

STRATEGIES FOR INDUSTRIAL DX

: Soft-Infra Report

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 **DBJ** Development Bank of Japan

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Executive Summary 1/2

- A glance at the progress of digital transformation (DX) in Japanese companies from the perspective of the provider side, which provides solutions, and the user side, where those solutions are applied, shows that Japan is lagging behind its global counterparts. Each side has issues to address if further progress is to be achieved.
- Taking into account the recent acceleration of DX due to the introduction of 5G and the emergence of Covid-19, we now must consider how to realize DX more effectively. In Japan today, DX is limited to the enterprise level (Phases 1 and 2). It is important that it be implemented at the industrial level as well (Phase 3).
- The essence of DX is (1) the synergistic effect of exponential growth made possible by digital technology and the fostering of human resources, and (2) an organizational culture that enables continual hypothetical thinking without fear of failure (Phase 0).
- Among the wide range of elemental technologies supporting DX, this report will touch on the current status of AI and 5G.
- We are currently in the midst of the third AI boom, and technological breakthroughs such as deep learning are expected to trigger significant progress in the practical application of AI. Deep learning technologies including image recognition, voice recognition, natural language processing, and anomaly detection are being put to use in a number of industries, and as AI replaces some business processes, human work will be concentrated in areas such as process supervision, management, and hospitality.
- 5G is a next-generation communication standard featuring high-speed, large-capacity communication, ultra-low latency and high reliability, and multiple simultaneous connections. Based on the current schedule, industrial use is expected to start in FY 2022, and related ministries, agencies, and telecoms have begun preparations for Beyond 5G (6G), which should emerge around 2030.

Executive Summary 2/2

- In promoting DX at the corporate level (Phase 1 to Phase 2), it is necessary to review the approach of solution providers and users in terms of human resource development. Solution providers need to be proactive in proposing solutions adapted to the business of the outsourcer, rather than simply maintaining and repairing existing systems. Solution users must gain a deeper understanding of digital technology at all levels of the organization and reassess their own business in light of what they learn.
- DX professionals are well versed in digital technology and data utilization, and are capable of implementing DX initiatives. To promote DX in future, adequate numbers of talented DX professionals will be essential. In-house training and outside hiring will grow in importance.
- By seeking optimal solutions for each job and level of employee, firms can create teams capable of implementing digital technology in their core business based on necessary management decisions, ultimately leading to insourced rather than outsourced DX. One idea for encouraging the hiring of outside talent is to create a pool of DX professionals. DX professionals would gain job satisfaction from being involved in the DX businesses of multiple companies on a cross-sectional basis, but a compensation system must be designed that will encourage users to build their knowledge of DX.
- Managers throughout industry have said that expanding business beyond industrial boundaries and strengthening inter-firm alliances at the managerial level are necessary to achieving DX for industry as a whole (Phase 3), and an effective method would be to build a Soft-Infra platform through organic strategic partnerships, including academics and liaisons, and investment activities.
- In doing so, it is necessary to push forward with an industrial DX that is not seen among global players from the U.S. and China but is unique to Japan. Digital signage initiatives are attracting attention in the media sector, and, Japan being an issue-driven society, so is the “inclusive tech” movement to create technologies and industries that support the socially vulnerable.
- If industrial DX is achieved, it could boost the enterprise value of entire industries, including the multiples of individual companies. There is great potential here for exponential growth.

Global DX Trends

- Japanese firms face **challenges in facilitating DX**, both as providers (mainly software companies) and users of DX solutions.
 - Provider side: **Japan has a large and expanding deficit** with the U.S in its balance of trade in software information services. In fact, it is clear that **Japanese products are not competitive in global terms and that there exists a large influx of U.S. products.**
 - User side: National trends in corporate ICT investment show significant increases in the U.S. and developed countries in Europe, while Japan's investment has remained flat. Investment in Japan is limited to updating existing software, suggesting **a lack of progress in the strategic use of software.**

