

# Is Quantum Optimization a Fit for Your Business?

**A Practical Guide for Enterprise Leaders**



# The Toughest Business Challenges Are Only Getting Harder To Solve

Across industries, companies face tighter margins, limited time, and rising operational demands. Supply chains are more interconnected and fragile. Energy grids are more dynamic. Labor constraints are real. Customer expectations continue to rise. At the same time, businesses are generating more data than ever before.

## The Common Thread? **Complexity.**

Many of today's most important business decisions involve balancing thousands—or even millions—of variables at once.

- Which routes should we assign to drivers to reduce fuel use and delivery times?
- How do we schedule crews while meeting regulatory and union constraints?
- How should we allocate capital or resources when changes in demand or supply occur?
- How do we recover from disruptions to a previous schedule or supply plan?
- How do we optimize energy flows across a distributed grid?



These are not simple spreadsheet problems. They are large-scale optimization challenges that can stretch even the most advanced classical computing systems. In fact, a Wakefield Research report found 81% of business leaders surveyed believe they have reached the limit of the benefits they can achieve through optimization solutions running on classical computers.

### Traditional approaches often rely on:

- Heuristics (good-enough rules of thumb)
- Simplified models that leave out real-world constraints
- Long compute times that limit how often decisions can be made or refreshed

## The Result?

Many organizations settle for “good enough” when better outcomes may be possible, including increased profitability, time to value, productivity, and sustainability.

**This is where quantum computing enters the conversation.**

# The Real Cost Of Complexity:

## Time, Energy, And Missed Opportunity

When we talk about “hard problems,” we often mean optimization problems where the number of possible solutions grows exponentially as the problem scales.

As complexity increases, organizations typically face tradeoffs in several key areas.

### 1. Time

Large optimization models can take hours or even days to run. In fast-moving environments like logistics, energy markets, or retail, that delay can limit responsiveness.

### 2. Energy and Compute Resources

Massive computations consume significant infrastructure resources. As workloads scale, so do costs; both financial and environmental.

### 3. Business Opportunity

Perhaps most importantly, limited computational capacity can hamper growth.

When teams know a certain optimization model will take too long to run, they often narrow the scope before the work even begins.

Teams may:

