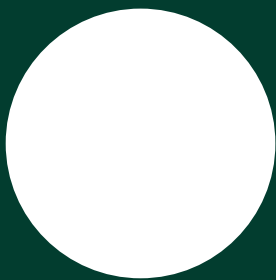


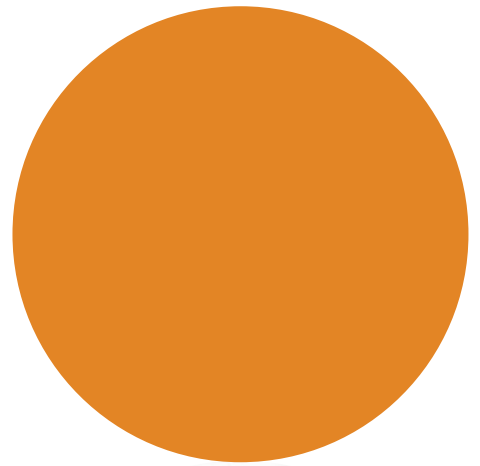


The Convergence Imperative:

The Critical Need for IT and OT to Come Together Around Data



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Introduction

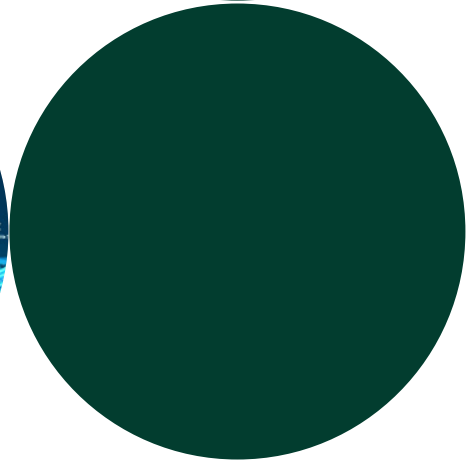
After a Decade, It's Time to Make it Happen

In 2011, Gartner's report, "IT and Operational Technology: Convergence, Alignment and Integration," predicted a tectonic shift for CIOs that would see their purview expand across all technologies in the enterprise, including industrial and operational assets. Ten years, millions more sensors, and petabytes of data later, Gartner's vision has proven prophetic – yet far from realized for industrial organizations.

While IT teams at non-industrial companies have made tremendous strides moving transactional work packages to the cloud, such as integrating and exploiting enterprise-wide data from CRMs, ERPs, and other data platforms, industrial enterprises continue to struggle to fully leverage the operations data they collect. This is far from a knock against IT leaders. The challenge of adopting new edge-to-cloud and Industrial Internet of Things (IIoT) solutions is indeed steep, with significant technological and cultural barriers.

Operational technology has been traditionally siloed from IT – literally and figuratively. Operational assets typically operate disparately. Their time-series data is unintegrated and lacking critical context for meaningful, timely extrapolation, analysis and action. Individual machines and sensors collect their own data. That data is stored locally, mostly in process historians, with spreadsheets as the go-to analytical tool. And that data and those spreadsheets live inoculated from each other, from one facility to the next, proliferating data silos and compounding IT's job.





At the same time, and perhaps even more critically, OT and IT professionals have functioned in parallel workstreams with conflicting mandates. OT has focused on delivering and maintaining optimal performance, protecting its equipment and people. IT has been charged with managing and safeguarding technologies and intellectual properties while controlling costs. Their technologies, processes, aims and professional worldviews are sometimes at odds, even if they share ultimate goals for business efficiency, continuity and profitability.

The journey to IT/OT convergence that Gartner predicted is underway, but it's been a bumpy road. A 2017 ABB survey of more than 200 utility executives revealed that over a quarter of respondents indicated their IT/OT technology integration was not going well at all, and another 41% noted that it was only going "fairly well." Recent research that we'll highlight later in this eBook shows that the situation has improved little.

But now, more than ever, the imperative has been dramatically amplified. IT and OT are being charged with delivering digital transformation across the board. COVID-19 has rapidly accelerated growing trends of remote work, as well as exposed risks and the need for greater resilience. Cost and competitive pressure has never been higher. The energy transition to renewables is putting pressure on oil and gas and power companies.

