Introduction

Building a more efficient, sustainable future for maritime shipping

The maritime industry, and the larger global ecosystem it feeds, is undergoing disruptive change. Facing an array of regulatory, environmental and social challenges, shipping and related supply chain organizations face mounting pressure to become more efficient and sustainable. The key to accomplishing this: digital transformation. That is, using digital technologies to operate more efficiently and make smarter, data-driven business decisions. But today, most stakeholders in this sector lag well behind other industries in bringing new digital approaches to their business processes.
Fujitsu is helping organizations across the maritime supply chain ecosystem apply digital tools and insights to their most pressing business and operational challenges. With a wide range of digital capabilities—predictive and prescriptive analytics, artificial intelligence, quantum-inspired computing, optimization services and more—maritime organizations can operate far more efficiently and sustainably. They can advance the well-being of their people, their communities and the environment, while strengthening the economics of their business for the future.

An industry under pressure

The maritime sector represents a vast, ancient industry that has played a central role in human societies for centuries. Indeed, the interaction among stakeholders across the maritime supply chain ecosystem—cargo carriers, port and terminal operators, railways and truck fleets—acts as the engine that keeps the global economy running, providing roughly 90 percent of the goods and raw materials we use every day.1

As the industry moves into the next decade, however, it faces significant challenges. While other industrial sectors begin to see the fruits of their investments in digital transformation, many parts of the maritime supply chain ecosystem still rely on antiquated, increasingly unsustainable processes. In many cases, the industry is struggling with:

• A reliance on unrefined bunker fuel that has made maritime shipping one of the biggest contributors to air contaminants and a global carbon footprint. In fact, the 15 largest cargo ships emit more pollution annually than all the world’s passenger vehicles combined.ii Shipping also contributes significant noise pollution in global waterways, impeding the feeding and reproductive cycles of whales and other endangered marine wildlife.

• Wasted Capacity: As critical as marine shipping is to every commercial sector, the industry is still far less efficient than it could be, with significant wasted capacity. Cargo ships, for example, spend approximately 40 percent of their time sitting idle in port. Even at sea, vessels spend 40 percent of their time in ballast due to trade imbalances or lack of suitable cargo.iii These inefficiencies extend across the supply chain, from the truck and rail systems that feed into ports, to the terminals loading and unloading ships, to the allocation of human beings and equipment. The result is higher costs for everyone in the value chain—ship operators, cargo owners, charterers and consumers alike.

• Analog Approaches: For a variety of reasons—industry fragmentation, inertia, resistance to change in businesses that continue to be profitable—marine shipping has been painfully slow to adopt digitalization to help address these concerns. While individual stakeholders (port and terminal operators, logistics companies, trucking fleets) have made isolated attempts to exploit digital technologies and data strategy, the industry as a whole remains far behind other sectors.

For now, these challenges have not translated to a significant drag on the bottom line. But the pressures—economic, social, environmental, regulatory—to implement concrete industrywide change continue to mount. For example, new regulatory regimes like the United Nations’ International Maritime Organization (IMO) 2020 regulations place stiff new requirements on vessels to drastically reduce greenhouse gas emissions by 2050 and use cleaner (and more expensive) fuel.iv

If maritime supply chain organizations want to move to more profitable, sustainable operational models, they must become significantly cleaner and more efficient. To do this, they need to start taking better advantage of digital transformation and data-driven decision-making, and accelerate digital initiatives currently under way.
Digitizing and optimizing across the maritime value chain

Fujitsu is working with stakeholders across the shipping and supply chain ecosystem to implement new digital capabilities and reimagine maritime operations. We offer an unmatched portfolio of intellectual property and services in data analytics, artificial intelligence (AI), quantum-inspired computing and other emerging digital domains. We can help you harness these new digital capabilities to transform your business.

At the same time, as a global leader in using technology to promote a more ethical, sustainable future, we are empowering maritime organizations to pursue innovation in socially and environmentally responsible ways. Across every stage in the journey of cargo and raw materials—from rail and truck distribution to terminal and port operations to marine shipping—we can help you strengthen your bottom line while advancing the well-being of people and our environment.