- Reduce model size
- Simplify constraints
- Run fewer scenarios

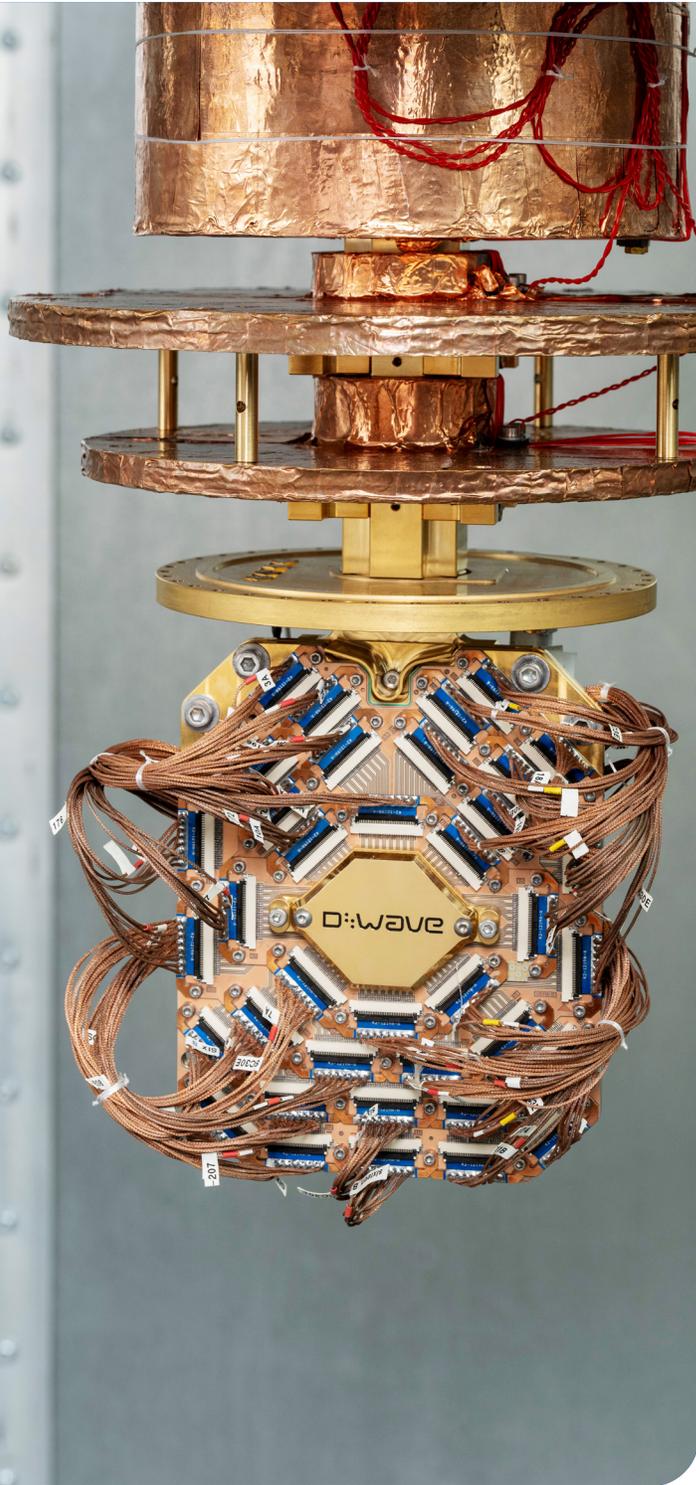
Over time, these compromises can limit insight and innovation, potentially leaving meaningful operational improvements and competitive advantages unexplored.

Quantum computing, particularly annealing quantum computing, can explore large solution spaces in new ways. In certain optimization contexts, this approach can help organizations evaluate complex combinations more efficiently or find higher-quality solutions within practical time limits.

**The opportunity is not to replace classical systems but to expand what's possible.**



# The Advantages of Using Quantum Computing



When quantum computing is applied to the right problems, organizations can explore gains in a variety of areas.

## Improved Solution Quality

Some optimization problems involve trade-offs across many competing objectives.

Quantum approaches may help uncover better combinations that classical-only or legacy approaches can miss.

## Faster Iteration

In environments where decisions must be recalculated frequently, such as dynamic routing or energy dispatch, faster solution cycles can enable more agile operations. When plans can be recalculated quickly, organizations can respond to changing conditions, disruptions, or new constraints without significant delays. The ability to re-plan in near real time can help teams maintain performance and continuity.

## Scenario Exploration

Being able to evaluate more “what-if” scenarios can strengthen planning and resilience. When organizations can test a wider range of outcomes, they gain a clearer view of risks, trade-offs, and potential opportunities before committing resources. This broader visibility can support more confident decision-making and help teams prepare for uncertainty with greater agility.