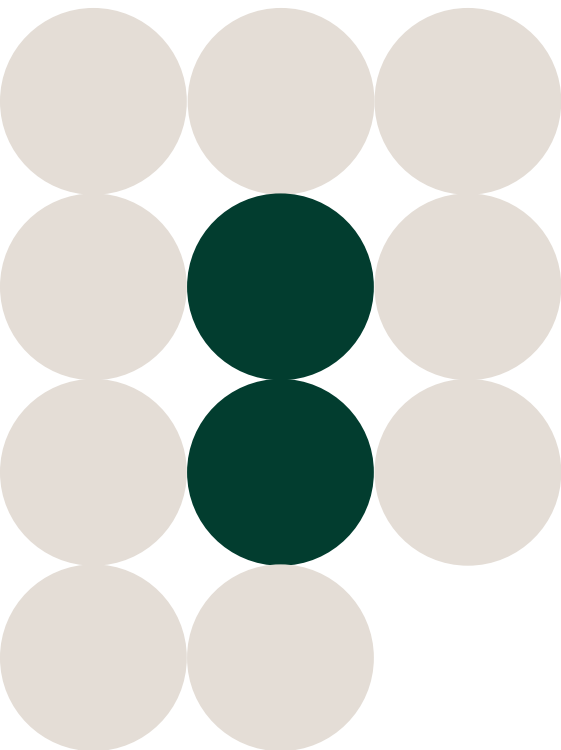
In short, industrial companies need to align and integrate IT and OT right now in order to survive and thrive in the new digital economy. It will be a journey to remake the landscape of OT. By starting now, you can make the most of your existing investments while converging on the architecture of the future. And the rewards are worth it – from reduced operating costs and lower security risks to increased business agility, greater organizational resiliency and tech-enabled differentiation.

This eBook will explore how IT leaders can help to make that convergence happen by exploring:

- Why IT/OT convergence is more business critical than ever
- The technology factors exacerbating the IT/OT disconnect
- How IT can think like and better support its OT counterparts
- The profound business benefits of alignment
- Best practices and technologies for enabling convergence
- Real-world examples of turning convergence into dramatic cost savings

Why Now More Than Ever?

There is no single factor creating the tipping point for OT/IT convergence. Rather, there is a perfect storm of process, market, organizational and technological dynamics driving business-critical convergence today. From strengthening safety and security to driving efficiencies and bottom-line impact across the board, your organization's ability to move forward with its digital transformation initiatives relies on your ability address these imperatives together – while also recognizing that you may typically approach these challenges from different angles.



1. Resiliency and Agility

Asset owners and operators increasingly face exposure to shocks, vulnerabilities, and financial losses. In order to assure security, safety and business continuity, OT needs the ability to orchestrate its operations across its supply chain, asset lifecycle, and production/maintenance. All of this is dependent on data and IT/OT connectivity.

At the same time, according to a recent study from OT security company Claroty, the COVID-19 pandemic has forced IT to be more agile and responsive, and has accelerated the convergence of IT and OT networks. The study reports that 65% of U.S. respondents say their IT and OT networks have become more interconnected since the pandemic began, and 73% expect them to become even more interconnected as a result of it. That said, as Claroty also points out, convergence can also open the door to security threats.

2. Cybersecurity

From taking down critical infrastructure and services to threatening the environment and public safety, a cyberattack on a connected operational environment could be catastrophic. And industrial cyberthreats are on the rise. Claroty's survey found that a majority of U.S. industrial enterprises (53%) have seen an increase in cybersecurity threats since the start of the pandemic.

This is on top of one of the worst years for industrial cybersecurity; according to research by Risk Based Security, reported breaches last year increased by 33% over 2018, with a total of 7.9 billion exposed records. At the same time, according to Deloitte, 90% of OT sector companies have reported at least one security compromise to their infrastructure in the previous two years resulting in the loss of confidential information or disruption to operations.

3. Safety

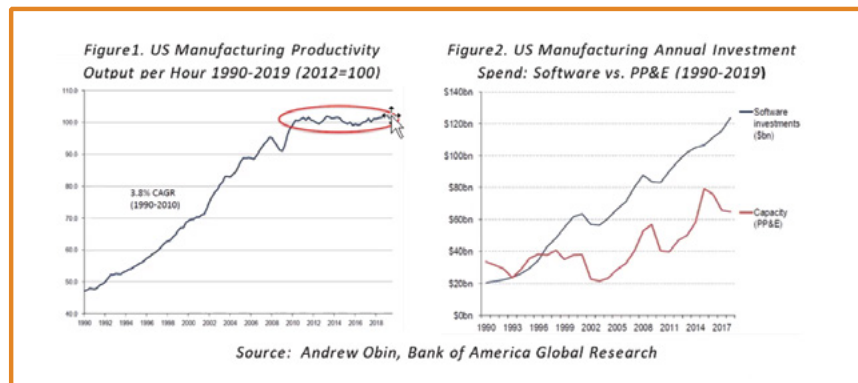
As any OT professional knows, safety and security are like, but not equivalent terms. Safety is about protecting people; security is about protecting data. But as digital transformation intertwines IT and OT, these concerns become more interrelated. The more connected these disciplines become, the more your interests and those of OT intersect. An attack like Stuxnet poses threats to both IT infrastructure as well as operational equipment that can result in physical damage to assets or physical harm to people. OT and IT simply must collaborate more closely in order to assure the wellbeing of an organization's property and people.



