JAMI KIRAN KUMAR
GLOBAL EXECUTIVE PERSPECTIVE

INDEPENDENT TECHNOLOGY WHITE PAPER / AUGUST 2026

Beyond the Qubit Count.

The quantum-computing challenge nobody should ignore—and the questions leaders should ask before believing the next breakthrough headline.

REAL PROGRESS • REAL CONSTRAINTS • BETTER DECISIONS

Authored by

Jami Kiran Kumar

AI & Digital Transformation Executive

An independent technology perspective grounded in curiosity, transparency and business value.

THE CENTRAL ARGUMENT

Quantum progress is real. The headline metrics are incomplete.

A larger physical-qubit count does not automatically mean a more useful quantum computer.

Quantum computing is attracting significant investment and ambitious roadmaps. Yet the defining challenge is not merely manufacturing more qubits. It is keeping quantum information stable, connected and correct long enough to perform valuable computation.

01

Fragility

Quantum states are vulnerable to environmental noise and imperfect operations.

02

Overhead

Logical qubits require many physical qubits plus continuous error detection.

03

Usefulness

Commercial value depends on reliable computation—not hardware count alone.

The leadership takeaway

Evaluate quantum systems by computational scale, quality, speed, logical error rate and demonstrated advantage—not by physical-qubit announcements in isolation.

> “The milestone worth watching is not the largest machine. It is the first system that can deliver repeatable value while errors remain under control.”
> **— Jami Kiran Kumar**

QUANTUM INFORMATION IS FRAGILE

The race against noise

Qubits operate at physical limits where small disturbances can corrupt a calculation.

Decoherence

Heat, vibration, electromagnetic interference, imperfect gates and other disturbances can alter a qubit’s state. The resulting loss of quantum information is commonly described as decoherence.

Errors are more complex than classical bit flips

A classical bit is either zero or one. Qubits carry additional phase information, meaning quantum systems must handle more error types while avoiding direct measurements that would destroy the encoded state.

Why speed matters

Error detection, decoding and corrective operations must occur repeatedly and with very low latency. The system is constantly racing against accumulated noise.

Connectivity creates opportunity—and risk

Entanglement and qubit interaction are necessary for meaningful quantum algorithms. But every connection and operation creates another opportunity for error. Scaling is therefore not simply adding qubits; it requires controlling a rapidly growing system.

Physical qubit

The actual hardware element used to hold and manipulate a quantum state.

Logical qubit

Protected quantum information encoded across multiple physical qubits.

USEFUL COMPUTATION REQUIRES PROTECTION

One reliable qubit can require substantial infrastructure

Quantum error correction spreads logical information across physical qubits so errors can be detected without directly measuring the protected state.

The resource cost varies by architecture, physical error rate, error-correcting code and target logical reliability. Surface-code approaches can require hundreds or thousands of physical qubits for one highly reliable logical qubit. IBM has cited an illustrative honeycomb-code benchmark requiring approximately 7,000 physical qubits for a one-in-a-trillion logical error rate.

Context matters

The “up to 10,000 physical qubits for one logical qubit” claim should be treated as an illustrative scenario—not a universal conversion factor.

The threshold problem

Error correction becomes effective only when physical error rates fall below the relevant code’s threshold. Adding more imperfect qubits does not solve the problem if operations remain too noisy.

The scaling problem

- More protection generally requires more physical qubits.
- More qubits increase control, cooling and connectivity demands.
- Syndrome extraction and decoding must keep pace with the hardware.
- Error-correction operations can introduce additional errors.

Progress is meaningful

Researchers have demonstrated logical-error suppression as code size increases. The challenge is translating experimental progress into scalable, fault-tolerant systems.

PROTECTION IS NOT ENOUGH

Logical qubits must also compute reliably

A protected quantum state has limited value unless operations can be performed without magnifying errors.

Three continuous stages

Stage	Purpose	Operational challenge
Syndrome extraction	Indirectly gather information about possible errors.	Measurements and gates are themselves imperfect.
Decoding	Use classical computation to infer corrections.	Must operate accurately with extremely low latency.
Correction	Restore the encoded state or track the required correction.	Must avoid introducing or amplifying new errors.