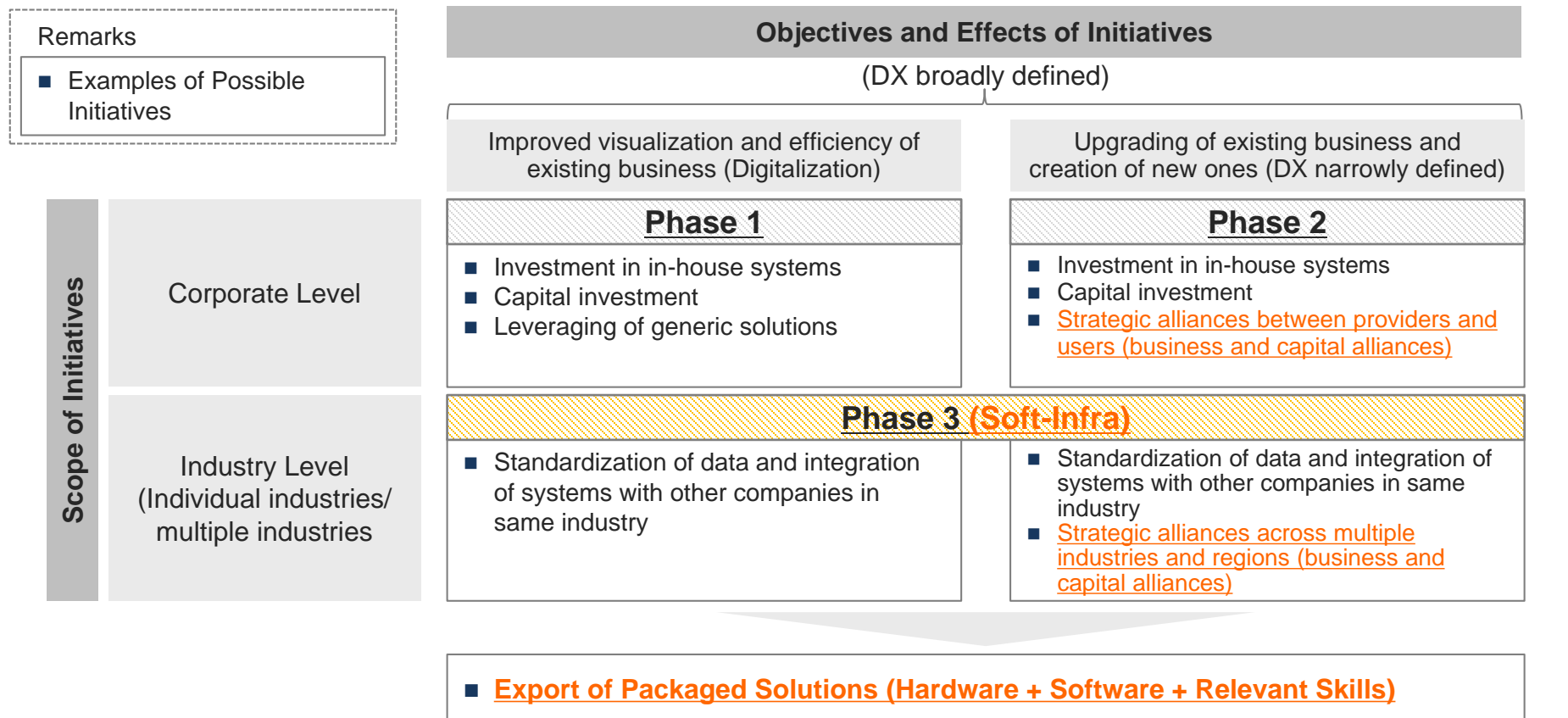


Source: (Left) Bureau of Economic Analysis, U.S. Department of Commerce.
 (Center) OECD Statistics.
 (Right) <https://www.imd.org/centers/world-competitiveness-center/rankings/world-digital-competitiveness/>

Three Stages of DX Developments

- The need for DX is broadly accepted. Companies are gradually introducing the Phase 1 and 2 practices described below.
- There remains a need, however, for the systemization of technical and strategic approaches, such as the proactive use of DX as a commercial opportunity and industry-wide development of new markets. All players are still examining approaches for Phase 3.
- Phase 3 has the potential for new market creation. Organic strategic alliances based on mutual understanding between providers and users can be effective.

Phase 1-2-3



Remarks

- Examples of Possible Initiatives

Defining DX: Increase in “t”

- When enterprise value is expressed using the compound interest formula, the mainstream in conventional corporate valuation has been *increase in “r”*.
- DX, however, can be expressed as increase in “t”.

The Essence of DX

Expression of Enterprise Value through the Compound Interest Formula

$$y(t) = a (1+r)^t$$

Mathematical Definition of Compound Interest

y(t): Amount after t years

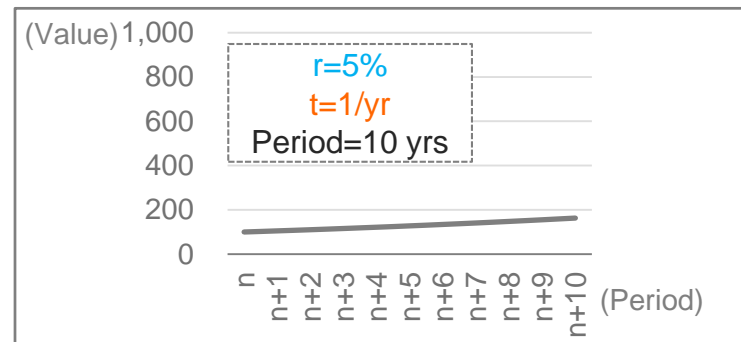
a: Principal

r: Interest rate

t: Operation period

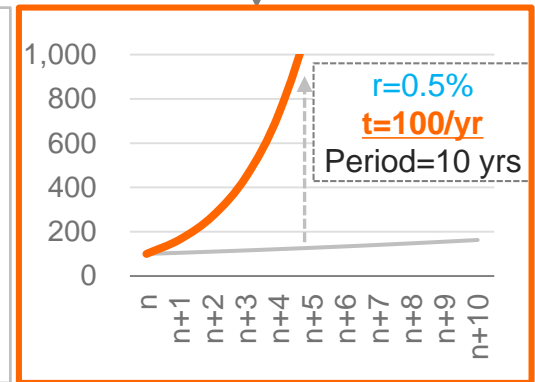
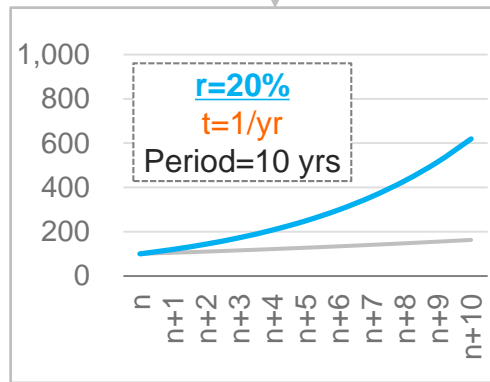
Whereas *increase in “r”* has been the mainstream in conventional corporate activities, DX involves increase in “t” ($\hat{=}$ accelerating the cycle).

Image of Value Enhancement



Traditional: Increase in “r”

DX: Increase in “t”



What Can We Do to Increase “t” ?