**Figure 1. Advanced Technologies can be Applied to Multiple Use Cases Across the Supply Chain**

Optimizing maritime shipping

Using Fujitsu digital solutions and services, marine carriers can reinvent shipping operations to become cleaner, safer and more efficient. Our industry-leading solutions include:

- **Vessel Fuel Optimization**: The International Maritime Organization (IMO) has mandated that, effective January 1, 2020, vessel operators immediately begin moving to low-sulfur fuel—a global transition that analysts estimate will cost billions of dollars. In this landscape, maritime firms cannot afford to continue business as usual. Fujitsu’s Vessel Fuel Optimization (VFO) solution can help shipping firms identify the fastest, most efficient route for any voyage and generate immediate, substantial fuel savings. VFO uses artificial intelligence to analyze a vessel’s past performance and correlate those insights with meteorological and hydrographic forecasts. It then provides prescriptive analytics in the form of detailed recommendations and waypoints for the optimal route. This guidance can reduce fuel consumption by 5 to 10 percent, saving millions of dollars annually for a large vessel while reducing greenhouse gas emissions.

- **GIS Maritime Awareness**: We are helping public- and private-sector organizations harness new Geographic Information System (GIS) technologies to make the world’s waterways safer and allow marine carriers to
work in harmony with local communities. Working with the government of Canada, for example, Fujitsu is developing a solution for First Nation coastal communities to track real-time information about vessels in their adjacent waters. By understanding where vessels are going and what they are carrying, these communities can improve the safety of their own fishing and marine activities and play a larger role in responding to accidents or spills.

**Improving port efficiency**

Ports and terminals are immensely complex operations, coordinating a broad spectrum of activities from directing vessels to the right berth, optimally loading and unloading cargo, scheduling rail and truck distribution and more. With so many tightly interconnected activities, even small inefficiencies can have ripple effects that cause substantial, expensive delays.

Drawing on advanced Fujitsu computing, analytics and AI capabilities, port operators are reinventing terminal operations. Our Digital Annealer quantum-inspired computing, for example, can solve some of the toughest combinatorial optimization problems—problems that require juggling hundreds or thousands of variables, that conventional computers cannot even approach. Port and terminal operators can use these tools to optimize berth planning, loading and unloading, crane and gate operations, rail and truck fleet scheduling and more. Solutions include:

- **Intelligent Berth Planning:** Ideally, ships arriving in port would be allocated a berth immediately. In practice, many ships get sent back out to sea to wait for an available spot—continuing to consume expensive fuel and generate noise pollution and greenhouse gases that negatively impact coastal communities. Fujitsu can help port and terminal operators visualize key real-time metrics (berth arrival times, vessel docking duration and utilization) to move more vessels into berths more quickly.

- **Port Operation Optimization:** Most terminal operators still rely on antiquated and labor-intensive processes to coordinate the operation of gantry cranes, gates and vehicles. Now, they can use Fujitsu Digital Annealer to optimize scheduling and maximize the use of available resources. By better coordinating port activities and scheduling, they can increase overall throughput—reducing waste while significantly improving the bottom line.

**Strengthening rail and truck fleet operations**

At the heart of the world’s distribution infrastructure, port terminals are closely interlinked to the truck fleets and rail systems that move billions of tons of goods and raw materials. As a result, even incremental improvements in cargo unloading, logistics and distribution can have a significant financial and environmental impact. Terminal and railway operators, as well as fleet shipping and logistics companies, are working with Fujitsu to take advantage of digital innovations such as:

- **Truck Scheduling Optimization:** Slow loading and unloading forces ships to stay in dock longer—and keeps other ships anchored at sea longer—wasting resources and increasing costs and carbon emissions across the supply chain. With Fujitsu's Digital Annealer, terminal and fleet operators can calculate a near-optimal schedule for trucks to unload containers and optimize traffic lights and gate operations. Today, operators in Japan, Germany and other major port locations are seeing a 25 percent increase in the number of containers delivered and a 35 percent reduction in total truck distance traveled.

