Data as a Game-Changer in the Waste Industry

DSQ Technology

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Executive Summary

In the waste industry, companies have struggled with fragmented data spread across different systems. This "black box" perception has made it difficult for organizations in the waste management space to make informed, real-time decisions.

But the industry is at a turning point. Advancements in data modeling, automation, and AI are transforming unstructured information from invoices, contracts, emails, voice calls, and images into actionable insights.

The result is a shift from fixing problems to preventing them. Waste professionals are now able to uncover hidden inefficiencies, stabilize cash flow, improve customer satisfaction, and forecast operational needs with precision. In an environment where margins can be tight and service complexity is high, leveraging data is no longer optional — it is the differentiator that drives efficiency, profitability, and trust.

For decades, the waste sector has lacked the standardization common in other utilities like water, electricity, or gas. In those industries, data is measured in universally understood units — kilowatts, gallons, cubic meters. In waste, however, terminology, formats, and processes vary widely between haulers, regions, and even properties. A front-load container in one contract might be described with entirely different terminology in another, and contamination charges might be tracked with inconsistent naming conventions across vendors.

Executive Summary (Continued)

Fragmented Data

Single Source of Truth
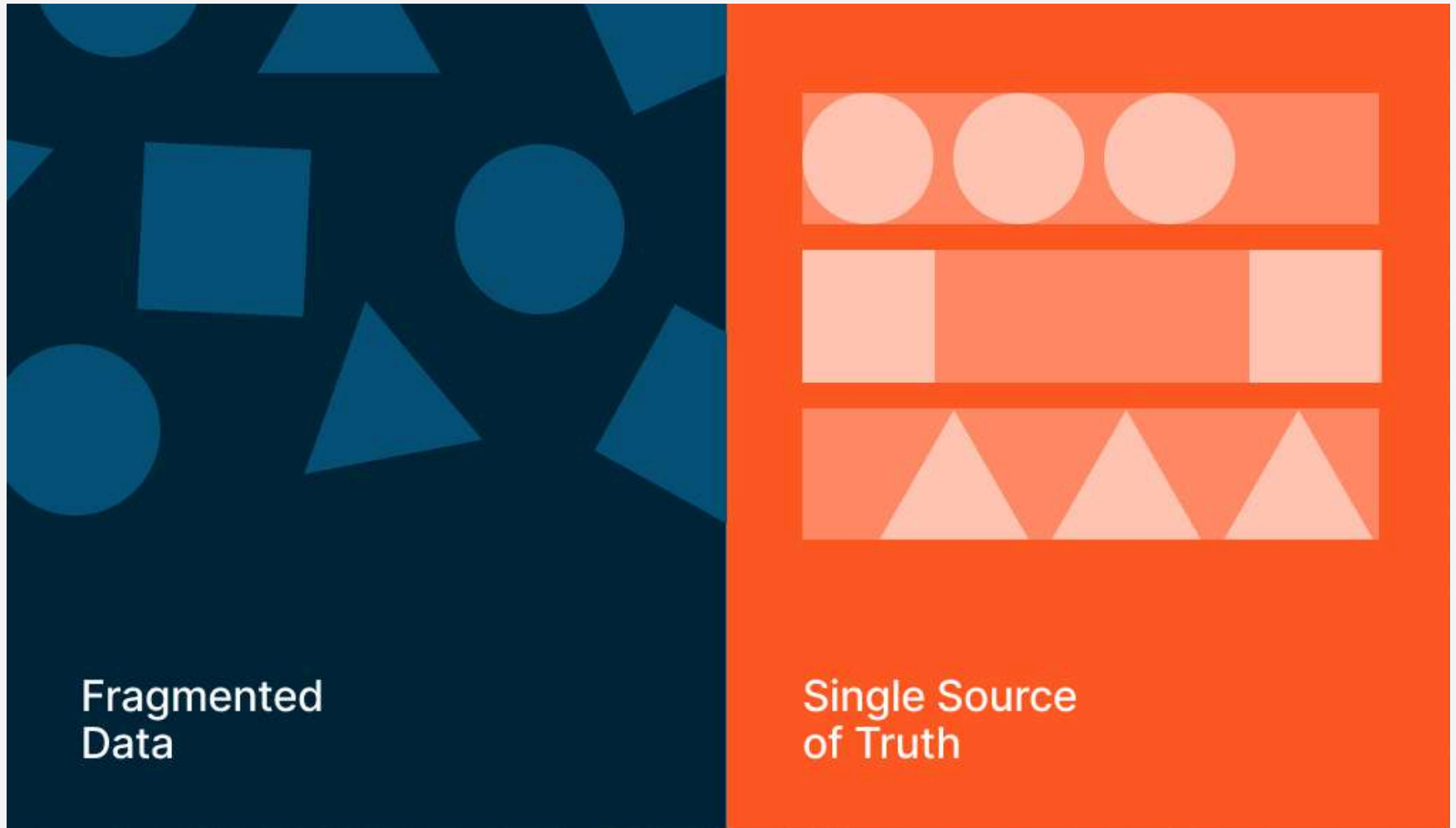
This lack of uniformity creates a **"black box"** environment where even seasoned professionals struggle to answer basic operational questions:

