

DXoT Strategy

Strategy and Progress towards Achieving a Six-fold Increase in EPC Productivity

**December 12, 2022
Toyo Engineering Corporation
DXoT Planning & Promotion Center**





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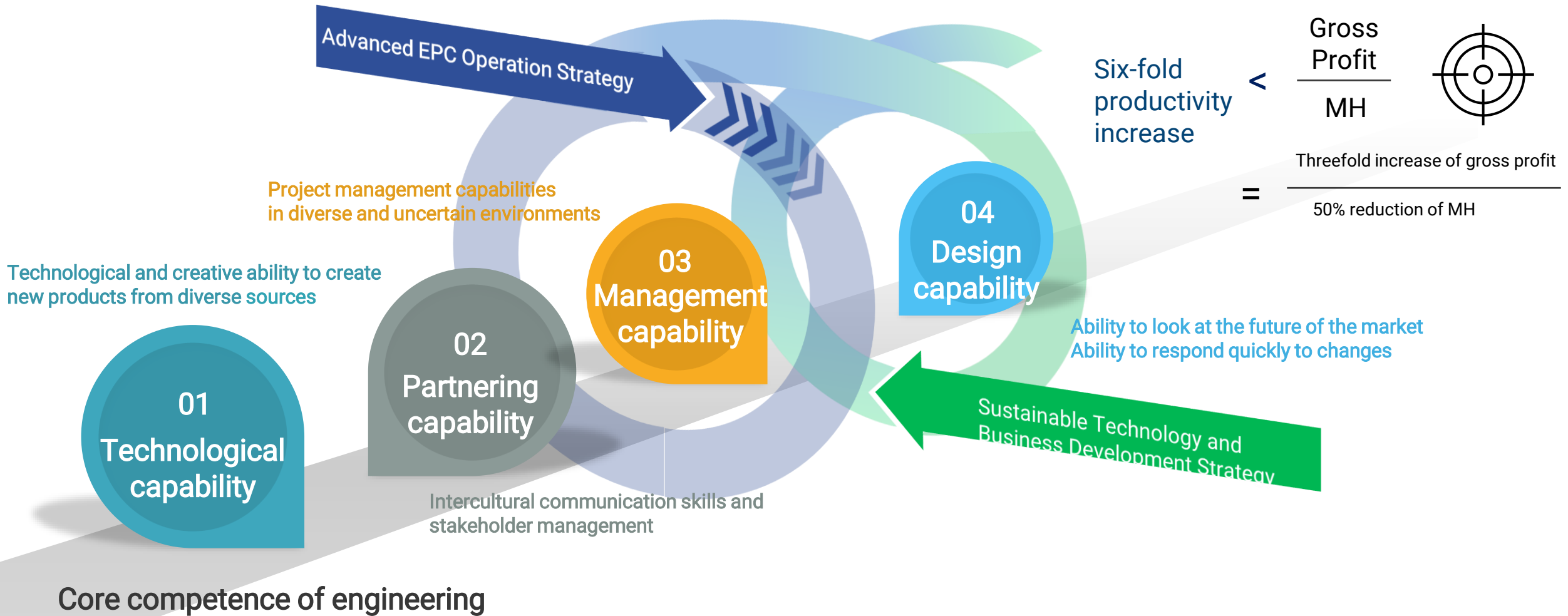


1

Digital Transformation Strategy

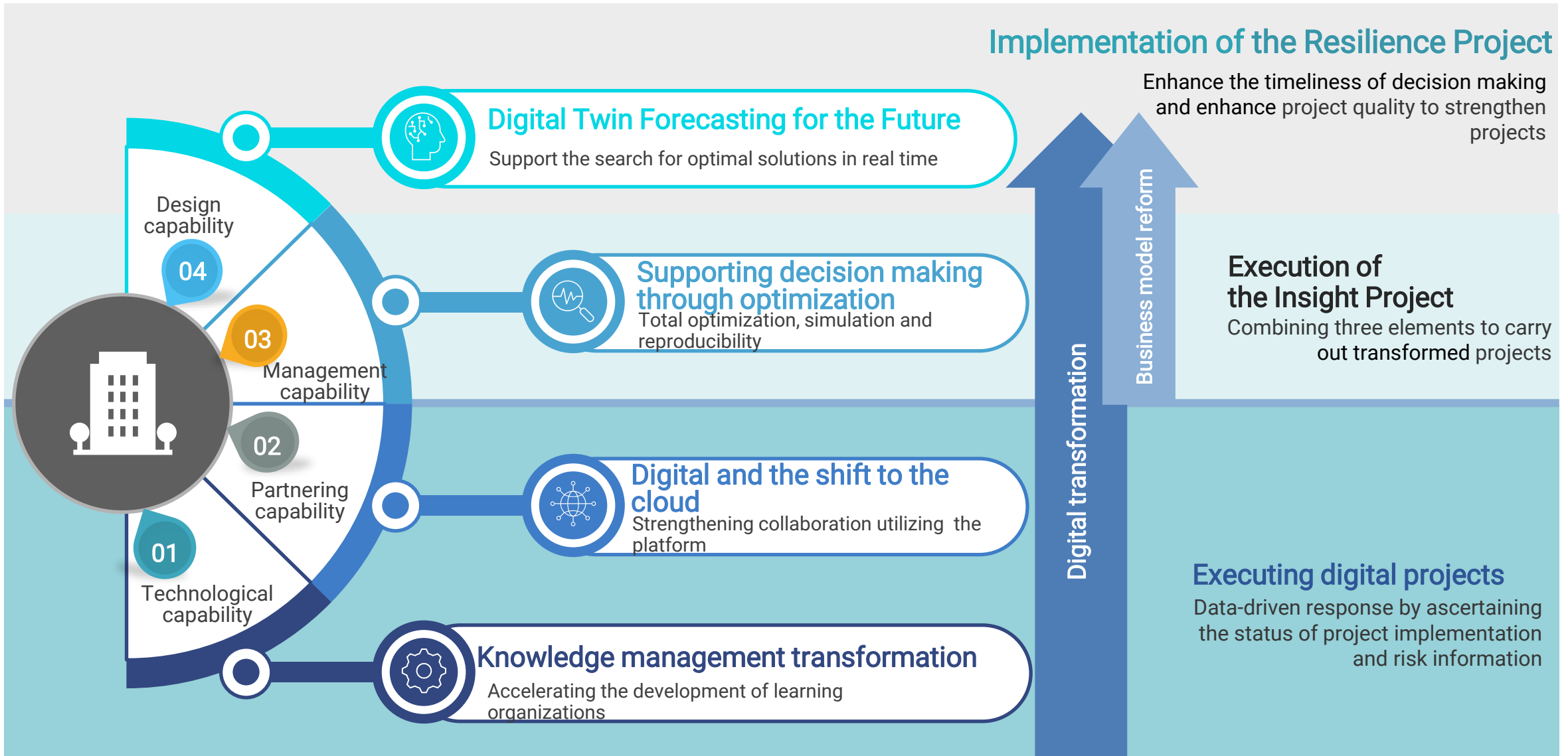
Digital Transformation Strategy

Digital transformation as an enabler of resilient blue and green strategies that complement our core competence



