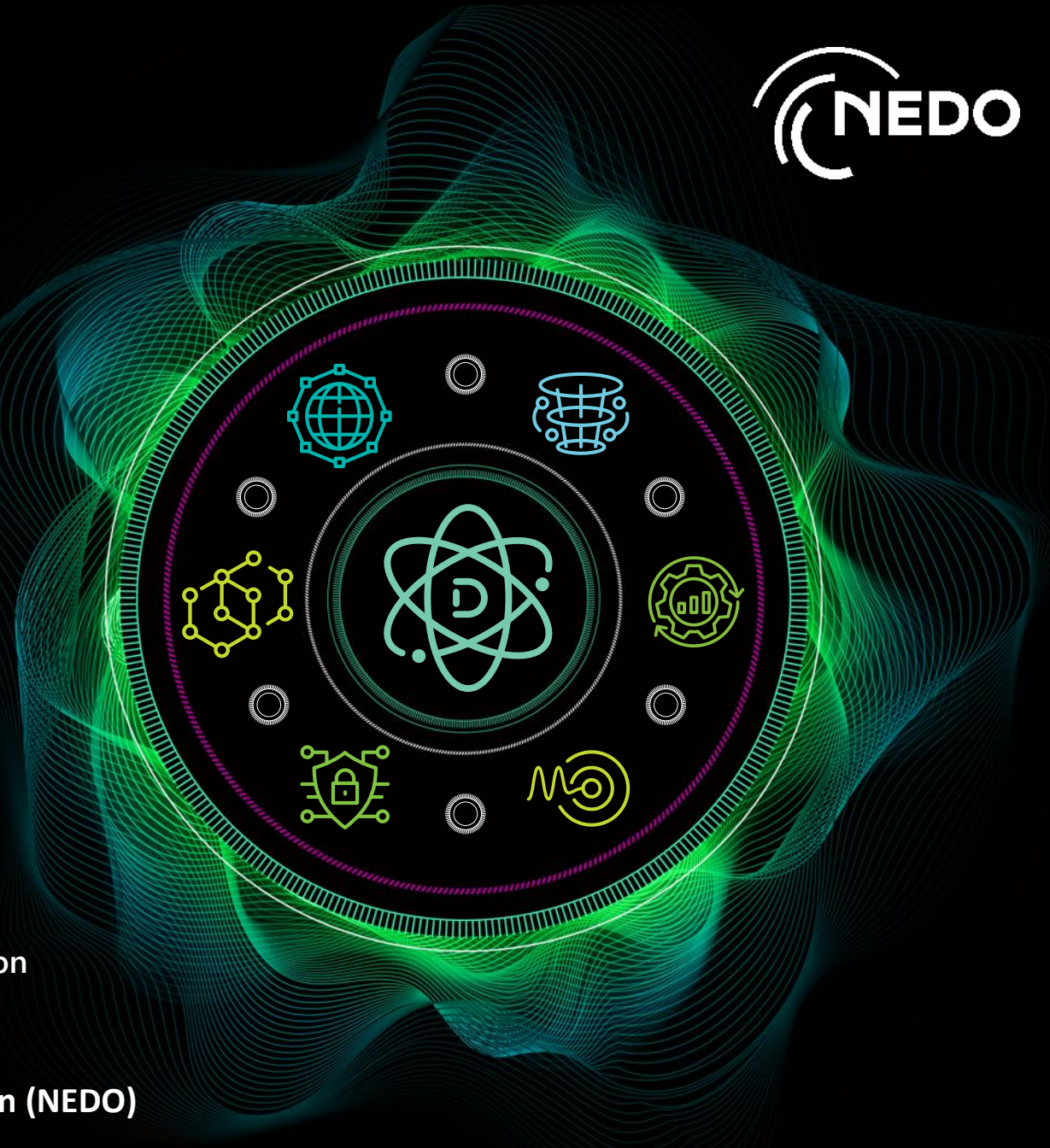
Quantum Computing Use Cases

Automotive Parts Production Planning Optimization

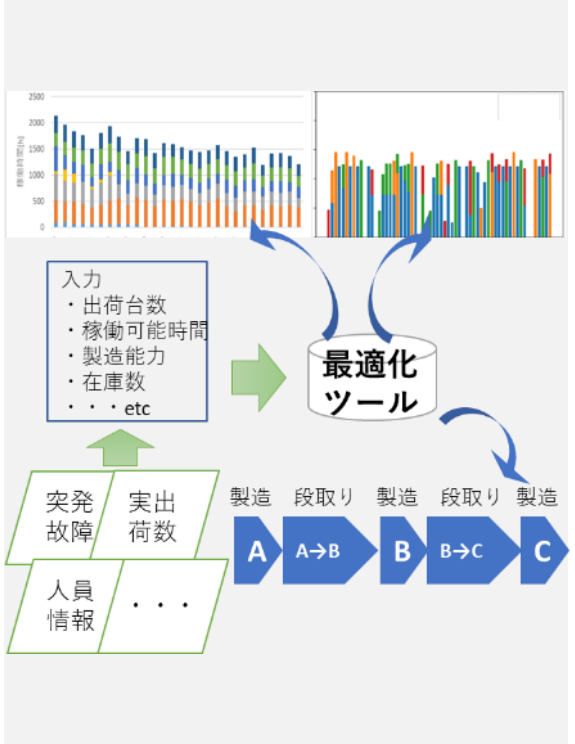


Combinatorial Optimization Problem

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New Energy and Industrial Technology Development Organization (NEDO)