Why “magic states” matter

Some operations required for universal quantum computing are especially difficult to implement fault-tolerantly. Magic-state preparation and distillation provide a route, but they introduce additional qubit and time overhead.

The hidden stack

A commercially useful quantum computer needs far more than a processor: cryogenic or precision hardware, control electronics, calibration, real-time decoding, compilers, algorithms and reliable classical integration.

Collaboration versus competition

Control hardware and software may become decisive differentiators. Limited sharing can protect commercial advantage, but it can also force organizations to solve similar foundational problems independently.

MOVE BEYOND ONE-DIMENSIONAL HEADLINES

Seven questions every decision-maker should ask

The right questions separate engineering progress from promotional scale.

1. **How many usable logical qubits are available?**
Physical count alone does not describe protected computing capacity.

2. **What are the physical and logical error rates?**
Ask whether logical reliability improves as the code scales.

3. **What error-correction method is used?**
The code determines hardware overhead, connectivity and decoding needs.

4. **What is the circuit depth or operational complexity?**
Useful work depends on how many meaningful operations can run reliably.

5. **Can the platform sustain fault-tolerant operations?**
Protected storage is different from protected computation.

6. **Has a commercially useful problem been solved better?**
Compare against the strongest relevant classical method—not a weak baseline.

7. **Are results independently reproducible?**
Transparent methods and validation create credibility.

A better scorecard

Scale + quality + speed + connectivity + logical reliability + application value + reproducibility.

OPTIMISM WITH DISCIPLINE

Potential should not be confused with production readiness

Quantum computing may become highly valuable infrastructure without becoming a general replacement for classical computing.

Where potential remains strong

- Materials and molecular simulation
- Chemistry and selected drug-discovery problems
- Specialized optimization
- Cryptanalysis and post-quantum security planning
- Scientific modelling

What leaders should do now

- Track logical capability, not only hardware announcements.
- Identify narrow problems with credible quantum advantage.
- Maintain classical baselines for comparison.
- Develop quantum literacy without committing to hype-driven timelines.
- Prepare cryptographic inventories and migration plans.

A portfolio approach

Treat quantum as a monitored strategic option: learn, experiment selectively, protect against cryptographic transition risk and demand measurable milestones before scaling investment.

> Innovation needs investment and ambition. It also needs transparency about limitations, measurable outcomes and honest communication about readiness.

My perspective

Quantum computing is not a lie. But a mature market must distinguish scientific progress, engineering readiness and repeatable business value. Those are related milestones—not interchangeable claims.

A TRUSTWORTHY TECHNOLOGY PERSPECTIVE

Sources, context and next conversation

An independent executive publication by Jami Kiran Kumar, August 2026.

Selected sources

Video inspiration: Tiff In Tech, “The Quantum Problem Nobody Wants to Admit,” YouTube, 2026.
youtube.com/watch?v=6Hj0MEV5_E0

IBM Quantum: “Building the future of quantum error correction.”
ibm.com/quantum/blog/future-quantum-error-correction

IBM Quantum: “What is fault-tolerant quantum computing?”
ibm.com/quantum/blog/what-is-ftqc

IBM Quantum: “How to measure the performance of a quantum computer,” 2026.
ibm.com/quantum/blog/hardware-metrics-2026

Nature Reviews Physics: “A series of fast-paced advances in Quantum Error Correction,” 2024.
nature.com/articles/s42254-024-00706-3

Important note

This publication is independent thought leadership. Estimates vary substantially by architecture, error rate, code and target reliability. It is not investment, scientific-validation or procurement advice.

Continue the executive conversation

I work at the intersection of AI governance, cyber resilience, enterprise architecture, sovereign innovation and digital transformation—helping leaders turn complex technology choices into trusted outcomes.

Jami Kiran Kumar
AI & Digital Transformation Executive
Visit my executive website: jamikiran-globalexcutive.online