4. Productivity

Productivity is another area of common ground. Through automation, simplified data access, and productivity-spurring applications, IT helps drive employee performance. On the other hand, tech-enabled productivity is a newer and urgent imperative for operations. Whether through Lean, Six Sigma or any other type of continuous improvement approach, many industrial organizations have already maximized productivity and performance levers they can harness from their operations. Digital technology needs to be the next lever for automated performance gains – and OT/IT data convergence is required to make it possible for data to be analyzed versus simply wrangled from operational assets.

Consider this: although manufacturing software investment is now more than double what companies spend on their property, plant and equipment, U.S. manufacturing productivity has plateaued over the past ten years, a trend experienced worldwide.



In order for OT to achieve higher levels of productivity and performance, it needs to empower people with the right information at the right time to gain critical insights and make better decisions. Concurrently, as labor shortages, skills gaps and a retiring generation of plant professionals continue to plague OT, they need technologies that will be intuitive to use and automate tasks in order to achieve more with less.

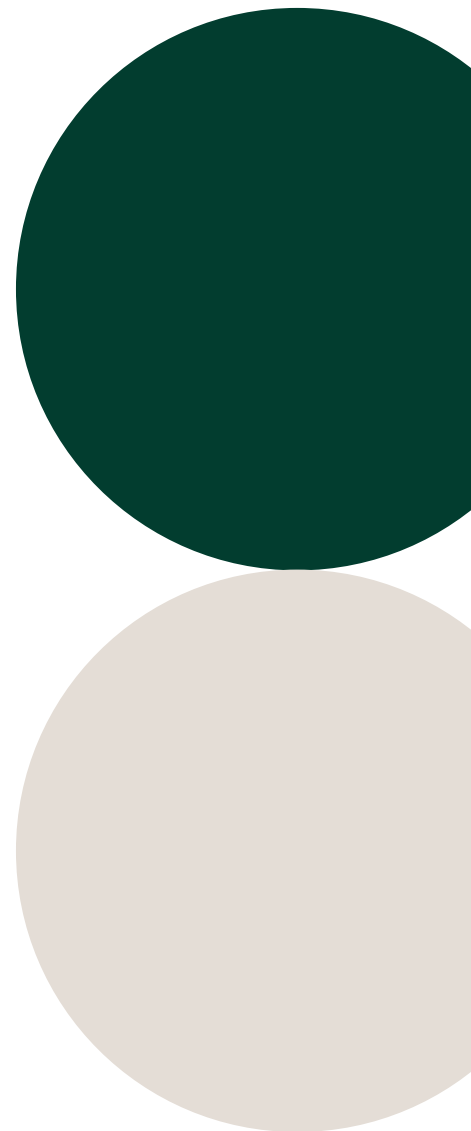
5. Cost

While cost levers have been exhausted at many companies, the need to keep assets running and producing at ever lower marginal cost has not. OT needs to continue innovating to reduce O&M spend while maintaining or improving asset availability and uptime. IT strives for the same as it relates to gaining cost efficiencies across the enterprise.

6. Executive Expectations

C-suites and boards increasingly expect IT and OT to be able to “tie the algorithms to the income statement and the balance sheet.” With IT/OT integration, IT will be much better positioned to not only deliver on digital transformation initiatives but also to more effectively report on materials and machinery costs, empower OT and other teams to be proactive, and drive effective business intelligence enterprise wide. What’s more, the C-suite expects IT to deliver solutions to the business that are sustainable and adaptable once put into production.

C-Suite pressure is compounded by the need to ensure organizations maintain or gain a competitive advantage. In its 2020 Hype Cycle for Managing Operational Technology, Gartner cautions that CIOs and technology leaders in sectors such as mining, material processing, manufacturing, power generation and distribution need to prepare now for innovations that are only two to five years from mainstream adoption. Specifically, it recommends that business cases should be prepared and proofs of concept should be in motion; ramping to full-scale production should also be starting within the next 12-18 months. Competitors are innovating; if you aren’t, you’ll be left behind.