Digital Transformation Strategy

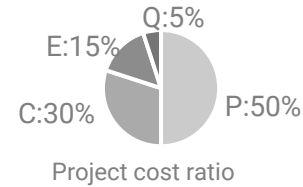
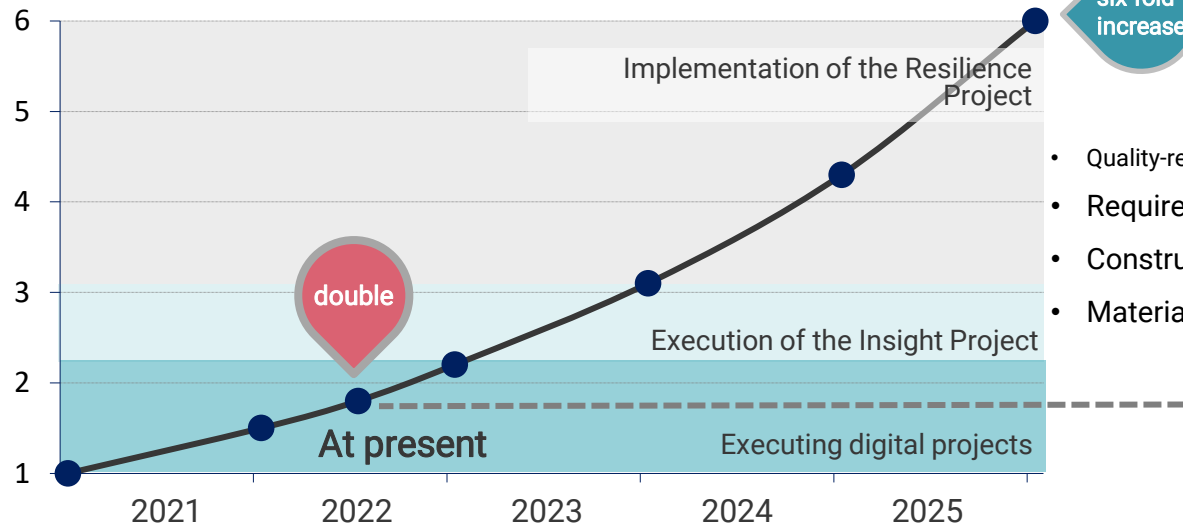
Combination of core competence and digital transformation to enhance project execution methods



Digital Transformation Strategy

About 30% progress in the increase of productivity through the evolution of project execution methods for the achievement of a six-fold increase in productivity in 2025.

Productivity



- Quality-related loss costs (Q) 50% reduction
- Required man-hours (E) 50% reduction
- Construction cost (C) 15% reduction
- Material cost (P) 10% reduction

Technological capabilities and knowledge management transformation

10% Reduction of quality-related loss costs

Partnering construction capability and the digital shift to the cloud

13% Reduction of man-hours required

Management capabilities and optimization

2% Reduction of construction costs

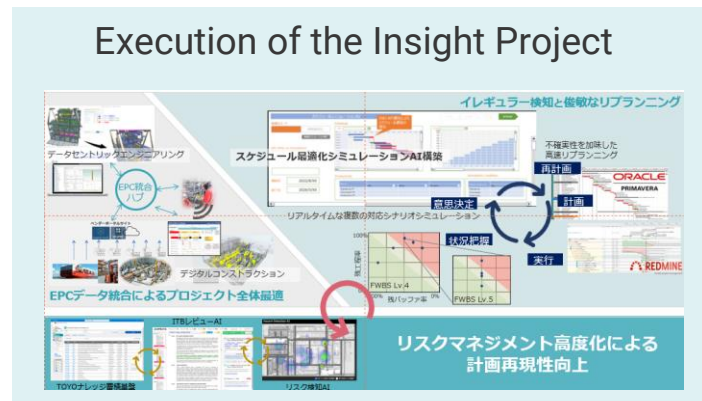
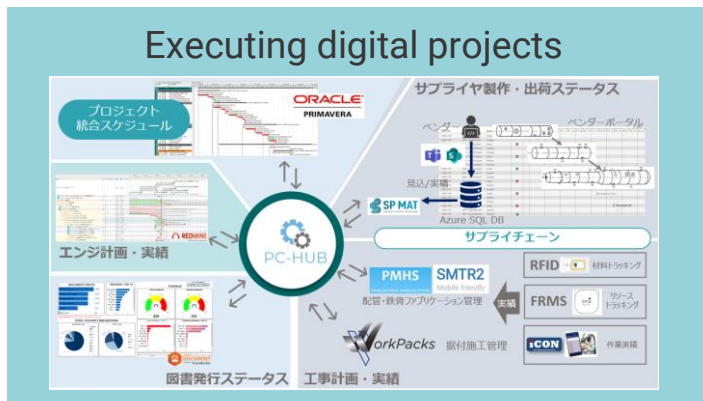
Design capability and digital twin forecasting of the future

1% Reduction of materials and equipment costs

30%

About 30% progress measured against the six-fold increase in productivity

Near transition to the Insight Project Delivery Phase



Implementation of the Resilience Project

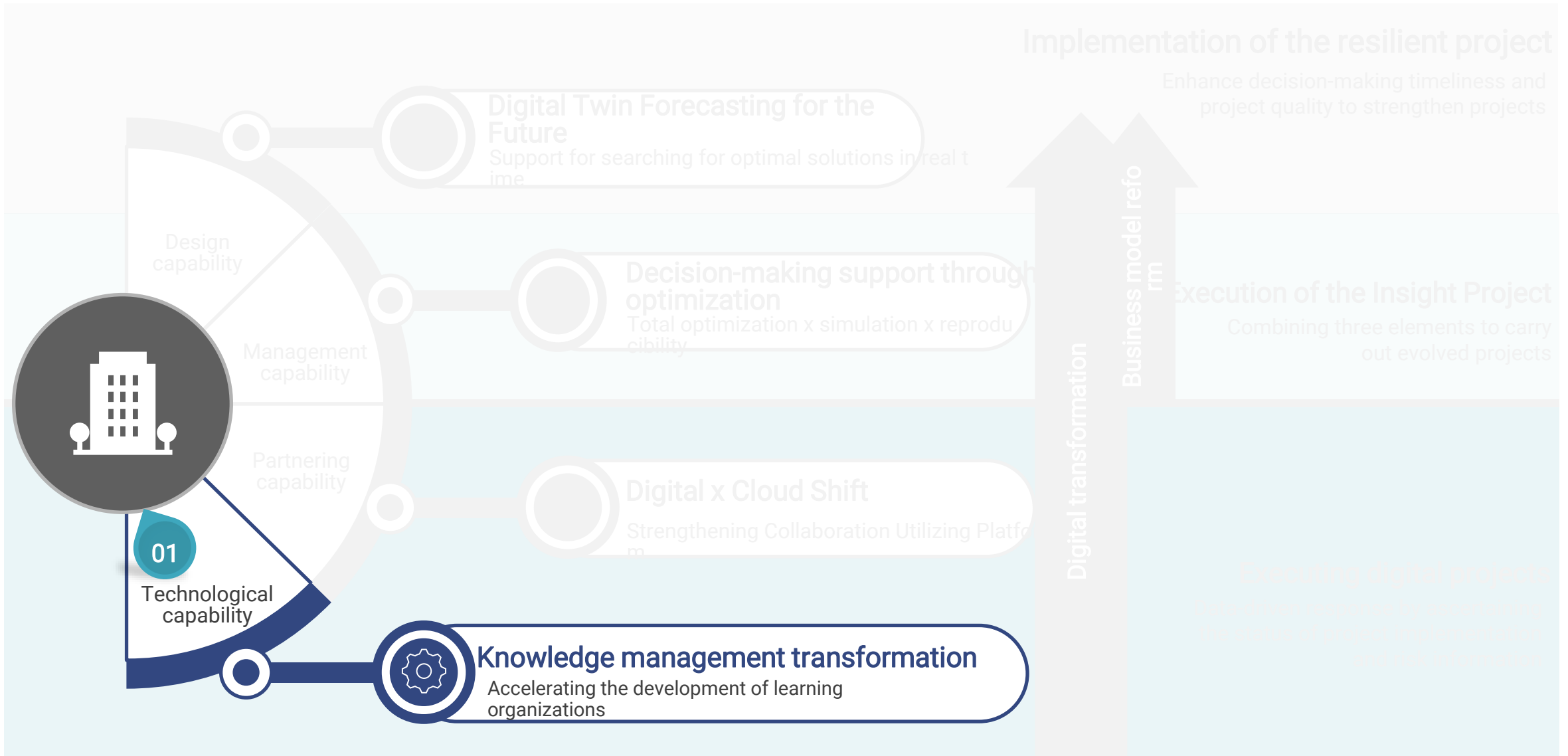
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Progress and Results