- *Why is one property's service cost higher than another's?*
- *Are these fees legitimate or errors?*
- *Are our vendors helping or hurting our business?*

Executive Summary

Without a unified language for data, the answers are slow to find, or finger-pointing becomes a common place – see it as "is my hauler messing me?".

A shift to **clarity** begins with establishing a **single source of truth:** a centralized data model designed to absorb diverse inputs and normalize them into a consistent framework. This model must account for both the obvious — like container types and service frequencies — and the nuanced, such as procurement workflow variations, client-specific restrictions, and exception handling processes.

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Unlocking Hidden Inefficiencies

When data is properly structured and accessible, it becomes a powerful lens for spotting inefficiencies that are otherwise invisible. This capability goes beyond identifying late pickups or billing discrepancies; it exposes systemic issues that impact costs, staffing, and service quality.

This mirrors a notable example where a company implemented new data tools not to eliminate jobs, but to redeploy staff toward more meaningful and strategic activities. Freed from mechanical and repetitive work, employees could focus on customer relationships, operational improvements, and revenue-generating initiatives. Rather than replacing staff, the technology increased organizational capacity while preserving institutional knowledge. Unified data systems improve both operations and employee satisfaction. By revealing hidden problems and making them actionable, companies save money while improving work environments.

Achieved through automation of invoice intake, verification, and processing.

88%
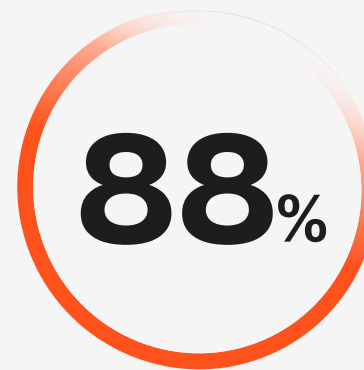
Faster invoice preparation

90%

Fewer missed bills

The Noise-to-Signal Breakthrough

In waste operations, data often arrives as a mix of clean, structured information and messy, unstructured inputs; emails with inconsistent tables, handwritten notes, call transcripts, and image files from truck-mounted cameras. Sifting through this "noise" to find actionable "signals" is one of the industry's greatest challenges.

The breakthrough comes from modern data processing pipelines that merge deterministic methods (clear, rule-based outcomes) with non-deterministic approaches like large language models (LLMs). Deterministic systems handle the straightforward — e.g., verifying charges against a contract. LLMs, repurposed for multimodal analysis, excel at interpreting irregular inputs such as images or audio recordings, identifying patterns that would be nearly impossible to code for manually.

The Noise-to-Signal Breakthrough

(Continued)

Case Study Example:
Compactor fullness monitoring illustrates the point. Traditional models could not reliably interpret noisy, edge-case data patterns, even though our team could quickly recognize them visually. By introducing LLM-based image analysis, we were able to classify these scenarios with high accuracy, predicting fill levels and scheduling hauls precisely — improving existing monitor technology.

This is the essence of the noise-to-signal transformation: systems that not only collect vast amounts of data but filter and elevate the most critical insights, enabling operators to act quickly and confidently. The result is more efficient routes, better service reliability, and reduced operational costs.

