame” their GenAI for a statement made or action taken	-	Disclose interaction w/ GenAI	Regulated occupation professionals must disclose their use of GenAI	Up to \$2,500 for each violation
US – Texas (Draft)	High-risk systems	Harmful manipulation; Social scoring; Emotion recognition; Biometric categorization	Require “reasonable care” to prevent algorithmic discrimination	Risk analysis and mitigation steps	Purpose & limitation of AI; known risks; summary of training data types	Only if AI system has caused or is likely to result in algorithmic discrimination	\$50,000 to \$200,000 per violation

*~20 legislation in place: California AI Transparency Act, California Consumer Privacy Act (CCPA), and several other [regulations](#)

(Reference) Comparison of Trends in Other Countries

	Risk categories	Prohibitions	Key requirements	Assessments	Transparency & Explainability	Reporting	Penalties
Canada (public sector)	High-risk systems	N/A	Risk management, data quality & governance	Impact assessments	Disclose AI system is in use; decision-making process	Information on efficiency, effectiveness of system	-
Australia (Online Safety Bill in effect). AI regulation in proposal	Proposal to convert Australia AI Ethics Principles into law	Online safety regulates AI generated material, child safety, hate posts	Risk management; age restrictions	Impact assessments; Proposal to include conformity & risk assessment	Disclose AI system is in use; decision-making process	-	Up to \$825,000 but soon to increase significantly
Brazil Bill No. 2338/2023	Excessive, High	Harmful manipulation, deception & exploitation of vulnerabilities; Predictive policing; Children's safety	Risk assessment, human oversight	Algorithmic impact assessments; Risk analysis and mitigation steps	Info on system reliability, security; decision-making process	Serious incident reporting; Impact assessments	BRL 50 million per violation; up to 2% of revenue
South Korea	High-impact	protection of "rights and dignity" while fostering a "trust-based foundation"	Risk management; labeling of generated content	Rights impact assessments; risk assessment	Disclose GenAI is in use	Monitor incidents	up to \$20,000 for violations
Chile (Decree No. 20 defines future AI regulation scope)	Unacceptable, High, Acceptable	<i>Proposed:</i> Harmful manipulation, deception & exploitation of vulnerabilities; Social scoring; Real-time biometric mass surveillance; biometric categorization	Risk management; data governance; transparency; human oversight; cybersecurity.	Fundamental rights impact, safety assessments	Require traceability& explainability	Technical documentation; system of records	Proposed: 5,000 – 20,000 TUM