01. Enhancement of Technological Capabilities and Knowledge Management Transformation

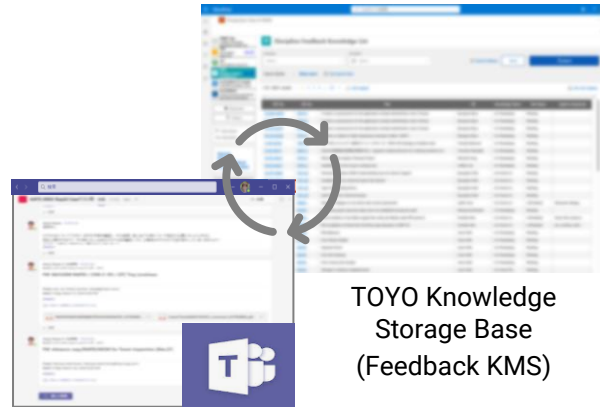


01. Enhancement of Technological Capabilities and Knowledge Management Transformation

Accelerating the development of organizations that learn from facts and truths

Easy acquisition and analysis of internal and external information

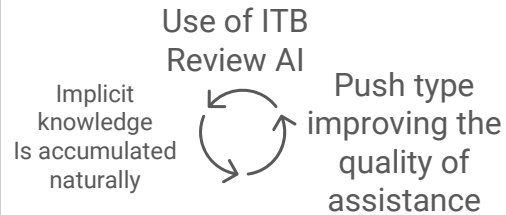
- Problem information during the project is naturally accumulated on the TOYO Knowledge Storage Base using business communication tools.
- The Semantic Search¹ engine efficiently obtains new knowledge and related knowledge including internal and external technical information.



Discovery of new findings that have been overlooked

Accumulation and utilization of tacit knowledge, a process of technology and value creation

AI shares the implicit knowledge of veterans in a push fashion to assist in ITB reviews.



ITB Review AI²

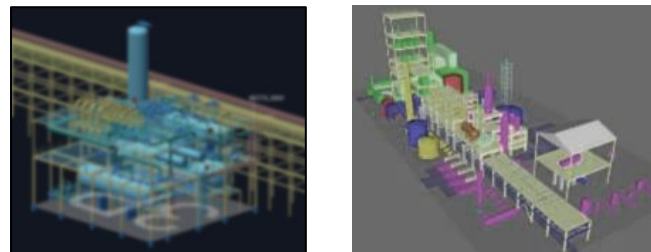
Homogenizing and improving the quality of risk detection and improving response capabilities

Real-time status analysis



- Cost and Time Lag Zero Reporting
- Identify what is happening using data.

Learning using simulation



- Rapid pipe modeling using automated routing
- Improved decision-making by quick case studies

Removing time and location constraints

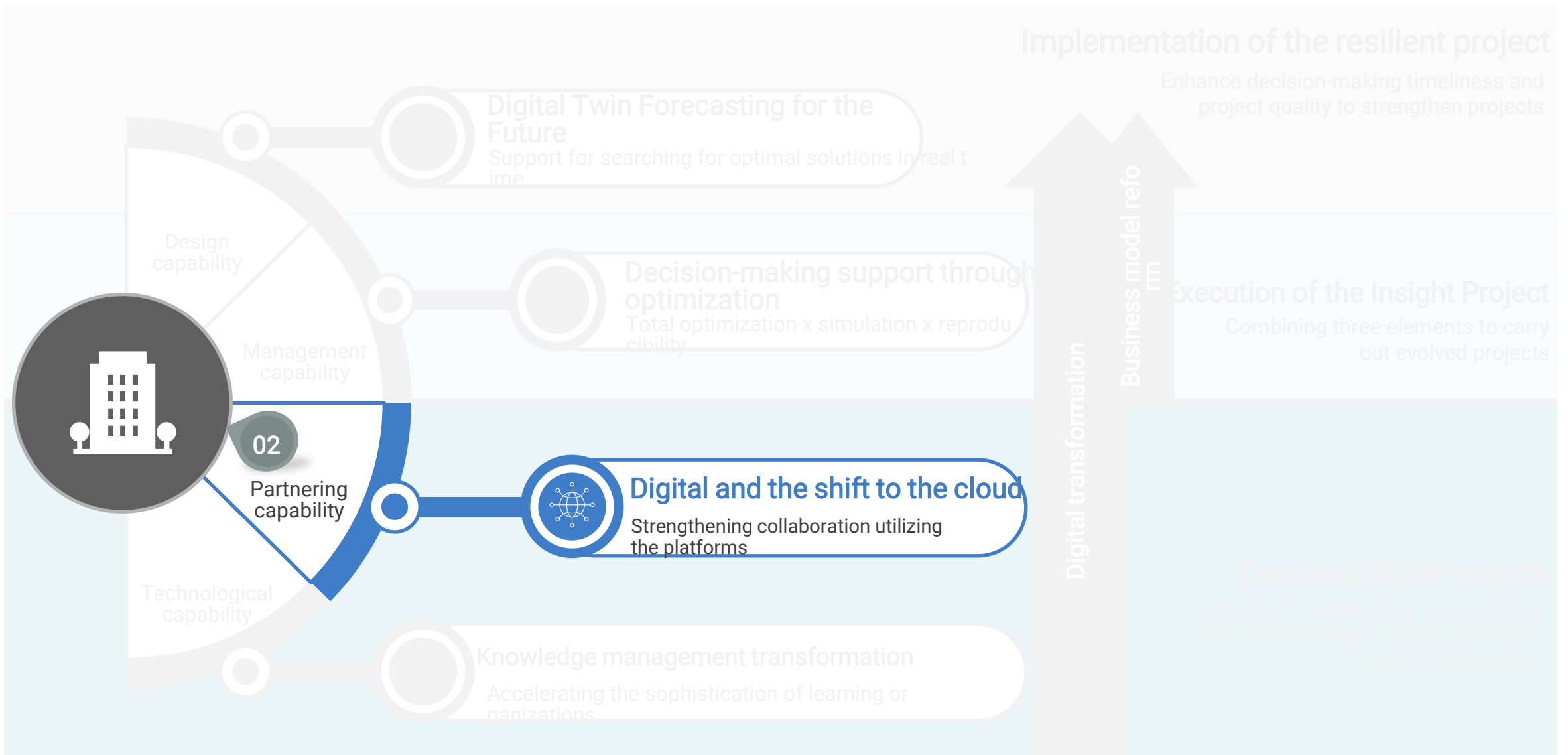


- Secure access-managed clouds
- Improve the flexibility of teamwork and dramatically shorten communication time

¹ Adopted the S&P Global product Goldfield. Search engines that analyze the subjects, predicates and objects of sentences, and the interaction between sentences, and take these relationships into account.