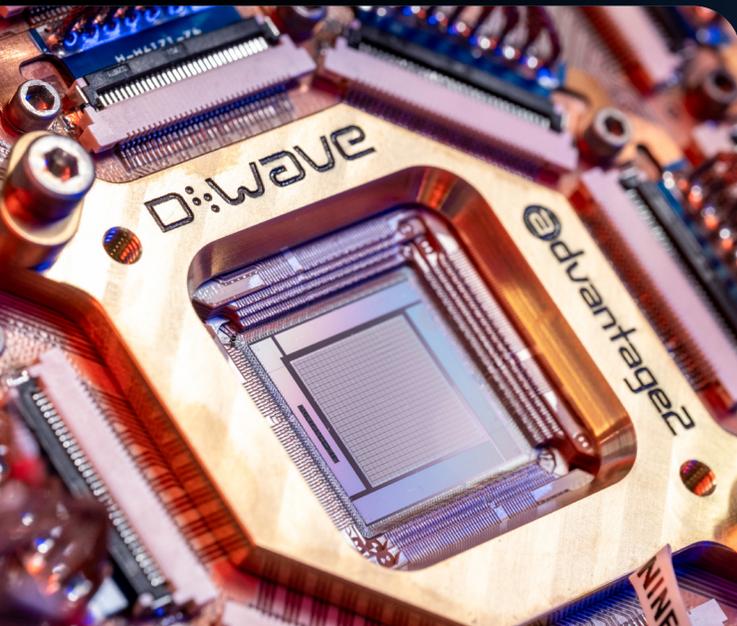
## Competitive Differentiation

Organizations that learn how to integrate quantum optimization technologies early may develop operational advantages that compound over time.

# The Advantages of Using Quantum Computing

Quantum computing has been discussed for decades, often framed as a future breakthrough. But in recent years, the conversation has shifted from theory to application. From hypothetical to in-production. **Why now?**

- 1. Technical Readiness:** Decades of research and technical advancements have led to the development of annealing quantum computers capable of solving real-world optimization problems today.
- 2. In-Production Results:** Organizations across industries have moved beyond experimentation to deploy applications in live environments, achieving improvements in scheduling speed, resource utilization, response times, and operational efficiency.
- 3. Flexible Access:** Quantum systems are available today through the cloud. For those organizations that want a higher degree of control, quantum computers can be purchased and deployed on-premises as well.
- 4. Hybrid Approaches:** Modern quantum solutions often combine classical and quantum techniques, making them more practical and business-ready. Quantum computing is not a replacement for existing systems, but an extension of the broader optimization engine.
- 5. Business Complexity:** The need to solve increasingly intricate and challenging optimization problems is accelerating at a rapid pace.
- 6. Ecosystem Development:** Tooling, APIs, and professional services have evolved to help organizations explore quantum in a structured way. No Ph.D. required.



In other words, quantum computing has moved beyond experimentation. For many business problems, especially optimization problems, it is now a viable real-world solution.

That doesn't mean it's the right fit for every use case. But it does mean it's worth a serious look, especially if complexity is becoming a competitive bottleneck within the organization.

**That's why identifying the right quantum question is critical.**

# Good Quantum Problems vs. Poor Quantum Problems

One of the most important steps in determining quantum fit within an organization is understanding which problems are worth exploring.

## Good Quantum Problems

Quantum computing is often well-suited to:

- Large-scale combinatorial optimization problems
- Scenarios with many interdependent constraints
- Problems where solution quality improves business outcomes in measurable ways
- Use cases where classical-only methods struggle as scale increases

These problems typically involve selecting the best combination from a vast number of possibilities.

## Poor Quantum Problems

Quantum computing may be less appropriate when:

- The problem is small and already solved efficiently with classical methods
- The challenge is primarily data collection, not optimization
- The business case is unclear or not measurable
- The organization lacks the necessary data infrastructure



Examples of good quantum problems involve selecting the best combination from a vast number of possibilities. This includes vehicle routing and logistics optimization, where organizations must balance routes, time windows, and costs across large networks. Other strong candidates include workforce scheduling, supply chain design, and portfolio optimization, all of which involve managing many interdependent variables and constraints.

**In short, quantum is not a magic wand.** It is a powerful tool when applied to the right problems. The key is aligning it with problems where complexity is the limiting factor and where improvement has meaningful business impact.

## Start Here:

# Preparing Your Data For Quantum

Even the most advanced quantum system cannot deliver meaningful results without strong, reliable data. Quantum computing can enhance how complex problems are solved, but it cannot fix gaps, inconsistencies, or unclear objectives in the underlying information. The foundation for impact must come from the organization itself through well-structured data, clearly defined constraints, and measurable business goals.

**Before exploring quantum, organizations should consider:**

- Is the data structured and accessible?
- Are constraints clearly defined?
- Are objectives measurable?
- Is there historical data available to validate improvements?

Quantum solutions do not operate in isolation. They rely on strong data pipelines, clearly defined inputs, and well-understood business rules.