If OT and IT recognize the need to converge, why the disconnect?

The divide of IT and OT over the past two decades can be traced back to Y2K and the dawn of connected devices. IT evolved to focus on optimizing costs when compute was expensive. OT applications became siloed for similar reasons. But now, with cloud, scalable compute, and artificial intelligence and machine learning, IT and OT need to bring their data and their missions back together.

As a result of this divergence, there is also confusion and misaligned expectations about who is responsible for IT/OT initiatives going forward. A 2018 survey by analyst firm Futurum Research among 500 people responsible for IT/OT planning, configuration, management and oversight found that IT-focused respondents perceive that leadership is roughly equal between IT and OT, with a miniscule leaning toward OT (33.1%). On the other hand, only 19.5% of OT respondents Strongly Agree that they are the ones driving IT/OT initiatives.

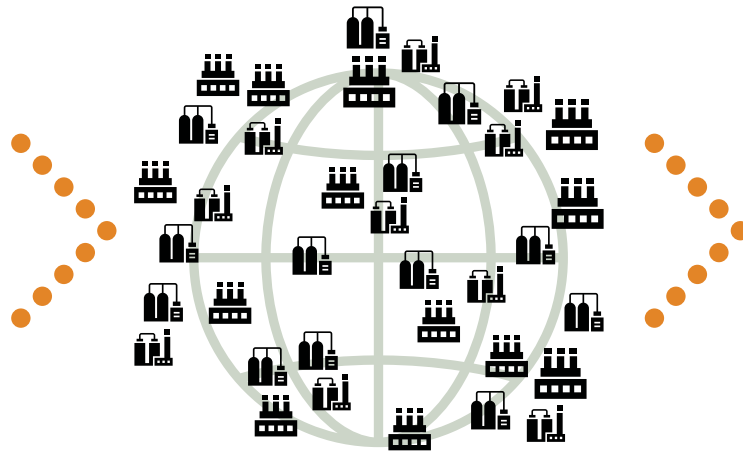
A Brief History of Time-Series Data

It's important to first acknowledge the technological challenges of converging data from IT and OT systems and sources. In analytics and AI-driven systems, as in all things, context is everything.

For industrial companies, IT/OT data context is almost non-existent and is the single biggest barrier to adopting modern analytical systems in industrial operations. Enriching time series data with the context essential for modern analytics is historically a complex challenge for industrial companies for three reasons:

1. Data Silos

5,000
pumps and 50,000+
other equipment
types across
50
production sites



RESULTS IN

**Virtual Blind Spots
in Decision Making**
Cost to operations,
environment, and lives

Industrial time-series data collected from assets is spread across many plant sites, segregated across networks, and locked up in legacy systems at the plant and in engineers' spreadsheets. At the same time, data silos proliferate as analytics are created using modern tools which, like spreadsheets, continue to create new data sets that then need to be managed.

Compounding the data silo problem is the heterogeneous nature of the data, especially the OT data, because it represents many different systems with a hodgepodge of software patches, versions, workarounds, designs, and different vendors for time-series data arising through mergers and acquisitions, as well as legacy plant-level decision making.

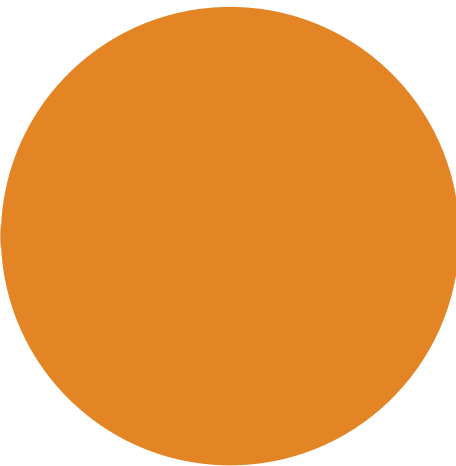
Add to that the exponential scale of these siloes: imagine 5,000 pumps and 50,000 other equipment types across 50 different production sites. It's difficult enough for OT to extract all the multifaceted data that can come from a single pump. How can they handle ten thousand if they struggle to handle even one?

2. Data Quality

OT data has notoriously demonstrated low quality. That's not about the accuracy of the data, per se. Poor quality is attributable to a lack of metadata to provide context to the OT data, and no standardization because of poor and inconsistent data labeling. This results in what is called "high semantic variation," making it difficult – if not impossible – to consume and share consistent data in an industrial enterprise today.