【Hypothesis formulation】Automotive Parts Production Planning Optimization



Use Case Overview	Create a one-month production plan that accommodates multiple constraints—including part-specific shipment schedules and volumes, available production equipment, and storage capacity limits—while remaining resilient to unexpected equipment failures.
Issues to be addressed and their effects	• Develop production plans that prevent stockouts while satisfying all operational constraints • Reduce planning effort by transitioning from manual planning to automated planning • Reduce CO_2 emissions by maximizing production output while minimizing equipment utilization
Contributions of quantum technology	As the number of parts, production resources, shipment schedules, and other constraints increases, combinatorial complexity grows rapidly, making the problem difficult for conventional optimization solvers to find optimal solutions within a practical timeframe. Quantum (inspired) computers enable production plans to be generated within practical time limits.

Expected realization period	2028
Industry classification	Manufacturing
Related QRAMI layers	Production Planning
Related quantum technologies	Quantum Inspired Computer

Novelty	Low
Difficulty of achievement	Mid
Social contribution level	Mid
Market size	Manufacturing Production Planning Solutions MarketProjected Market Size in 2028: USD 1.7 Billion

Detail

Automotive Parts Production Planning Optimization

Key Challenges

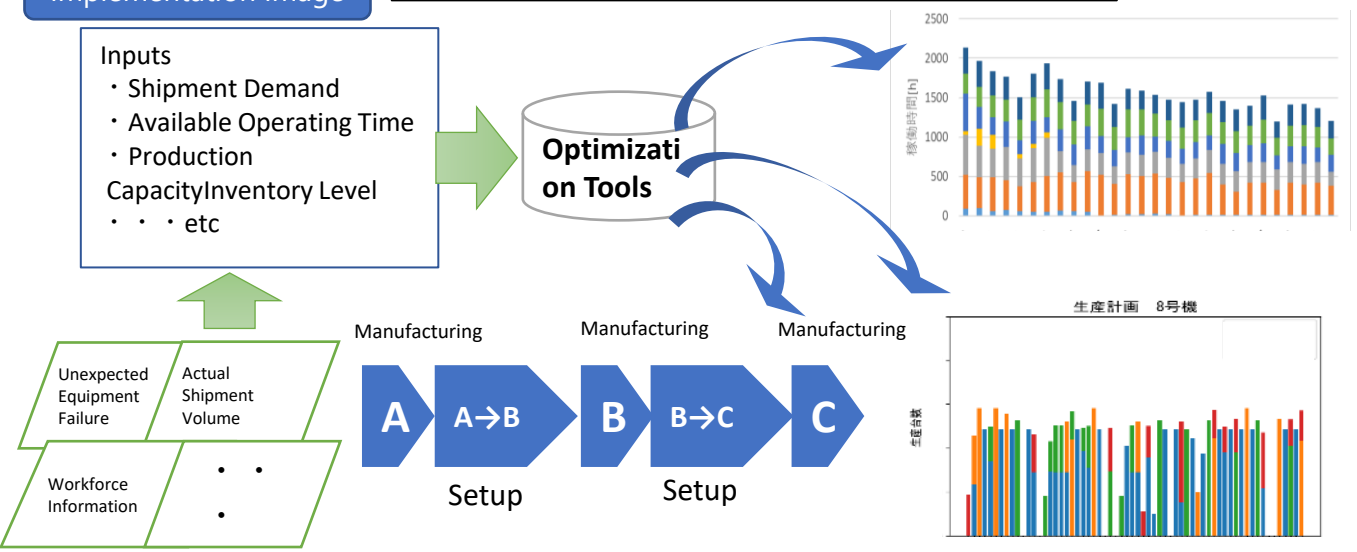
- Develop a one-month production plan that satisfies complex constraints while preventing stockouts

Overview of the Use Case

- Develop production plans that are infeasible to compute within practical timeframes using exhaustive combinatorial search due to combinatorial explosion
- Develop production plans that satisfy constraints such as part-specific shipment schedules and quantities, available production equipment, and storage capacity limits, while remaining resilient to unexpected equipment failures

Implementation Image

Target Realization Date: 2028



Expected Benefits

- Reduce planning effort through the automated generation of one-month production plans
- Reduce CO_2 emissions by maximizing production output while minimizing equipment utilization

Action Plan

QRAMI	Action
Business	Delivery Planning Solution
Function	Delivery Planning Software
Information	Expertise in Formulating Operational Constraints and Objectives
Integration	Factory DX (Digital Transformation)
Asset	Quantum-Inspired Computer

More use cases are available on our website. We invite you to explore them.
https://www.quantum-computing-use-cases.nedo.go.jp/english/

More Use Cases

New Energy and Industrial Technology Development Organization (NEDO)
AI and Robotics Department (e-mail: quantum_ai@ml.nedo.go.jp)

This collection of use cases was obtained as a result of the work commissioned by the New Energy and Industrial Technology Development Organization (NEDO) "Cyber-Physical Development Business of Quantum/Classical Hybrid Technology/Study of Use Case of Quantum Technology" and the “Post-5G Information and Communications System Infrastructure Reinforcement R & D Project (Quantum Industrialization)/Comprehensive Study for Promoting the Industrialization of Quantum Computers ”.