- As digitization and AI increase the speed of processes, humans will become the limiting factor*.
- This points to a need for measures to increase human speed.

Humans and Organizations in a Digital Society

Changes in Human Movement due to Digitalization

- Digitalization of processes lending themselves to digitalization
- Enabling of AI for AI-convertible processes

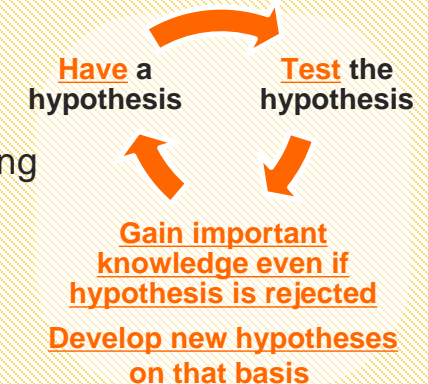
- Moving quickly in recognition of humans as the limiting factor*

*Limiting factor:
Something which regulates (prescribes) the speed of the whole.
In this paper, however, we use the term to imply that the speed of digitalization is controlled, and therefore potentially limited, by humans.

Changes in Organizational Movement due to Digitalization

- Trying quickly rather than considering cautiously
- Experience of rapid failure (lean startups)
- Action with hypothetical thinking

- Organizational culture conducive to good ideas
 - Diversity
 - Tolerance of challenges and failures
 - Culture fostering open-mindedness and collaboration
 - Flat organization



“Efforts to maximize t” lend agility to the organizational culture, leading naturally to qualities seen in Silicon Valley

Industrial DX with “AI”

- As they expand the range of data that can be handled, AI and deep learning are attracting interest as driving forces for DX.
- AI and deep learning technologies can eliminate industrial bottlenecks and play key roles in enhancing enterprise value and reforming the industrial structure.

Industrial DX Using AI

- Conventional Technology Limited the Scope of DX

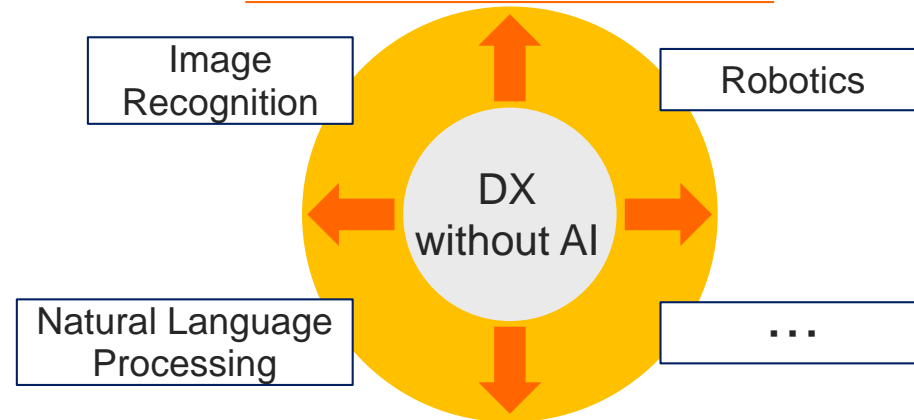


Examples:

- POS → analysis → marketing by humans
- Activity log → recommendations, etc.

- Through AI and Deep Learning (DL) and future technological advances of those, it will be possible to handle data that could not be utilized in the past, expanding the possibilities of DX.

Extension of DX via AI & DL



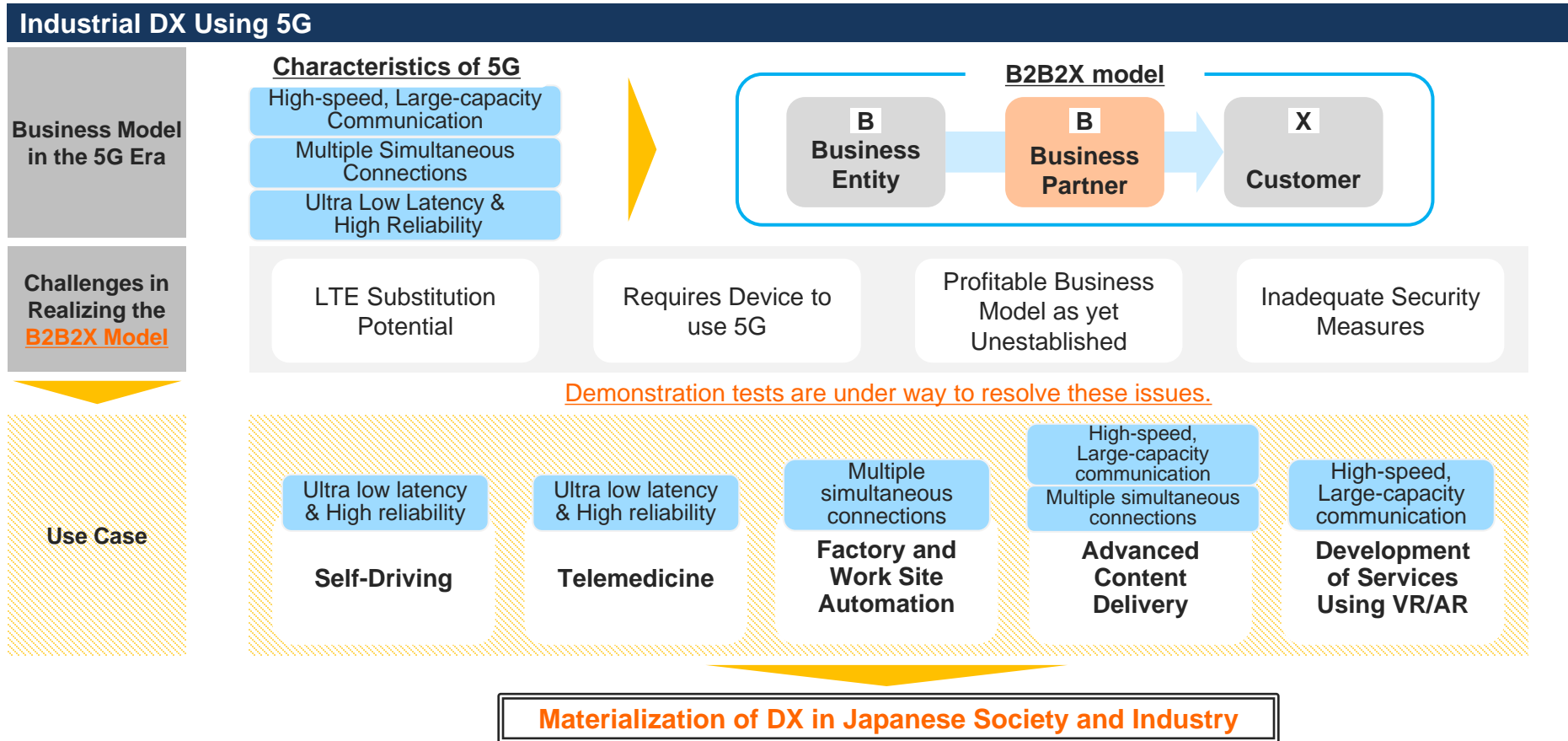
Examples:

