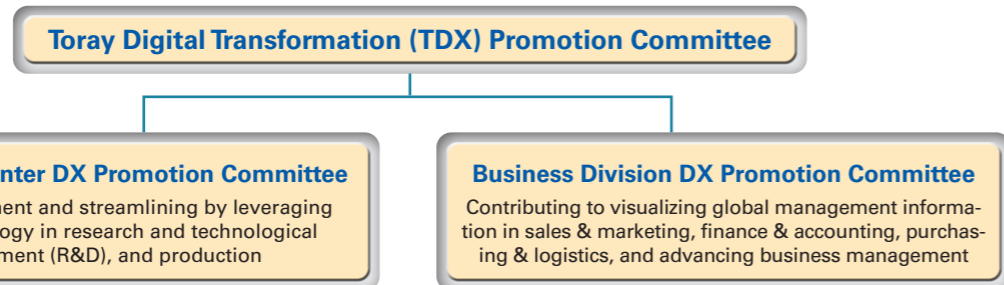# Advanced Business Management by Utilizing Digital Technologies

Promotion of Closely *Genba* (Workplace)-Linked DX

Having declared advancements in management through digital transformation (DX) to be a key initiative, Toray established the Toray Digital Transformation (TDX) Promotion Committee, which is chaired by the President, as a body to debate and discuss group-wide policies for promoting DX. After having put in place the subordinate Technology Center DX Promotion Committee and the Business DX Promotion Committee, the Company is advancing a group-wide TDX Promotion Project in addition to departmental initiatives.

In particular, we will promote utilization of data and digital technologies in a manner closely tied to the *Genba* (workplace) to successfully face a number of challenges, such as creating products and services that meet the needs of our customers and society, strengthening cost competitiveness, and increasing the sophistication of business management. Specifically, in addition to promoting DX themes in research and development, production, business, and management fields, we will develop a global data infrastructure and develop human resources fluent in digital technologies.

Toray Digital Transformation (TDX) Promotion Committee

Technology Center DX Promotion Committee
Drive advancement and streamlining by leveraging digital technology in research and technological development (R&D), and production

Business Division DX Promotion Committee
Contributing to visualizing global management information in sales & marketing, finance & accounting, purchasing & logistics, and advancing business management

Investing ¥20 Billion in DX Promotion

Under AP-G 2025, based on DX closely tied to the *Genba* (workplace), we will promote building of a global data infrastructure to utilize the data accumulated within Toray Group throughout the Group, integration of analysis and simulation technologies, collaboration with the value chain, and the development of more than 2,000 human resources fluent in digital technologies.

In building a global data infrastructure, we will centralize Toray Group's performance management data, including that from domestic and overseas affiliates, and improve Group governance through timely monitoring systems such as Business Intelligence (BI). By combining analysis and simulation technologies, we will work to reduce costs and improve quality through the visualization of production

activities and data analysis, and create new materials through simulation informatics. In collaboration with the value chain, we will work to improve the accuracy of production and sales plans and the optimization of inventory through real-time collaboration and management, while focusing on visualizing our carbon footprint. We will also accelerate the promotion of DX in all aspects, such as in strengthening digital marketing and in managing signs of problems by utilizing AI.

As far as human resources are concerned, we will expand and upgrade the DX human resource certification system and develop human resources who understand the workplace, know how to use digital technology as a tool, and who will take the lead in improving that workplace.

Investment related to digital technology: ¥**20** billion

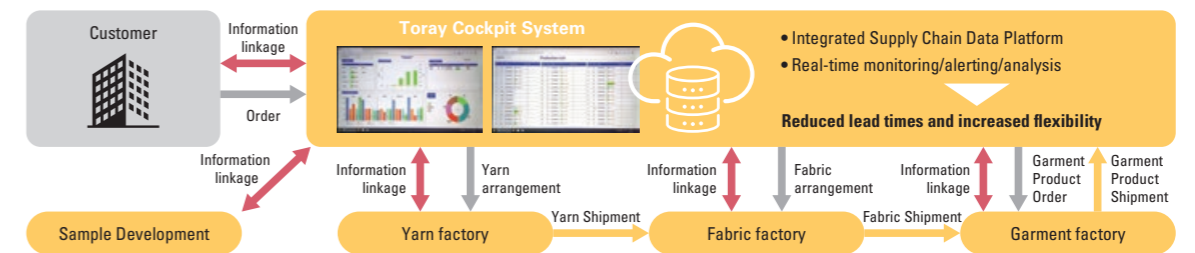|	
Building a global data infrastructure	Promoting **accumulation, sharing, and visualization** of data
Combining analysis and simulation tech.	Using AI and MI* to capture benefits of **digitally leveraged manufacturing** *Materials Informatics
Cooperating with value chain partners	**Real-time** cooperation and management
Development of HR fluent in digital technology	Establishing **a base of human resources fluent in digital technologies** totaling 2,000 people group-wide • Focusing on the development of senior leaders and leaders who are familiar with both the frontlines and digital technology