Noise → Signal Funnel

Raw Data/ Noise

LLM Image Analysis

Actionable Insights
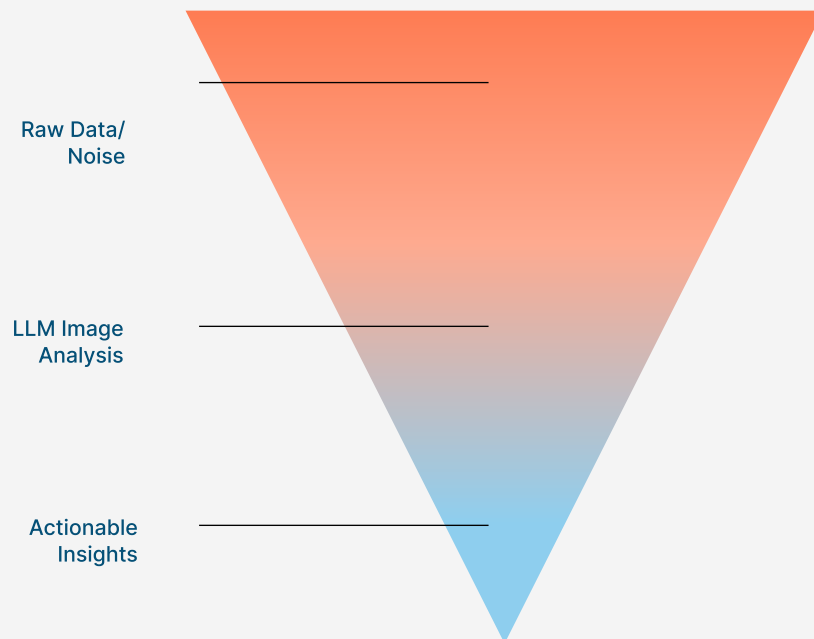
Classification Accuracy

60%

95%

Traditional Models

LLM Models
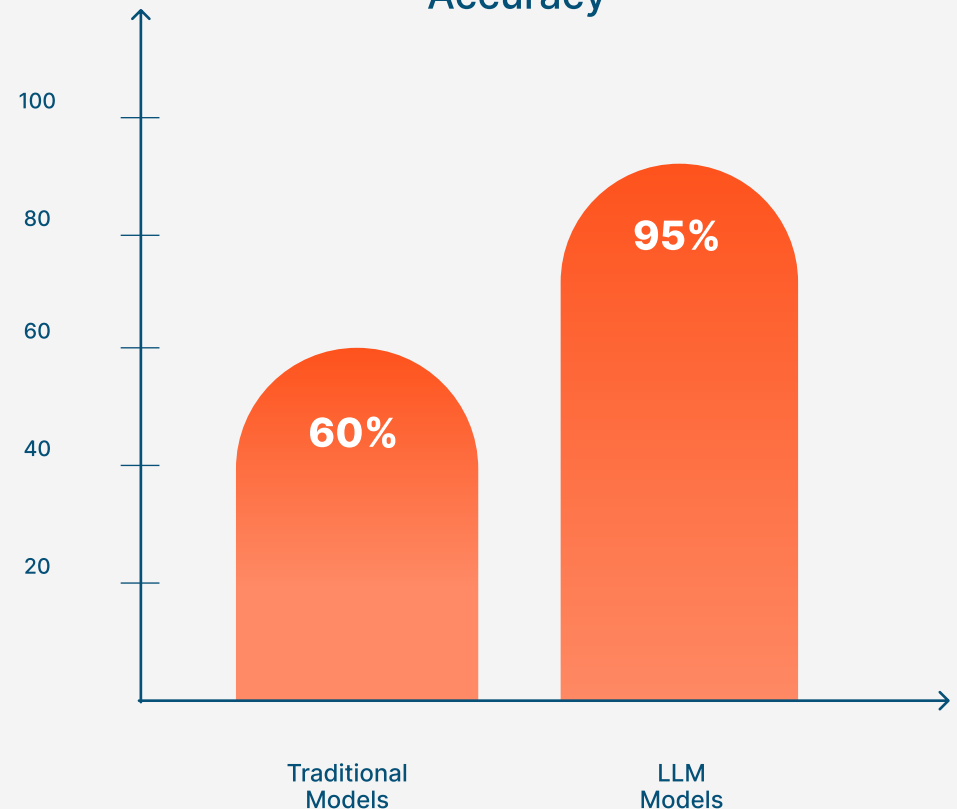
Broader Industry Success with Image-Based Predictive Maintenance

While waste hauling may be less charted than manufacturing, AI image analysis has already been proven in other sectors.

For instance, OdySight has deployed image-based AI predictive maintenance in factories to spot early signs of wear and equipment failure, minimizing unplanned downtime and saving maintenance costs.