- Utilization of real-time situational data, such as faces, text, and images
- Natural language generation
- Machine control automation

Industrial DX with “5G”

- Application of 5G in business is still in its infancy in Japan, where its use has been limited to a small number of use cases.
- 5G is expected to play a key role in realizing industrial DX. Improving efficiency through automation, realizing telemedicine based on ultra-reliability, and creating new business in the B2B2X model* are among the situations where 5G's strengths can be utilized.

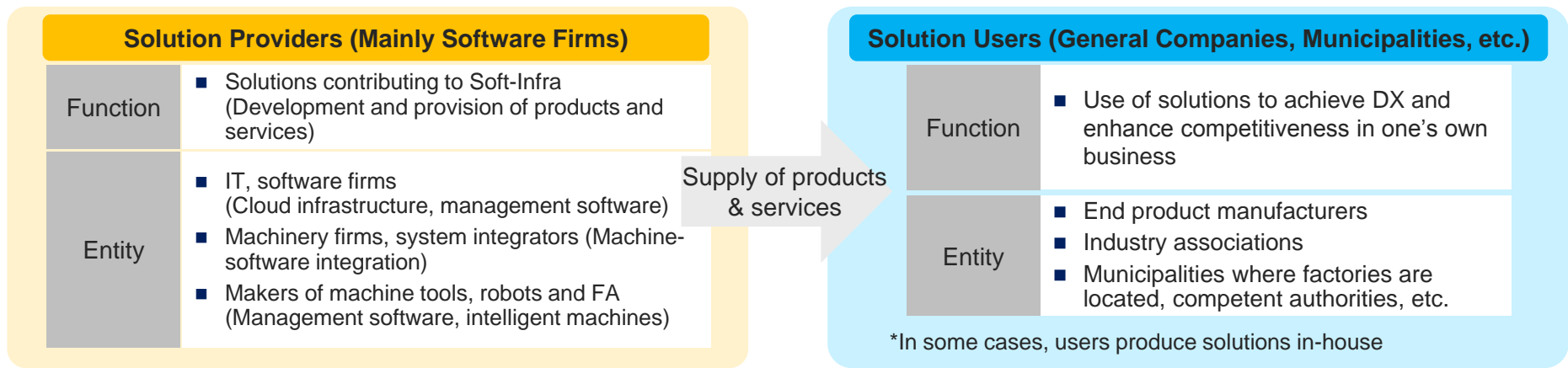
*The B2B2X model: The common name for a service (X) provided by a main business (B) to a customer through a business partner (B), rather than simply a service (X) provided by the business (B) to the customer.



Providers and Users

- Realizing the Soft-Infra concept requires that we approach it from two different perspectives.
 - Solution providers: Players who develop and provide solutions contributing to Soft-Infra
 - Solution users: Players who can realize Soft-Infra in their business through the use of these solutions
- In the future, winning or losing may depend on the stance taken by each player. Our aim, therefore, should be to spur the winners on to further progress while raising the standard of the losing group to that of the winners.

Providers and Users (Example: Smart Factories)