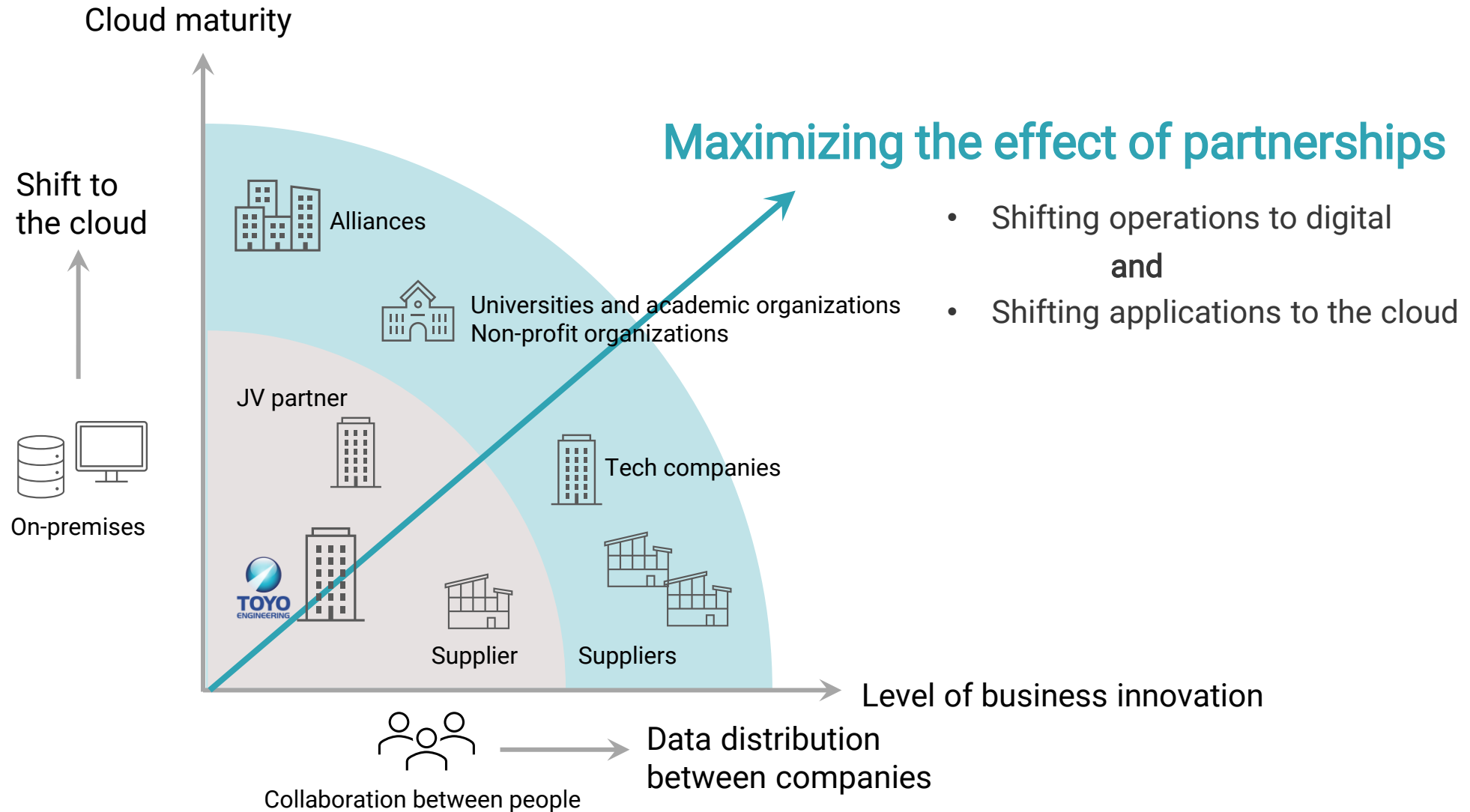
² The SpectA RFQ Guide View by SOLIZE Co., Ltd has been adopted. ITB: Invitation to Bid.

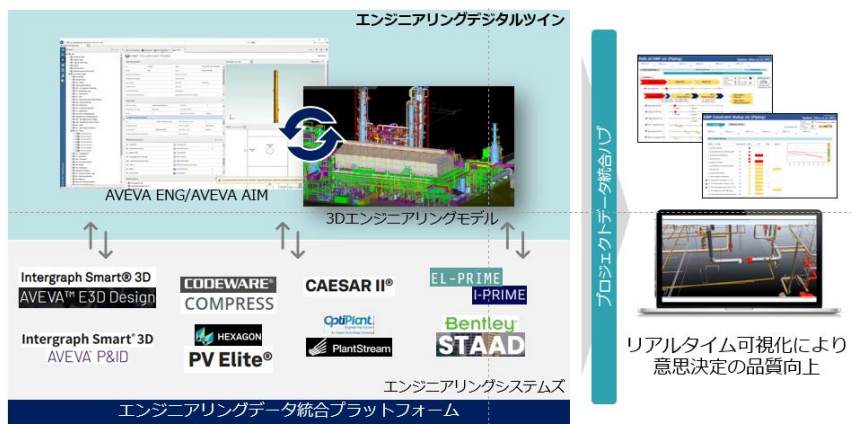
02. Strengthening Partnering Capability and the Digital Shift to the Cloud



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Shifting operations to digital and applications to the cloud to maximize synergy from partnerships



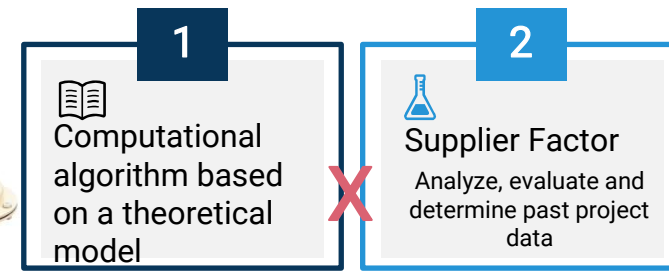


リアルタイム可視化により
意思決定の品質向上

Automation

Along with the digitization of design data, QC operations are automated based on rules.

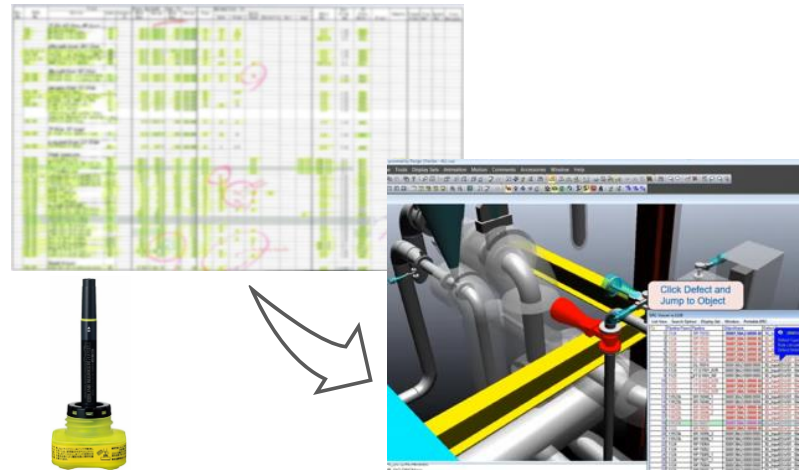
QC man-hours are reduced 40%.
Quality deterioration due to human error and omission during checks is prevented.