Operational Impact:
Cash Flow, Credits, and Margins

+71% Increase

$400

$234

Credit Recovery ($)

450

400

350

300

250

200

150

100

50

Before   After
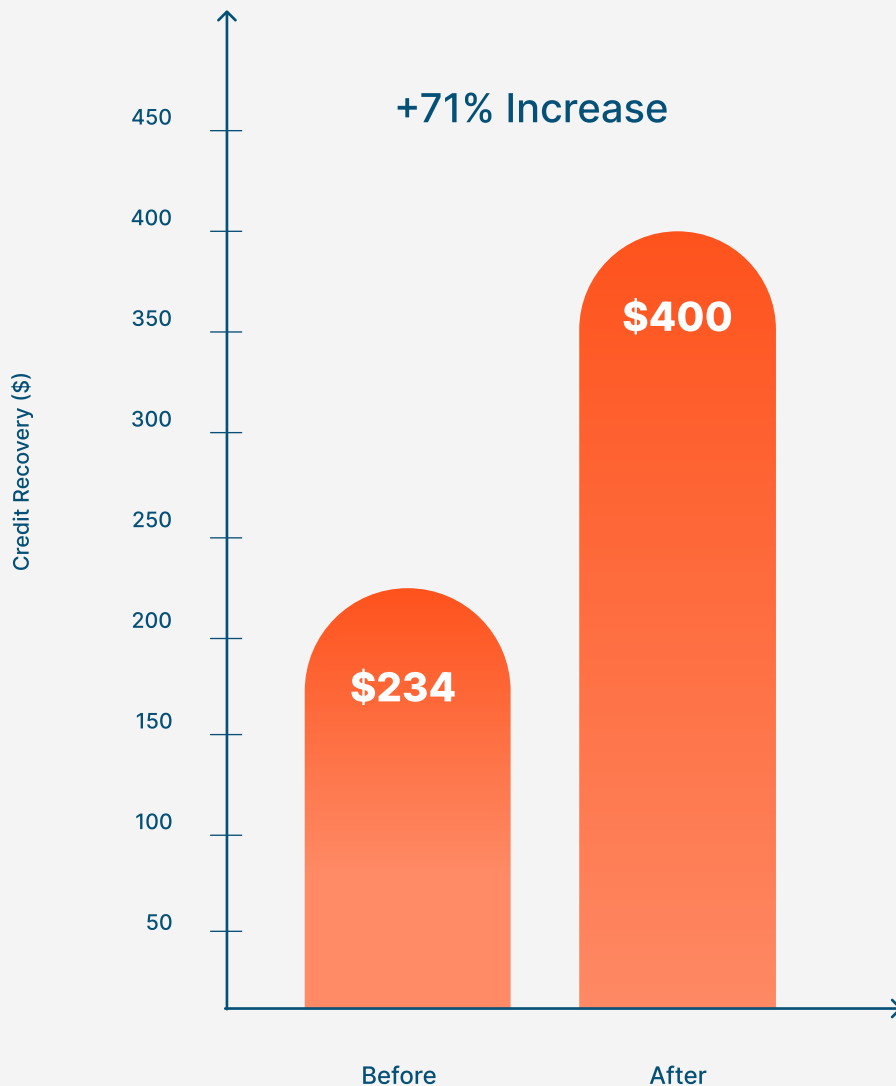
Efficient data handling doesn't just improve operations — it strengthens financial performance. In the brokerage model, rapid and accurate processing of vendor invoices enables faster customer billing, improving cash flow and reducing disputes.

Case Study Example:

One customer increased their **average credit recovery from $234 to $400** per incident by using unified, verified data to challenge inaccurate charges. This is nearly a 100% increase in credit value captured, directly impacting profitability.

In another scenario, the ability to process vendor invoices within minutes instead of weeks eliminated chronic late fees on recurring bills — a direct boost to cash flow stability.

From Reactive to Proactive Service

Charlie Dolan ✓
The right information, to the right people, at the right time — that's the game-changer.

A well-structured data environment transforms customer and vendor relationships. Service providers can proactively address issues by pushing accurate, timely information to customers before complaints arise. This not only resolves operational problems faster but also builds trust.

By enabling customer service teams to retrieve answers instantly rather than "calling back later,"

organizations increase responsiveness and reduce customer stress. On the vendor side, this capability helps haulers differentiate themselves in competitive markets by demonstrating transparency and reliability.