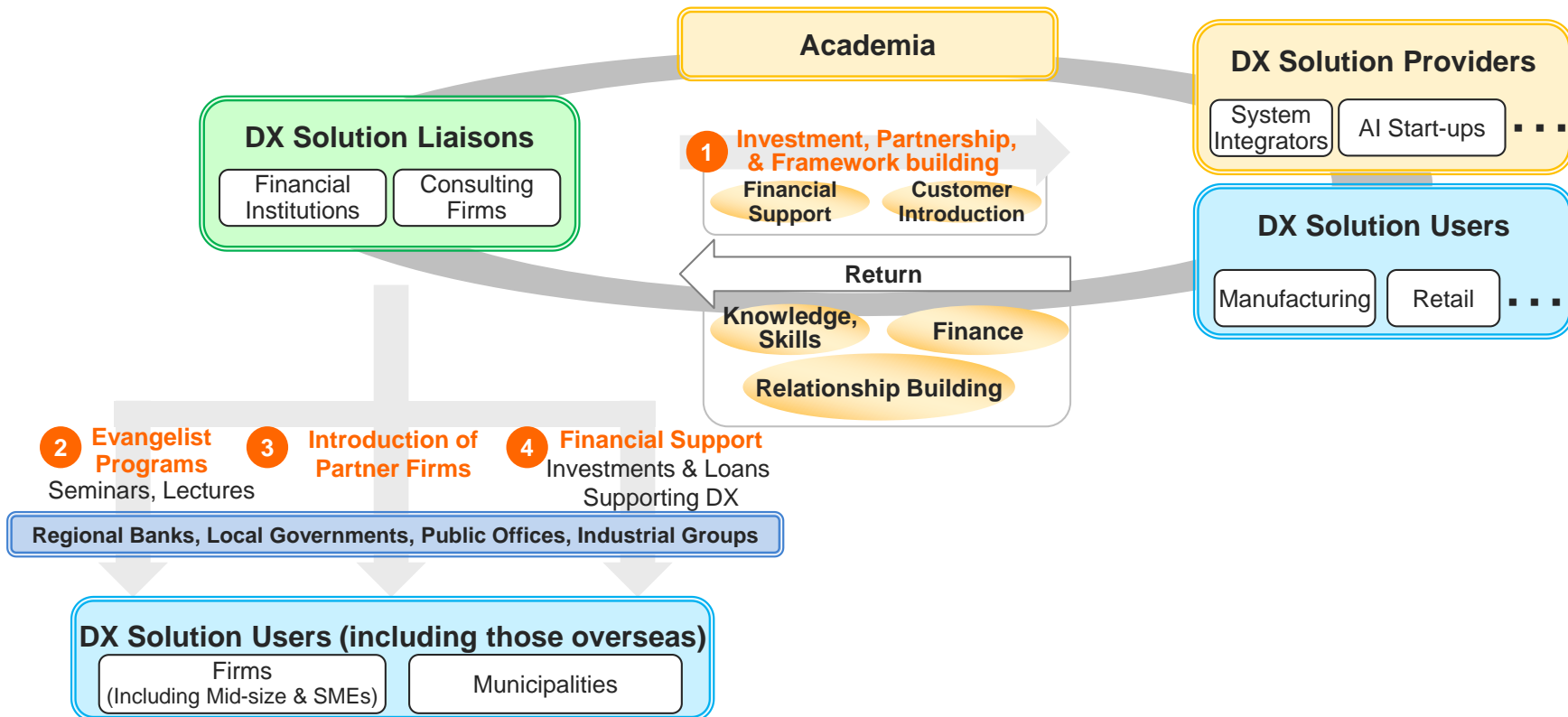
**Development Competition
Anticipating User Issues**

**Competition to Explore Issues
and Realize DX on one's own**

“Strategic Partnerships” for Industrial DX

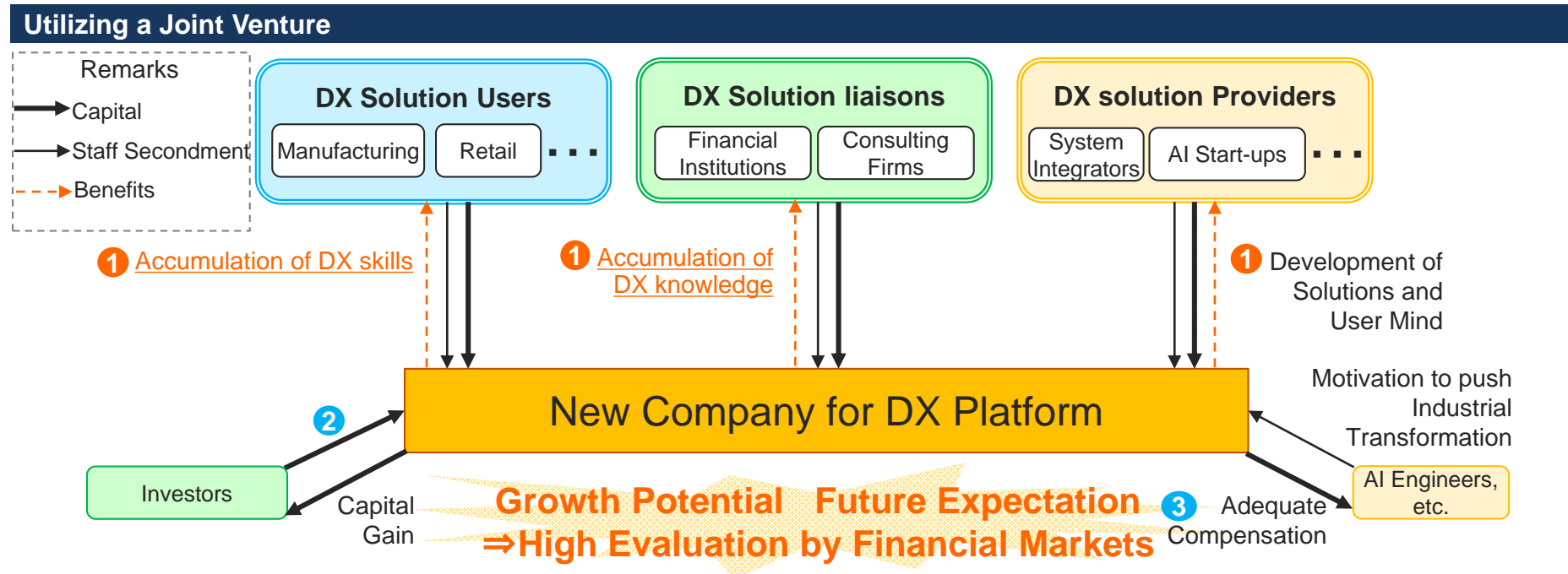
- Looking ahead to **Phase 3** and its aim of industry-wide DX, the partnerships with the greatest potential will include not only providers and users, but also **people in academia, with their bird's-eye view of industry from the technology perspective, and solution liaisons, whose strengths lie in customer contact.**
- As **solutions originating in Japan (packages of hardware, software, and related know-how)**, successful cases of industrial DX can work to strengthen Japan's digital competitiveness by encouraging skill-sharing and expansion into other industries.