Body Size Prediction Algorithm

Improving efficiency

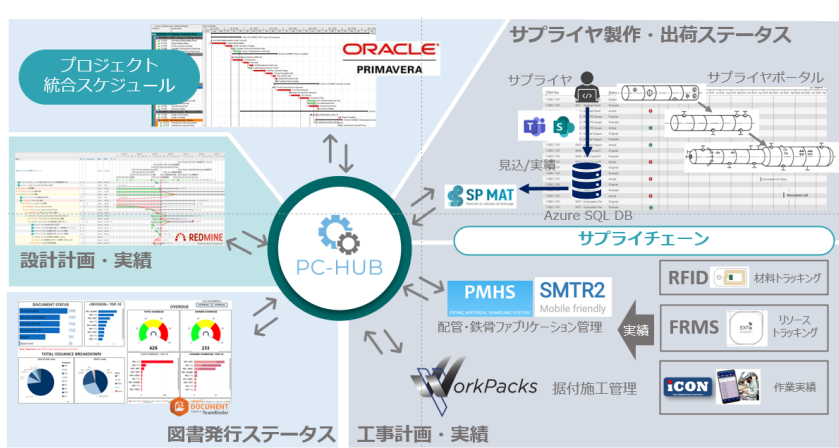
About 40% of engineers' work hours¹ are spent searching for information, checking for consistency, and sharing information. Achieving a dramatic increase in the efficiency of information handling by shifting to digital.



Forecast

Depending on the supplier's design, As a design performance bottleneck For predicting the information on the instrumentation that had been used
Achieved 90% accuracy.

13% reduction in man-hours by the shift to digital in the engineering area



Automation

A spool and steel frame tracking system with RFID and drawn has been implemented. Mobile apps have also been introduced to automatically acquire progress information. 20% improvement in on-site QC efficiency.



Improving efficiency

Integrate interdependent supply chains. Improve the efficiency of information transmission to minimize rework and confusion on site, and improve the efficiency of supply chain management.



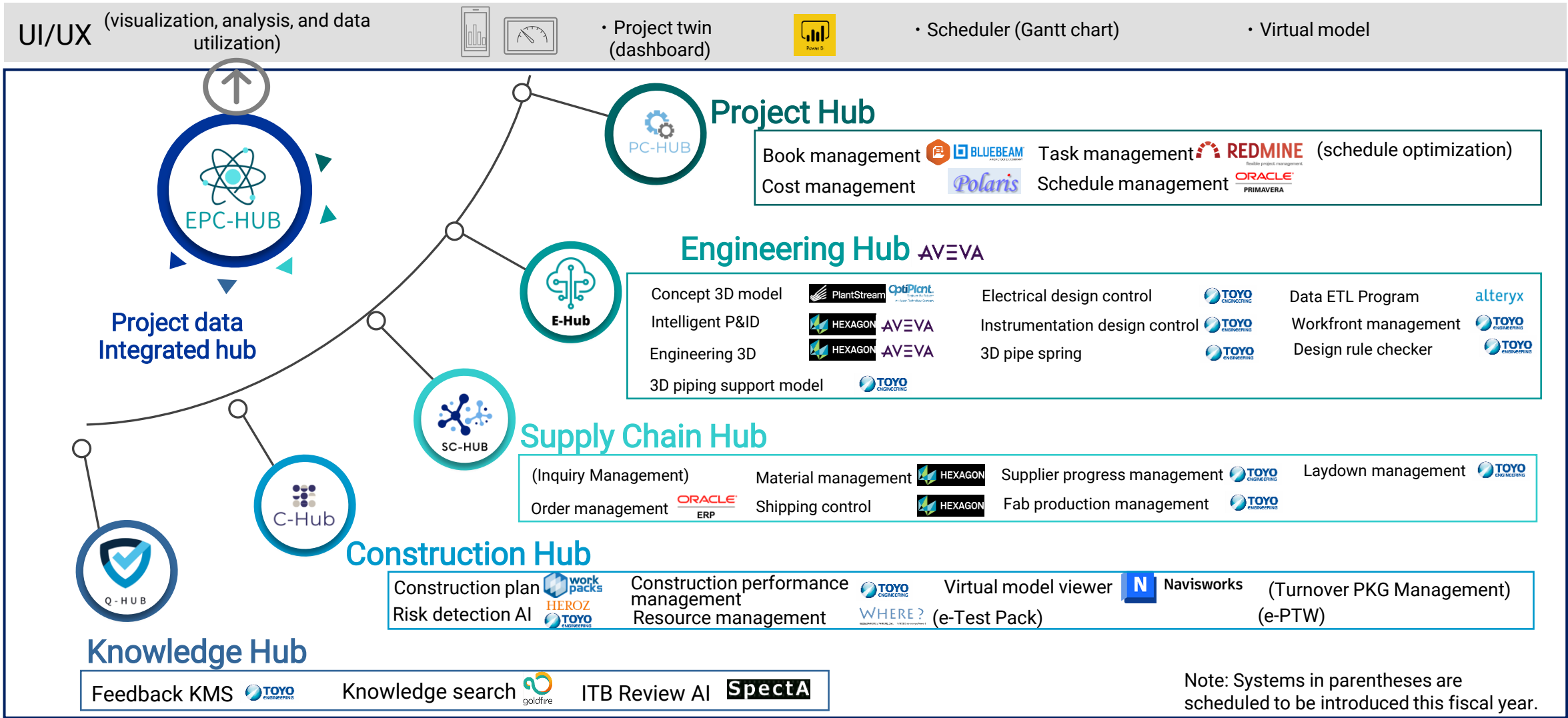
Forecast

Incorporating actual results and the latest conditions on site in the simulation
Enabling high-speed redesign of the construction plan.

The digital shift in supply chains and construction areas

02. Strengthening Partnering Capability and the Digital Shift to the Cloud

34 applications have been newly introduced and modified, and the EPC operations which form the basis for the execution of digital projects, have been shifted to digital and cloud operations on the TOYO platform.