- **Rail and Vessel Inspections:** Rail lines and vessels require regular inspections to ensure that rails, joints and welds are free from defects and safe for use. Today, these inspections are largely manual—and slow and expensive as a result. Fujitsu is helping rail and vessel operators use AI-based image recognition to dramatically accelerate these processes. Using Fujitsu Advanced Image Recognition (F|AIR) technology, these companies are automating the analysis of vast quantities of 3D images to perform non-destructive
testing (NDT). They are driving inspection times down from days to minutes, while empowering companies to identify problems earlier and eliminate the risk of human error.

Allocating people and resources more efficiently

Organizations across the supply chain ecosystem—vessel operators, terminal operators, truck fleets and logistics firms—spend most of their time making sure that the right people and equipment are in the right place, at the right time, to keep operations running. Today, those decisions are largely manual, based on juggling spreadsheets and making decisions based on who or what looks to be available.

These types of logistical problems are among the hardest mathematical equations to solve, with *quintillions* of possible solutions. The mathematics needed to find the quickest, most cost-effective allocation is well beyond what the fastest conventional computing systems can provide. But they are perfectly suited to Fujitsu’s Digital Annealer quantum-inspired computing.

Fujitsu’s Digital Annealer is the only solution in the industry that can tackle the most challenging scheduling and logistics problems—up to 10,000 times faster than industry-standard computing. Maritime and supply chain companies can calculate, in real time, the optimal schedule and logistics for employee assignments, asset allocation, loading/unloading, distribution and more. As a result, they can dramatically reduce costs and delays and generate new revenues by utilizing resources that would otherwise sit idle.

Conclusion

Fujitsu: your partner in digital transformation

Ready or not, digital transformation is coming to the maritime and supply chain industry. As new regulations come into force and social and environmental pressures mount, the success of your organization—and the stability of your financials—will depend on your ability to capture and exploit digital insights. Fortunately, you do not have to navigate this journey on your own.

As one of the world’s most experienced and respected ICT companies, Fujitsu has a long history of working with customers at all stages of technological maturity to embrace digital innovation. Drawing on experience gained from multiple Digital Annealer use cases, thousands of AI and analytics projects and one of the world’s largest AI patent portfolios, we can help you reinvent your operations.

Only Fujitsu can provide:

- **Quantum-inspired computing:** By tackling the world’s most challenging logistical problems, Fujitsu’s Digital Annealer delivers dramatic improvements in resource utilization and operational efficiency that companies relying on conventional computing solutions cannot approach.

- **Human-centric AI:** Fujitsu’s industry-leading AI strategy has kept human beings front and center in the development of new AI capabilities for more than 30 years. Our Zinrai Human Centric AI portfolio focuses on removing bias, increasing transparency and delivering ethical AI-based solutions that empower workers, businesses and society.

- **Proven commitment to sustainability:** Fujitsu is a global leader in harnessing technology to promote environmental sustainability and social responsibility. We have been a leader on the Dow Jones Sustainability World Index for 20 years, with a proven track record of helping organizations in dozens of industries reduce their carbon footprint and environmental impact, while strengthening their business.

- **Real-world results:** Fujitsu is working right now with public- and private-sector stakeholders across the maritime supply chain ecosystem to reimagine their operations. We have delivered AI and non-destructive testing solutions to maritime customers on four continents and 10 countries, conducted hundreds of Digital Annealer proofs-of-concept, and identified numerous use cases. We are a global leader in applying GIS
technology to maritime use cases and are setting the industry standard for reducing vessel fuel consumption and greenhouse gas emissions.

Let Fujitsu help you apply digital innovation to solve your most pressing business and technical challenges. No matter how your organization operates today, we can help you build a cleaner, safer and more efficient supply chain for the future.

Find out more

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