Partnerships Leading to Phase 3



Ecosystem of Resources and Investments

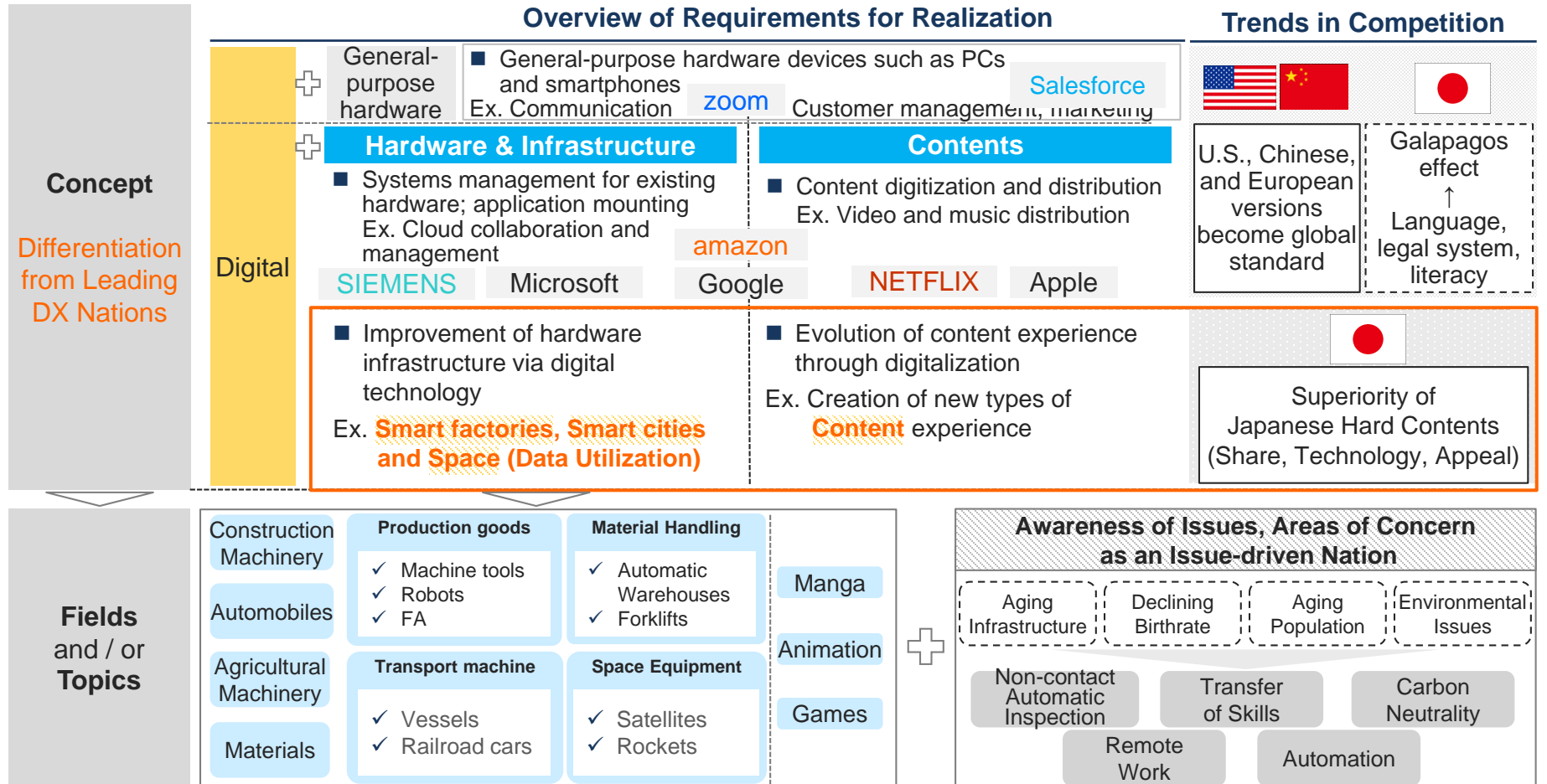
- By creating and operating joint ventures aimed at promoting DX, solution providers, users, and liaisons can collaborate in building ecosystems for Industrial DX.
 - ① As a human resource ecosystem, solution users and liaisons can participate in DX operations through secondment. This not only provides a return on investment but permits on-the-job training for DX projects, helping to develop the human resources needed to drive DX in the companies to which they are seconded.
 - ② Creating a platform for industrial DX requires a certain amount of capital investment. Through agile, concentrated use of invested capital, a company can be agile in commercializing the platform. The evaluation of new company's potential will increase multiples, increasing its ability to raise external capital.
 - ③ With the smooth financing this enables, the company will be better able to attract DX talent from outside sources, functioning as an ecosystem of human resource and capital supply.



Bringing Strengths to be “a Game Changer”

- With major U.S. and Chinese firms dominating fields using digitalization on general-purpose or existing hardware, and in view of the superiority of Japanese hardware and infrastructure and the issue-driven nature of Japanese society, it is important that our approach be a comprehensive one aimed at achieving an industrial DX which is uniquely Japanese.