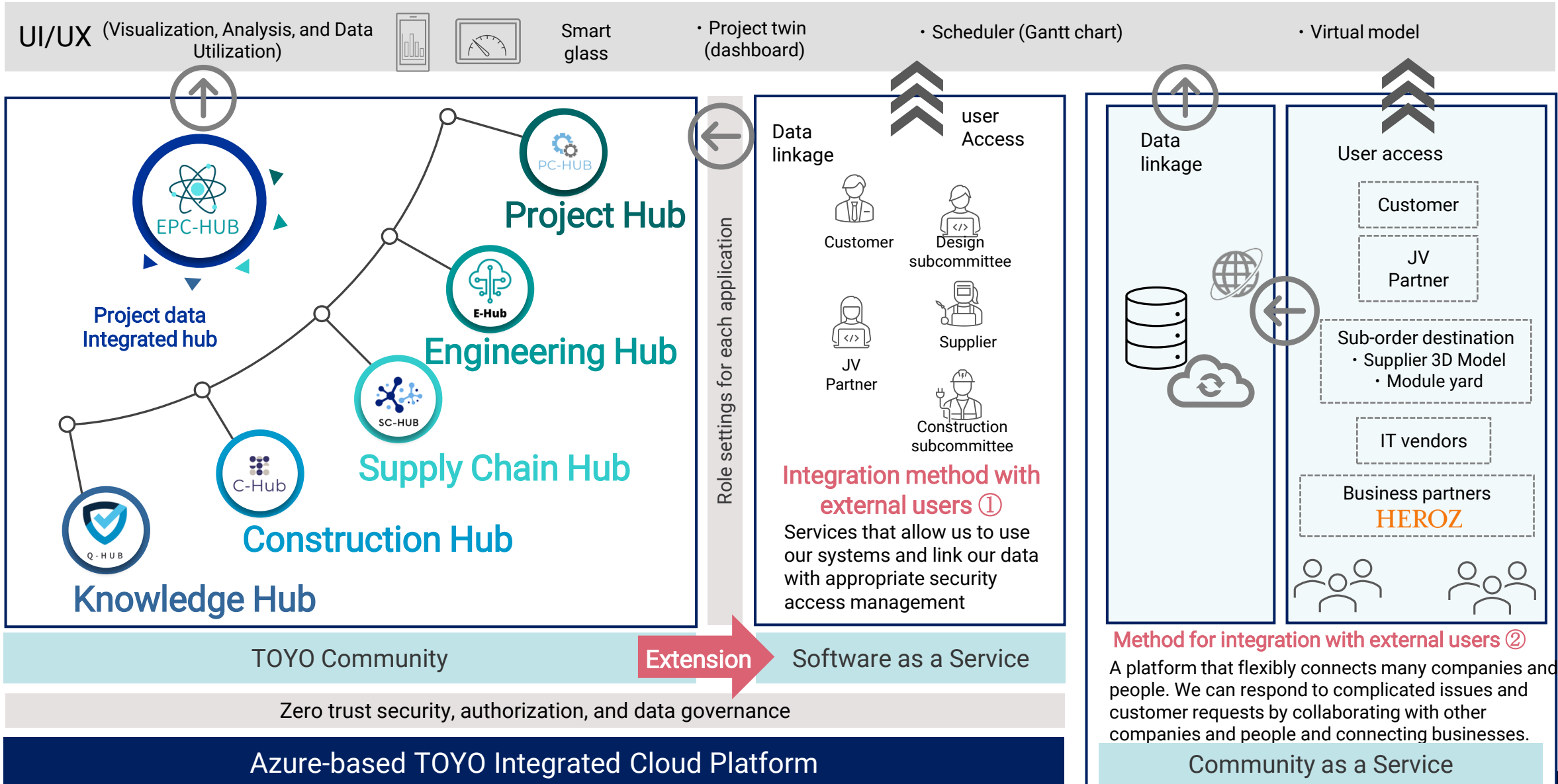


Zero trust security, authorization, and data governance

Azure-based TOYO Integrated Cloud Platform

02. Strengthening Partnering Capability and the Digital Shift to the Cloud

Expansion of the Toyo Platform completed the foundation for flexible and agile business connections with various companies and people. Expansion of business fields.



02. Strengthening Partnering Capability and the Digital Shift to the Cloud

Joint development with HEROZ Corporation

The AI for U system for detecting the risk of schedule delays in underground construction has been developed and applied in actual projects.



■ What is AI for U?

This is the first system in the domestic plant engineering industry to escape from personal and local judgment when considering construction properties and to provide knowledge in a push-type manner.



It is possible to prevent delays in construction by detecting potential hazards during construction and incorporating them into the design in advance.



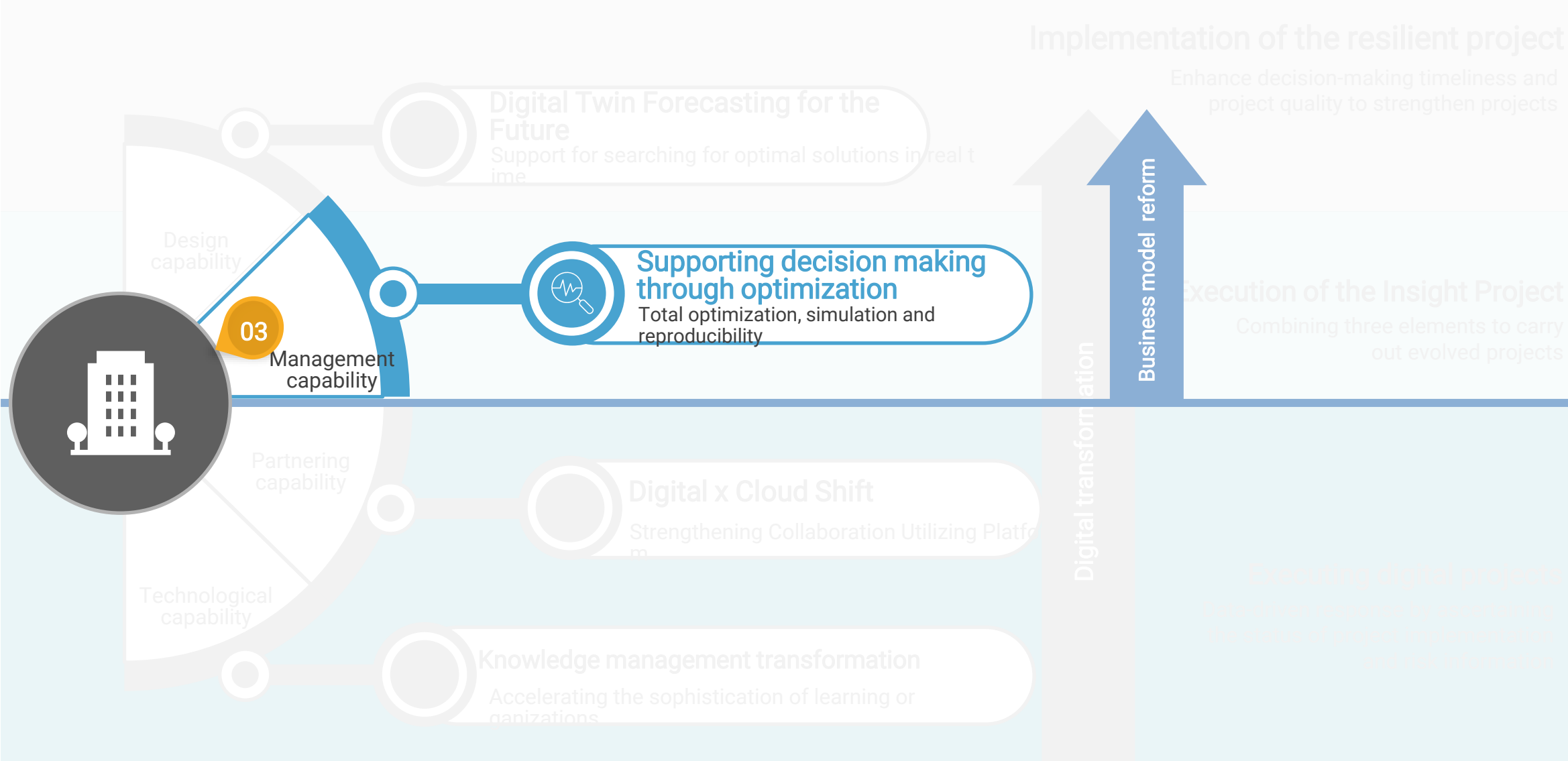
Underground Constructability Hazard Detection AI (AI for U)