## Preparing Your Data For Quantum Optimization

Organizations looking to increase the potential impact of quantum computing can begin by strengthening the data foundation behind their optimization models:

- Organize and structure key operational data so it can be easily accessed and used in optimization models
- Ensure consistency across datasets, especially for variables such as demand, capacity, timing, and resource availability
- Clearly define constraints and inputs so business rules can be translated into optimization models
- Establish reliable data pipelines that can support regular updates and scenario testing
- Maintain historical datasets that can be used to validate results and measure improvement

Data maturity is often a stronger predictor of success than technical sophistication alone. Organizations with clean, well-structured, and accessible data are typically better positioned to test, validate, and scale advanced optimization approaches, including with quantum.

# A Practical Recipe For Success

Once data is structured, constraints are clearly defined, and objectives are measurable, organizations are better positioned to evaluate new approaches. From here, companies tend to follow a structured path for exploring and deploying quantum solutions.

## 1. Identify a High-Value Use Case

Start with a well-defined optimization problem where improvement can be quantified—cost savings, time reduction, resource efficiency, or revenue impact.

## 2. Validate Problem Fit

Determine whether the structure of the problem (the number of variables, constraints and objectives) makes it a strong candidate for quantum optimization.

## 3. Run A Proof of Concept

Test quantum and hybrid approaches on a contained version of the problem. Compare against classical baselines.

## 4. Measure and Refine

Evaluate results objectively. Where did performance improve? Where did it not? Iterate.

## 5. Scale Thoughtfully

If value is demonstrated, integrate the solution into operational systems through cloud APIs.



This measured approach reduces risk and builds internal confidence.

It also ensures that quantum exploration remains grounded in business outcomes—not hype.



# Real-World Use Cases for Quantum Computing

Quantum computing adoption is growing, and organizations are already exploring building and deploying practical applications across industries.

## Manufacturing And Supply Chain

Determining production schedules, facility locations, and inventory strategies under uncertainty is a complex optimization challenge for many manufacturers and supply chain leaders. Advanced optimization approaches can help organizations evaluate more variables and constraints at once, supporting more efficient production planning, improved resource utilization, and better alignment between supply and demand.

## Logistics And Routing

Optimizing delivery routes with constraints such as traffic, time windows, fuel consumption, and driver availability. Even small percentage improvements can translate into significant cost savings at scale.

## Workforce Scheduling

Balancing employee preferences, regulatory requirements, skill sets, and coverage needs is a complex challenge for many organizations. More efficient scheduling can help organizations control labor costs, improve coverage, and support better employee satisfaction and retention. More efficient schedules can improve both cost control and employee satisfaction.

## Resource Scheduling

Coordinating the allocation of limited assets such as equipment, production lines, vehicles, crews, or facilities across competing priorities. Optimized resource scheduling can reduce downtime, improve utilization, and increase throughput without adding new capacity.

## Energy And Grid Optimization

Managing energy distribution across complex networks with fluctuating demand and renewable inputs. Better optimization can support grid reliability and efficiency.



# Customer Stories:

## Quantum Computing In Action

Real-world impact is what ultimately matters. While every organization's journey is different, several enterprises have already explored how quantum optimization can address practical, high-value challenges.

### **BASF:**

## Accelerating Manufacturing Scheduling

BASF, one of the world's leading chemical companies, partnered with D-Wave to complete a proof-of-concept project exploring how hybrid quantum optimization could improve manufacturing workflows in a liquid-filling facility. The site processes and fills a large number of bottles each month across multiple products, requiring tightly coordinated operations from the arrival of liquid tanks to final shipment. Even small delays can disrupt schedules, increase costs, and impact delivery timelines.

Together, the teams developed and tested a hybrid quantum application in a real-world production scenario to optimize task scheduling and tank assignments while meeting business and quality requirements. The application focused on minimizing setup time between product changes, reducing tank unloading durations, and lowering overall product lateness relative to due dates. The hybrid quantum solution reduced projected scheduling time from 10 hours using an industrial-grade classical solver to just 5 seconds.