Japanese DX: Sweet-spot to Success

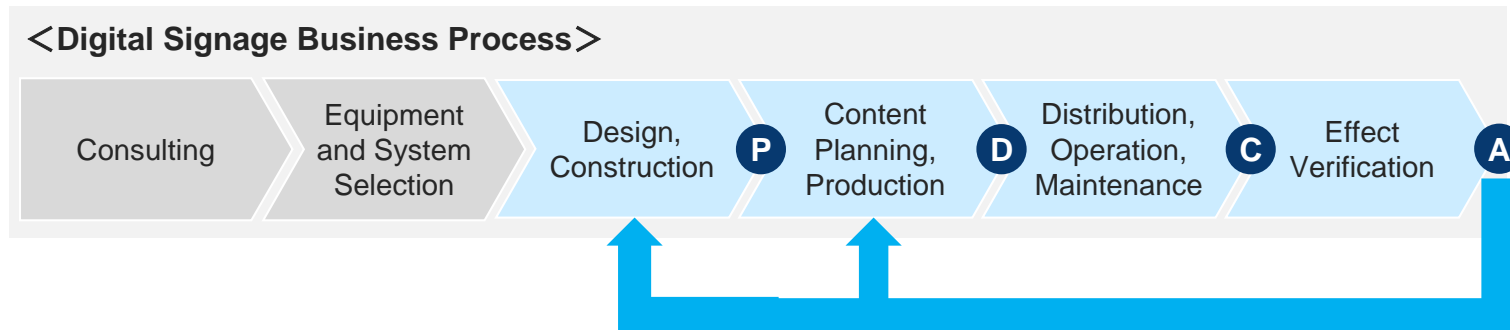


Source: Materials produced by Prof. Matsuo of the Graduate School of the University of Tokyo, processed by DBJ.

Media Innovation: “Digital Signage x AI”

- Accelerating the PDCA cycle in the digital space by applying AI and digital signage.
- Potential for innovation in media and many other industries by introducing contents and services optimized in the digital space into the real world.

Potential for Innovation in the Media Industry through the Use of Digital Signage



Enhancing the PDCA Cycle in the Digital Space

Utilize image recognition technologies for tracking pedestrian traffic, the viewer's attribute type and the viewer's gaze, in order to verify the effect

- Determine whether the ad is effective or ineffective (A/B testing)
- Utilize findings to select ads and improve consulting plans
- Analyze pedestrian traffic data for effective ad placement plans
- Achieve optimal digital signage layout design
- Optimize services and content through utilizing the digital space

Implementation in the Real World

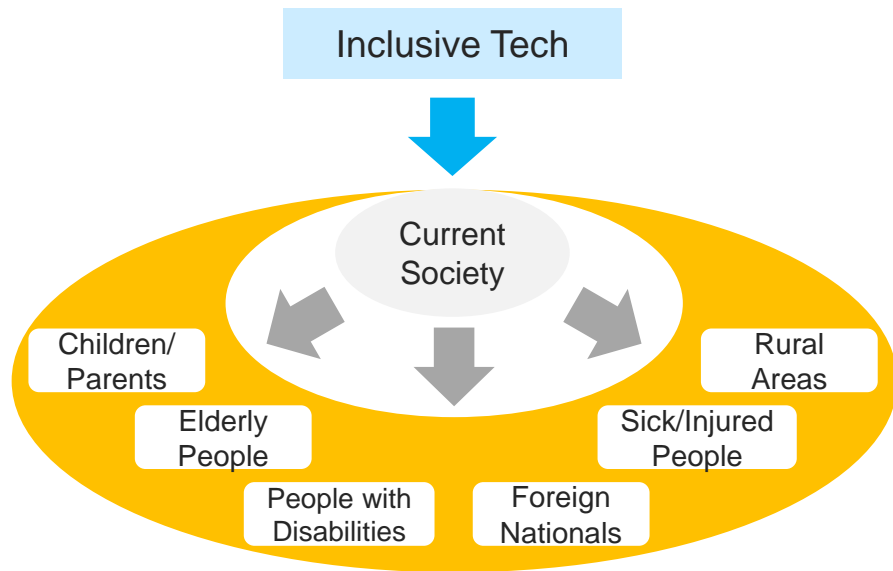
Introduce services optimized in the digital space into the real media industry

- Digital signage business:
(e.g.) Provision of optimal contents/services
- Publishing-related business:
(e.g.) Planning of book titles
- Marketing-related business:
(e.g.) Detailed planning of flyers and posters

Issue-driven Innovation: “Inclusive Tech”

- Solving social challenges such as visual impairment, by implementing appropriate technologies on a global basis.
- Creating a potential “Inclusive Tech” market by applying AI and other advanced technologies to efforts aimed at a society where all members are universally empowered.