3

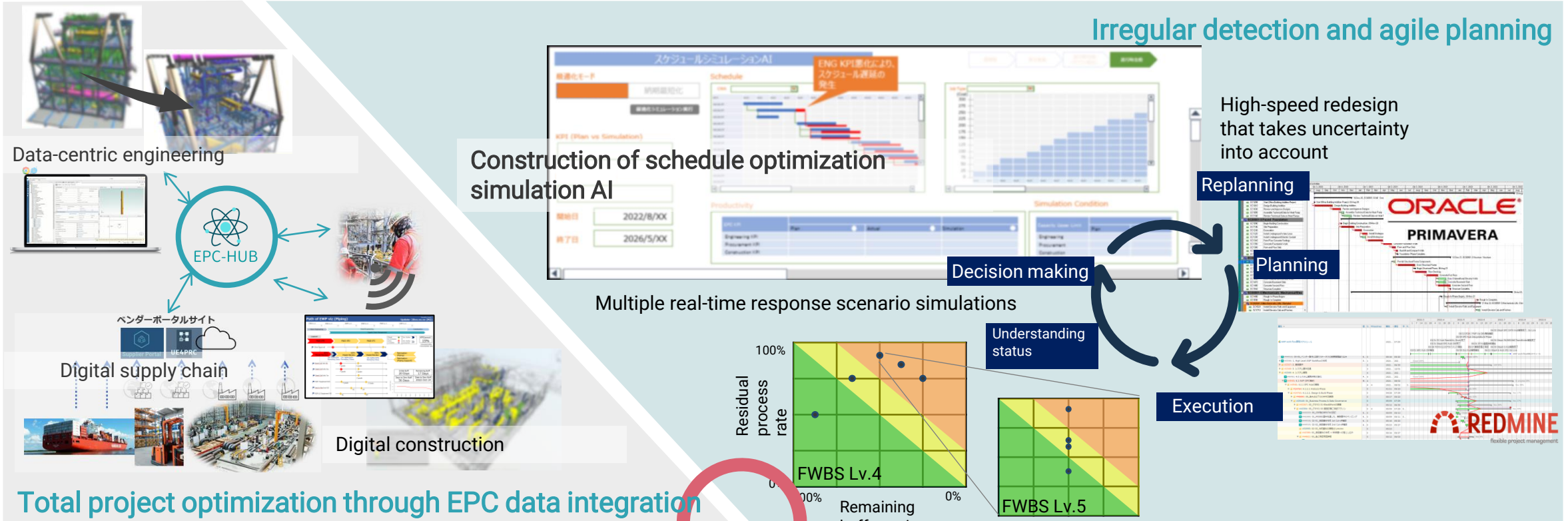
Business model reform

03. Strengthening Management Capability and Supporting Decision-Making through Optimization

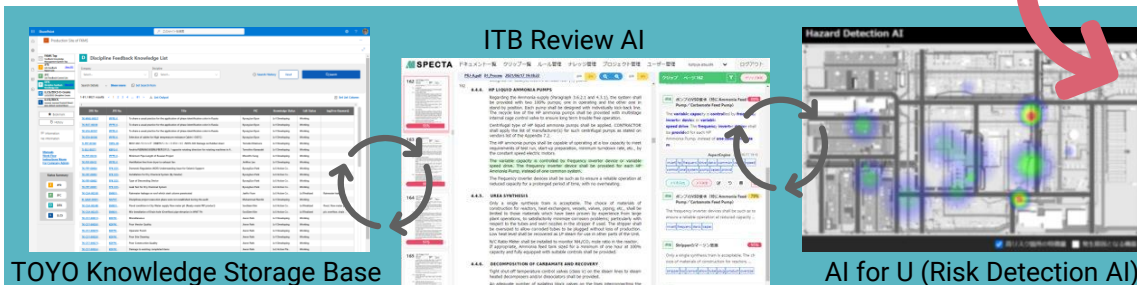


03. Strengthening Management Capability and Supporting Decision-Making through Optimization

Strengthen and circulate project execution from three perspectives to implement the Insight Project