Beyond speed, the application also delivered measurable operational improvements. Compared to BASF's existing optimization solution, the hybrid quantum approach:

- **Reduced lateness by 14%**
- **Cut setup times by 9%**
- **Shortened tank unloading durations by up to 18%**

These results demonstrate how hybrid quantum optimization can help manufacturers improve efficiency, accelerate decision-making, and better manage complex production environments.



## NTT DOCOMO: Reducing Network Congestion

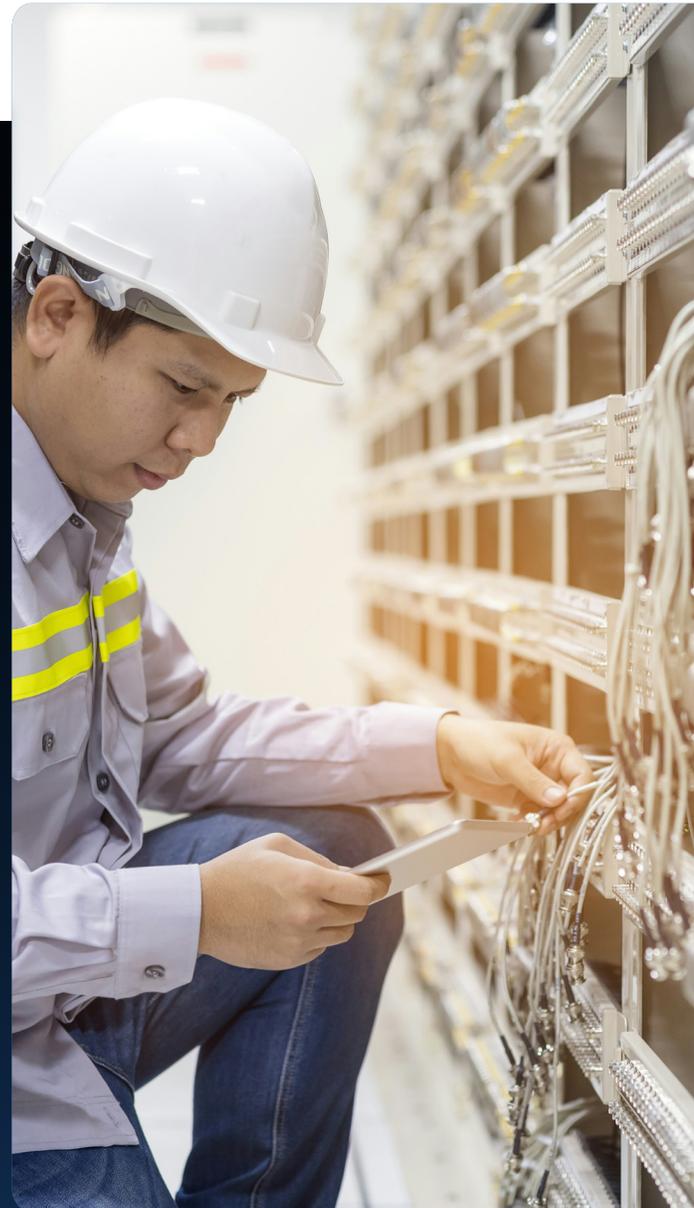
NTT DOCOMO, Japan's largest mobile operator with more than 90 million subscriptions, partnered with D-Wave to improve mobile network performance during peak usage periods. As network traffic increases with 5G expansion and rising consumer demand, managing congestion at base stations has become a complex optimization challenge.

Using D-Wave's hybrid quantum technology, DOCOMO optimized base station tracking areas to better manage paging signals and device movement between stations.

In pilot tests across several regions in Japan, the hybrid quantum solver completed an optimization task in 40 seconds compared to 27 hours using a general-purpose classical solver, resulting in:

- **Reduction in paging signals by 15% during peak calling times**
- **Approximately 1.2 times more devices to connect during periods of high demand**

These improvements demonstrate how quantum optimization can enhance network efficiency, reduce congestion, and potentially lower infrastructure costs, helping telecommunications providers maintain service quality as traffic volumes continue to grow.