The Future of Waste Data
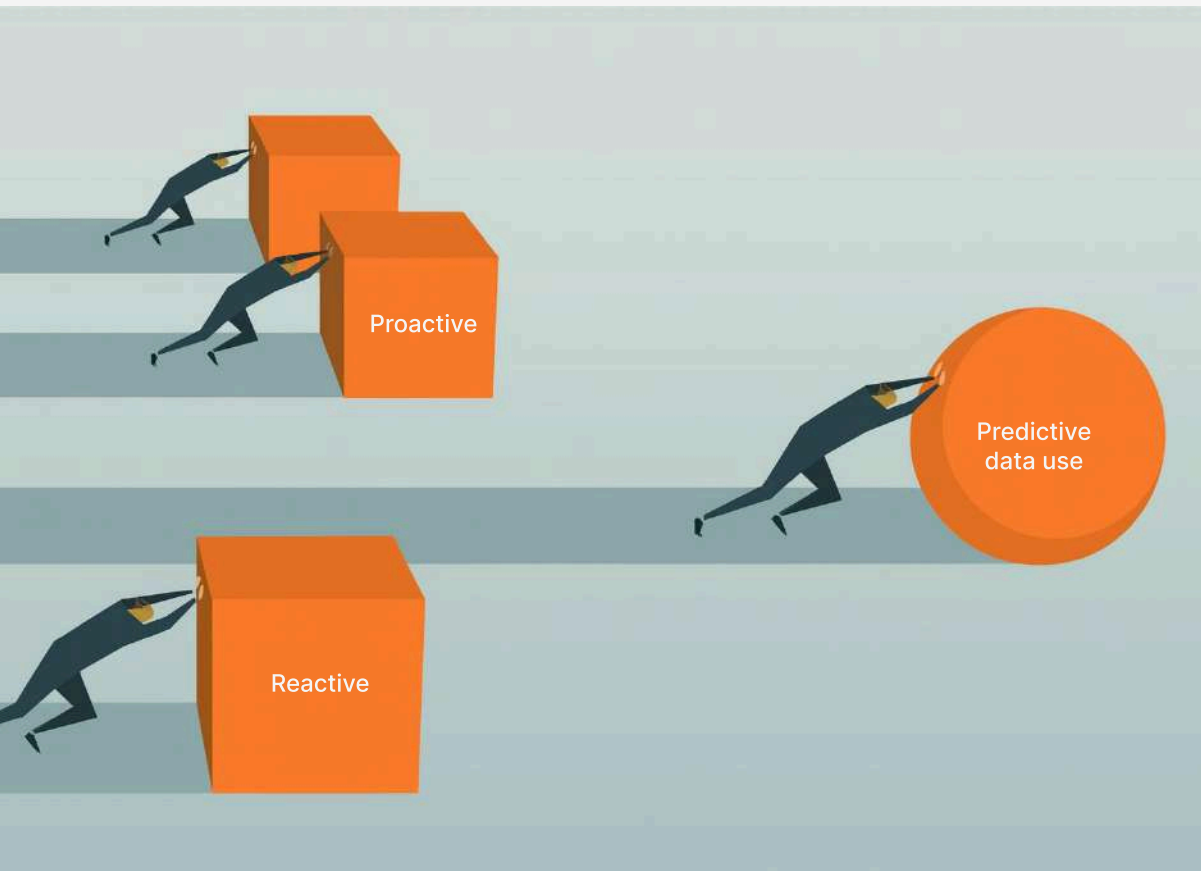
The industry is moving toward **predictive operations:** forecasting service needs, identifying upcoming inefficiencies, and automatically initiating corrective actions. The integration of multimodal AI — capable of processing text, images, and voice — means processes that once required months of development can now be deployed in weeks.

This evolution will not replace human expertise but will **increase capacity** across the organization, freeing teams from low-value, repetitive tasks and enabling them to focus on higher-order problem-solving.

Real-World Impact Metrics

Looking more widely at industry benefits: according to Makula, predictive maintenance can reduce costs by **10–40%** while greatly extending asset lifespans. This is ROI that applies equally to waste fleets, billing systems, or vendor invoicing tools.

In manufacturing, one of the most established use cases, unplanned downtime costs top companies up to **$1.4 trillion annually.** AI and robotics-based predictive systems are already helping major companies like Coca-Cola and Siemens Energy cut downtime and reduce maintenance costs by as much as **23% annually** (BI).

Conclusion

In an environment where change is accelerating and competition is fierce, the ability to get to the signal faster — and act on it — will define the leaders of the next decade.

Data is no longer a static byproduct of waste operations — it is the foundation for operational control, customer satisfaction, and financial stability. Waste organizations that invest in accurate, unified, and actionable data systems will not only uncover hidden efficiencies but will also position themselves as trusted, high-performance partners in the industry.

About DSQ Technology

DSQ Technology builds automation that solves waste management problems. We're waste management professionals who have lived the pain points that our technology is built to solve.

As an independent, Pittsburgh-based company, our vision is a world where business leaders can confidently make informed decisions using real-time data. To learn more about our technology and services aimed at delivering that mission, visit our website at dsqtechnology.com.