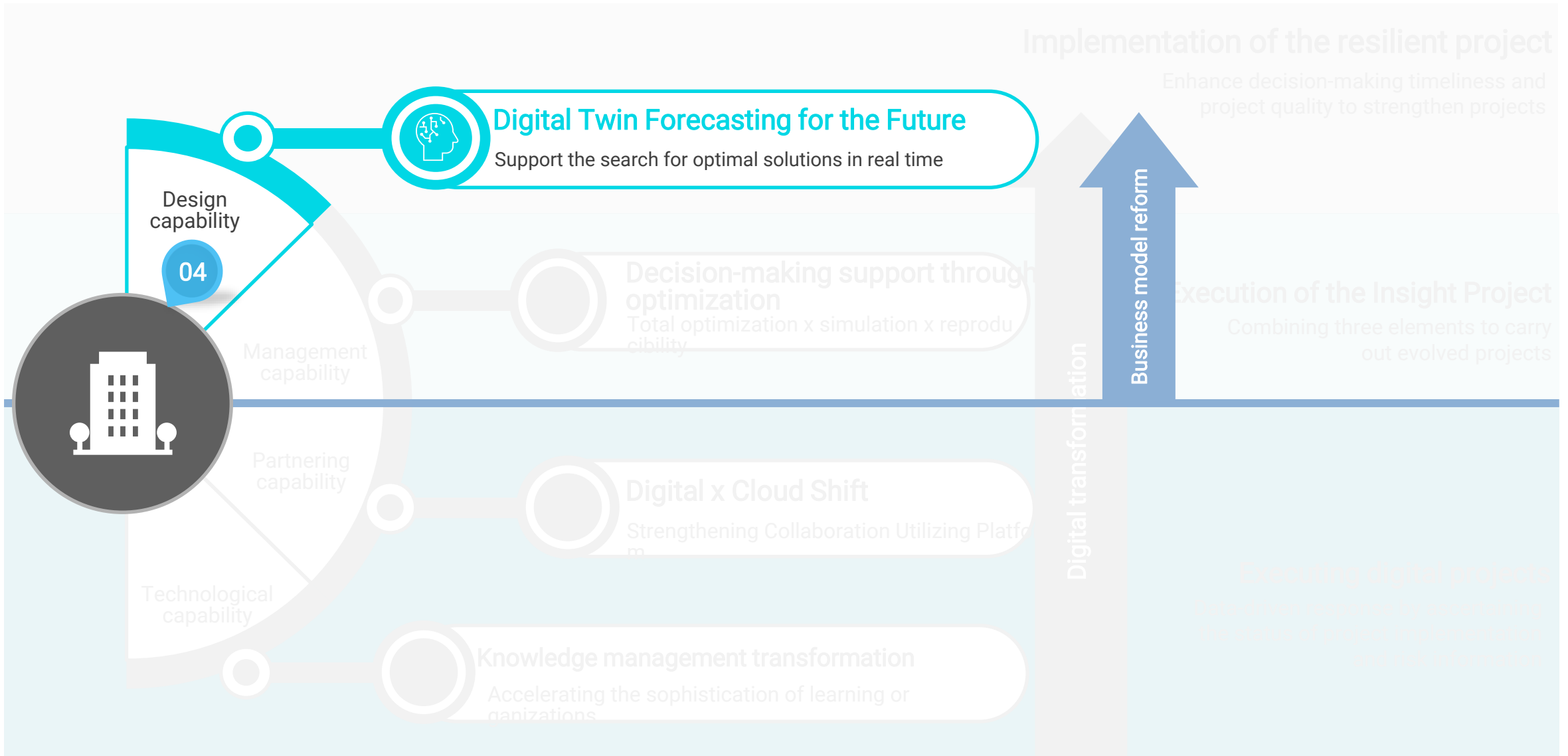


Total project optimization through EPC data integration



Improvement of plan reproducibility by improving risk management

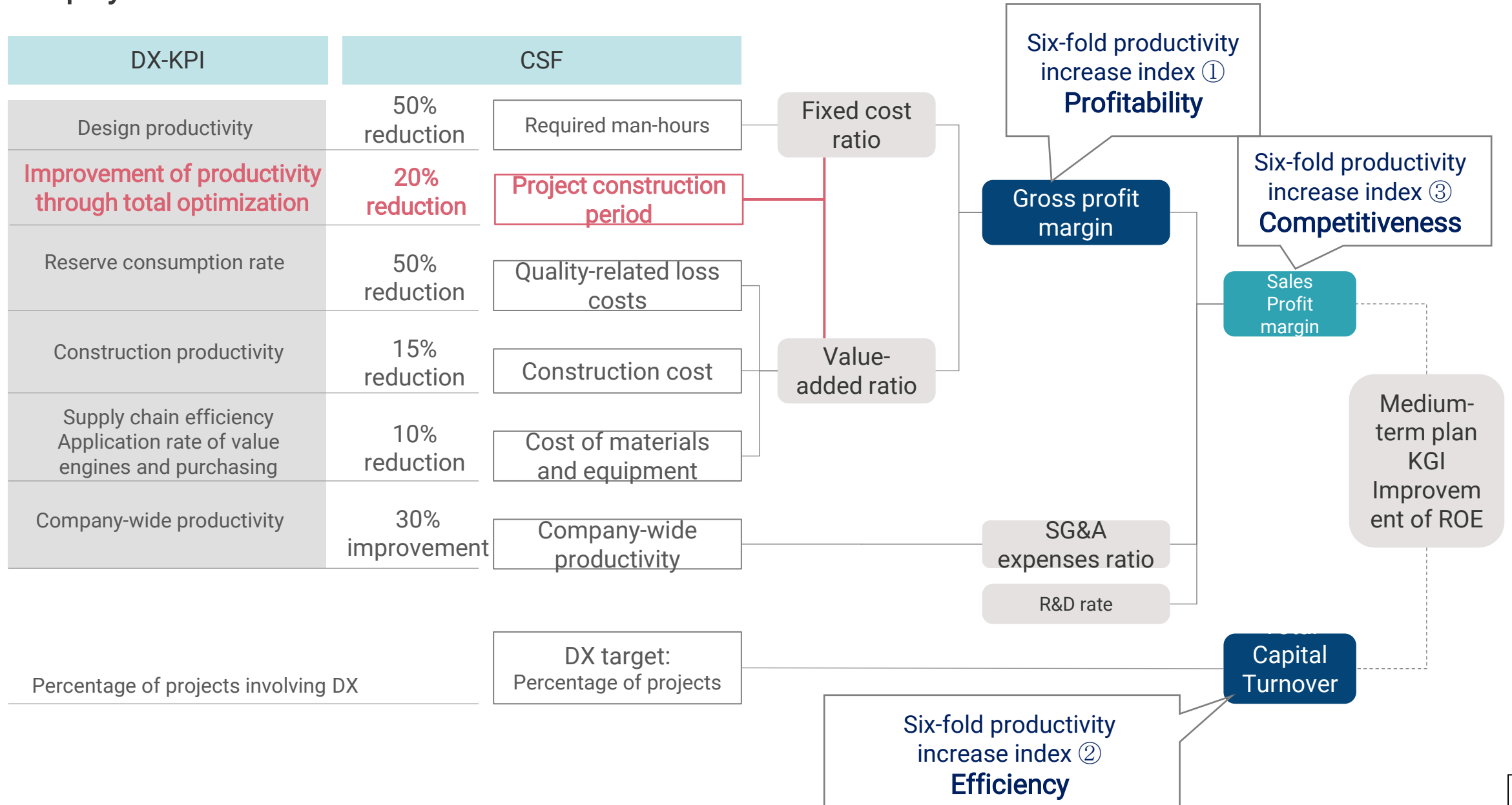
04. Enhancement of Design Capability and Future Forecasting Using Digital Twins



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Visualization of the Three Links between DX-KPI and KGI and the Medium-Term Management Plan for Each Employee



Value Creation Approach

To maximize the investment value for customers



Before DX

Conventional projects execution

Digital

execution of the project

Insight

execution of the project

Resilient

execution of the project

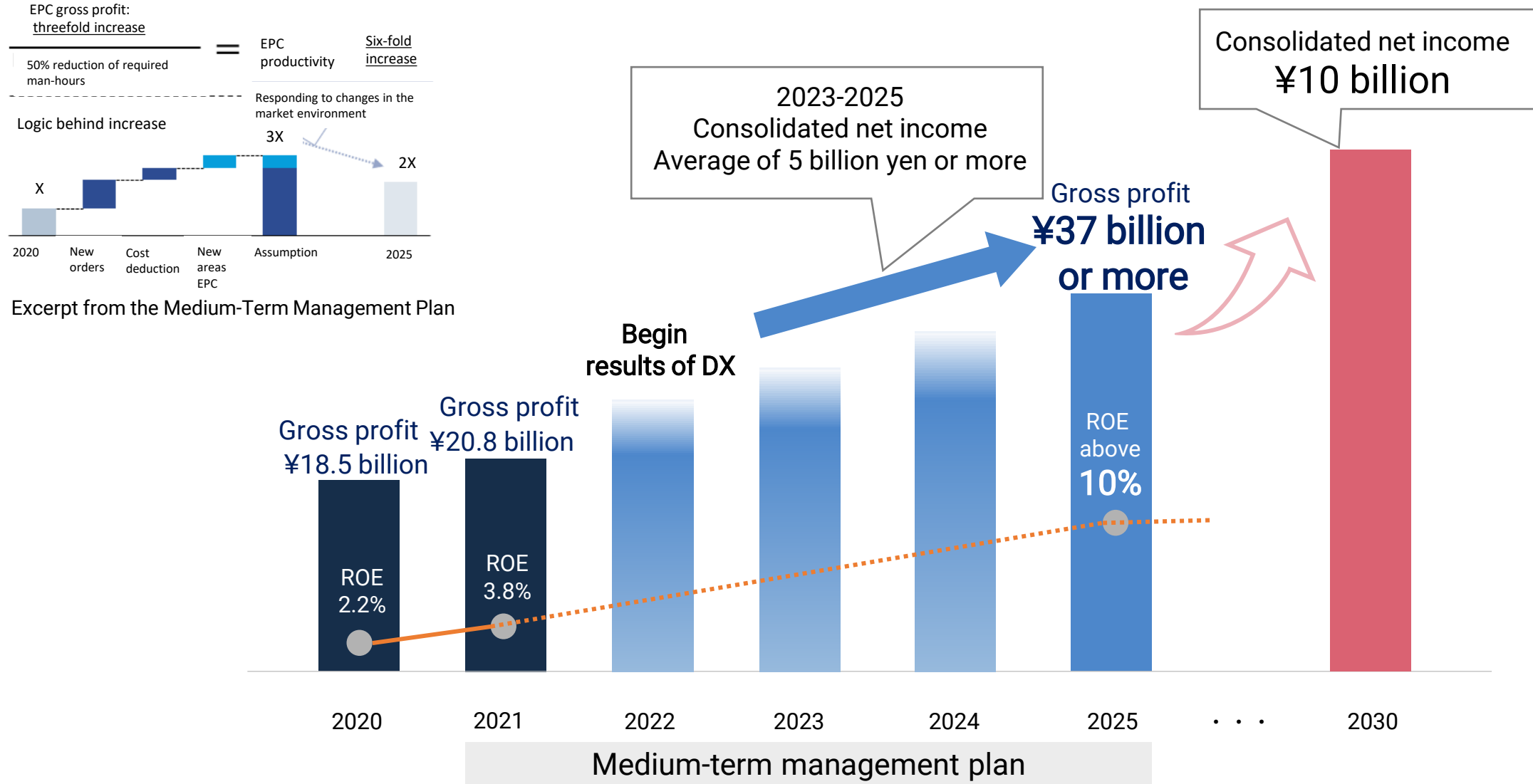


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Results of DX

Effective harvesting of DX

Some results have been achieved in quality improvement and productivity improvement through DX since 2022. Project application and results are expected to expand from 2023, and the medium-term management plan targets are expected to be achieved.





Toyo Engineering Corporation

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