Level of Digital Fluency

Expert	Over 20 people	Creation of new digital methods (Professional)
Senior Leader	Over 200 people	Execute from problem-setting to solution by themselves using digital methods (Leader)
Leader	Over 600 people	Solving problems with basic digital methods (Field promoters)
Associate	Over 1,200 people	Mastering the digital basics
General Digital Personnel		

Case 1

Apparel Business Cockpit System

To strengthen our ability to build global value chains and sales operations, which are strengths that the Toray Group has cultivated over the years, we are promoting business model reform. We are achieving this reform by working to deepen and extend our value chain by utilizing collaboration with bases outside Japan, external resources, and DX tailored to actual situations in the workplace. In supplying differentiated, highly advanced processed products,

we are building an integrated supply chain data platform that centrally manages data dispersed across various sites, such as customer orders from major global apparel companies, fabric and garment production schedules. This makes it possible to visualize data, act quickly on any abnormalities, improve prediction accuracy, and provide value in the form of, for example, reduced lead times and production flexibility.
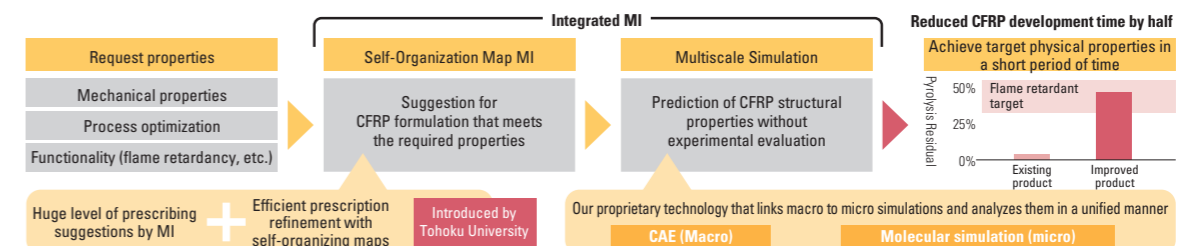

Toray Cockpit System
- Integrated Supply Chain Data Platform
- Real-time monitoring/alerting/analysis

Reduced lead times and increased flexibility

Customer — Information linkage — Order; Information linkage; Sample Development; Yarn factory; Yarn arrangement; Yarn Shipment; Fabric factory; Fabric arrangement; Fabric Shipment; Garment factory; Garment Product Order; Garment Product Shipment

Case 2 ## Development of Flame-Retardant CFRP by Means of Integrated Materials Informatics (MI)

Having utilized integrated MI, which combines MI using self-organizing maps (introduced from Tohoku University) with its proprietary multiscale simulations (MS), Toray succeeded in halving the development period for a flame-retardant carbon-fiber reinforced plastic (CFRP).

Simplifying and displaying in visual form vast amounts of data, a self-organizing map arranges materials with similar characteristics close to each other. Using this feature makes it possible to analyze complex information in a form

that is easy for humans to understand. A method that combines microscale (molecular dynamics, etc.) and macroscale (CAE, etc.) simulations, using MS makes it possible to analyze phenomena from multiple angles, solve essential problems, and promote material design. Going forward, we will expand integrated MI's range of applications while accelerating the streamlining and sophistication of research and technological development.

Integrated MI

Request properties; Mechanical properties; Process optimization; Functionality (flame retardancy, etc.) → **Self-Organization Map MI** Suggestion for CFRP formulation that meets the required properties → **Multiscale Simulation** Prediction of CFRP structural properties without experimental evaluation → **Reduced CFRP development time by half** Achieve target physical properties in a short period of time

Huge level of prescribing suggestions by MI + Efficient prescription refinement with self-organizing maps (Introduced by Tohoku University); Our proprietary technology that links macro to micro simulations and analyzes them in a unified manner — CAE (Macro), Molecular simulation (micro)

Case 3 ## Building of a Toray Common Data Analysis Environment

Data analysis such as MI and process informatics (PI) is performed in the following steps: data acquisition → accumulation → processing → analysis. Systems for data acquisition and accumulation are built according to each department's operations. However, since data processing and analysis deal with organized numerical data, building of a common company-wide environment was needed from the perspective of increasing sophistication and efficiency of initiatives. In response, from November 2022,

we built and rolled out the Toray Common Data Analysis Environment to the entire Company. This is equipped with a programming environment (Python common environment) and a proprietary data analysis tool that can be operated intuitively. Since its rollout, utilization of the Toray Common Data Analysis Environment has extended throughout Toray including technical and business departments, contributing significantly to DX promotion within the Company.

Data Analysis Flow: Data Collection (Sensor Data, Experiment Data, External data, etc.) → Data Accumulation (Numerical data, Image data, Chemical structure, etc. (unorganized)) → Data Processing (Numerical Conversion, Data processing, Integrated data) → Data analysis → **Production Efficiency, New Material Creation**

Python Common Environment
- Use Python without complicated environment settings
- Program templates created by experts can be used

Toray Common Data Analysis Environment

Data Analysis Tools
- Advanced data analysis without programming
- Intuitive GUI for easy operation