## Pattison Food Group: Workforce Scheduling at Scale

Pattison Food Group, the largest purveyor of food and healthcare products in western Canada, partnered with D-Wave to optimize workforce scheduling for its growing e-commerce operations. During an influx of online orders, scheduling delivery drivers across more than 100 retail locations was a manual process handled by a team of three to four schedulers, requiring approximately 80 person-hours each week.

Working with D-Wave, Pattison Food Group developed a hybrid quantum-powered auto-scheduler capable of accounting for numerous constraints, including driver availability, store preferences, shift coverage requirements, and mandatory rest periods. Once deployed into production, the application:

- **Reduced weekly scheduling time from 80 hours to just 15 hours, representing an 80% time savings**
- **Consistently met a threshold of fulfilling at least 95% of e-commerce demand while ensuring drivers received schedules aligned with expectations**

This real-world deployment demonstrates how hybrid quantum optimization can streamline complex workforce coordination, deliver measurable ROI, and scale across large retail networks.



# D-Wave Launch Program: A Guided Path To Quantum

For many enterprises, the biggest challenge with quantum computing is knowing where and how to start.

The D-Wave Launch™ Program provides a structured, phased approach that guides organizations from early exploration to production deployment, with expert support at every step.

Here's a quick overview of the process:

## Phase 1: Problem Discovery

Identify and prioritize high-impact use cases and assess where quantum optimization could deliver measurable business value.

## Phase 2: Proof of Technology

Clarify the problem, build the first optimization model, and test initial results.

## Phase 3: Proof of Concept

Define solution requirements, build a production-ready formulation, and test performance against real-world data and classical benchmarks.

## Phase 4: Pilot

Run the solution in a live pilot environment, validate end-to-end data flows, and define a clear roadmap for full production deployment.

## Phase 5: In Production

Deploy the solution at full scale across production environments, supported by enterprise-grade quantum-computing-as-a-service (QCaaS) infrastructure and production service-level agreements (SLAs), with measurable business value tracked and realized.



Teaming up with D-Wave experts to execute this phased approach helps enterprises effectively evaluate quantum and focus on achieving measurable business outcomes from discovery through production.

# Moving Forward: Is Quantum Right For You?

## Quantum Computing is Not a One-Size-Fits-All Solution.

Quantum computing is not a one-size-fits-all solution. But for organizations facing growing complexity in optimization, it could offer a meaningful new capability.

The key questions to consider:

- Are your optimization problems becoming harder to solve at scale?
- Are classical methods limiting solution quality or speed?
- Would measurable improvements create competitive advantage?
- Is your data infrastructure ready to support advanced modeling?

If the answer to some of these questions is yes, **it is time to engage.**



## Connect with the D-Wave Team

Bringing quantum computing to your enterprise starts with a simple conversation.

The D-Wave team can help:

- Assess your current optimization landscape
- Identify strong candidate use cases
- Evaluate potential ROI
- Define a practical path forward

Our team provides hands-on, highly consultative support to help you harness the power of quantum computing right now. Together, we can turn your business complexities into opportunities.

[Request a meeting with the D-Wave team.](#)

## About D-Wave Quantum Inc.

D-Wave is a leader in the development and delivery of quantum computing systems, software, and services. It is the world's first commercial supplier of quantum computers, and the first and only to offer dual-platform quantum computing products and services, spanning both annealing and gate-model quantum computing technologies. D-Wave's mission is to help customers realize the value of quantum today through enterprise-grade systems available on-premises and via its Leap™ quantum cloud service, which offers 99.9% availability and uptime. More than 100 organizations across commercial, government, and research sectors trust D-Wave to address complex computational challenges using quantum computing.

Learn more about realizing the value of quantum computing today and how D-Wave is shaping the quantum-driven industrial and societal advancements of tomorrow: [www.dwavequantum.com](http://www.dwavequantum.com).

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