Image of Inclusive Tech

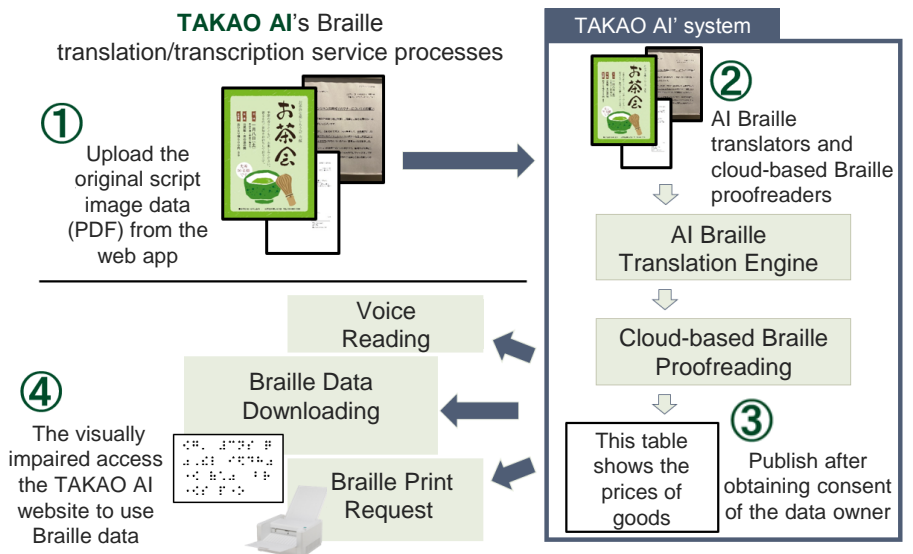


- It is possible that apps intended for the visually impaired that contain functions for location beacon, guidance system, and voice-guided navigation can serve to improve accessibility for many times more people, with or without visual impairment (Global market size estimated at 20 trillion yen).
- Santen Pharmaceutical, JBFA*, and IBF Foundation* have jointly launched the VISI-ONE Accelerator program for ecosystem formation, indicating the emergence of advanced efforts originating in Japan.

Example of Inclusive Tech: TAKAO AI (Matsuo Lab Start-up)

Company Name	TAKAO AI, Ltd.
Business Outline	Development and operation of document conversion services for improving information accessibility
Representative	Ryuta Itabashi
Establishment	February 25, 2021

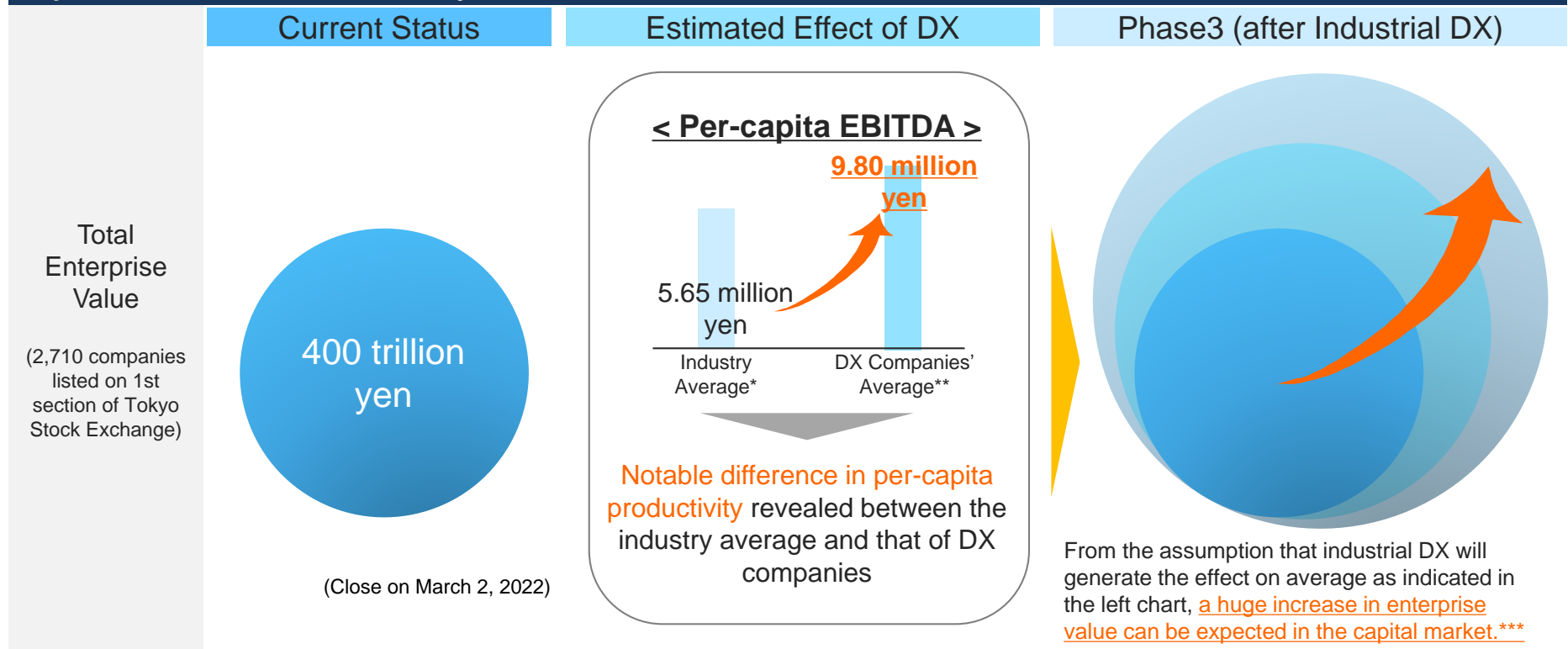
Example of TAKAO AI's Solutions



Increase in “Enterprise Value” by Industrial DX

- The estimation of the impact that productivity improvement through DX promotion of each company can bring to the enterprise value of the entire industry in Japan.
- Achievement of industrial DX can increase the total enterprise value (including the each company’s multiple) of the entire industry, suggesting the potential for exponential growth.

Impact of DX on the Entire Industry



* Industry average: Calculated for TSE 1-listed companies excluding DX companies.

** DX companies: Companies selected as “DX stocks” (Ministry of Economy, Trade and Industry, TSE, etc.) for the three straight years from 2020 to 2022.

*** It is assumed that industry average per-capita EBITDA will grow to the level equivalent to that of DX companies’ average.

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