3. Data governance

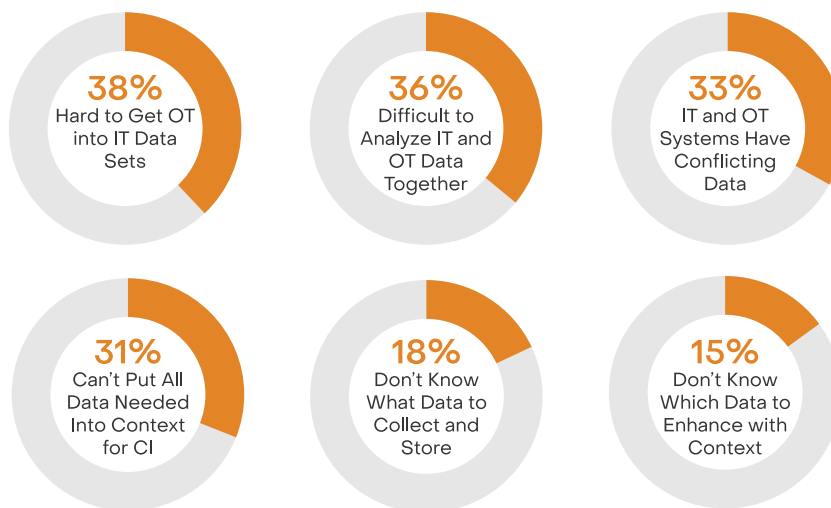
OT data is some of the most ungoverned and ungovernable data. Process data collected and stored in a historian system lacks key metadata and, while it may be governable for a single system at a plant, it's virtually impossible to govern from an enterprise perspective. These systems are often running different versions, are configured differently and have completely different tag naming formats. Compounding the problem are spreadsheet silos proliferating throughout the enterprise.



The Ongoing Quest For Context

Standardizing time-series data is critical so that you can make apples-to-apples comparisons of like equipment types, as well as deliver context for decision making. The relationships, or connections, between the data, can be more important to represent than the data itself. For example, to represent a piece of equipment like a pump in context, you have to not only represent the data about the pump, you also must represent the data relationships of the sensors attached to the pump measuring attributes about the pump's performance like pressure, flow and temperature – and you must also represent the relationship of the pump based on the production process it is supporting.

Plant Data Management Challenges



Source: Tech-Clarity

Standardization also organizes assets into hierarchical or process-oriented relationships to create the “graph” of your industrial operations. But, to date, the effort to create some sort of actionable industrial graph has been manual and laborious, often requiring months, or even years of human effort working off of spreadsheets, or teams cobbling together point products. This antiquated approach doesn't scale, and is very error prone, causing quality, scalability and security to take a back seat, and resulting in excessive costs and a high level of failure.

In fact, this approach often results in what's commonly referred to as “pilot purgatory,” where both IT and OT focus on a shiny analytic output without considering or solving for the complexities of how to scale beyond initial deployments with adaptable solutions that can be sustained and improved over time. It's no wonder that a Tech-Clarity report reveals that 80% of respondents believe putting OT data into context with plant IT data is important, but merely 52% have programs to address this challenge.

IT and OT:

Seeing the World Through Each Other's Eyes

For IT to successfully partner with OT to realize convergence and transformation, it's important to see the world from the other's perspective.

OT

I am accustomed to real-time observation and control of physical events.

I want control over operations to protect my people, my plant, and my assets.

I ensure business continuity by managing uptime for assets.

I work with assets and devices that may be generations or decades old.

I hate disruptions and value availability above all. Production interruptions can mean higher costs, potential inability to deliver product, or other impacts on safety and quality.

I prefer not to give other people access to my systems. My data is typically siloed, and I may not be comfortable relinquishing some control.

I believe IT doesn't know practice engineering and operations.

I know how to support operational teams in a 24/7/365 environment.

IT needs to understand our process, how we actually get work done before implementing new systems.

"I wish IT recognized I am a highly trained engineer, and that my work may not have the cool factor of Silicon Valley tech but it's literally powering our modern world. Also, IT needs to understand that I'm not used to providing other people access to my data and systems, when cybersecurity wasn't an issue."

IT

I am accustomed to transactional data recording and information processing.

I want control over technologies to protect company data and IP.

I ensure business continuity by managing uptime and availability for enterprise data, systems, hardware and software.

I made tech updates and upgrades frequently and routinely.

I care about availability, but my offline apps don't necessarily impact revenue. I often schedule time for routine systems administration.

I am responsible for broad data protection, security and governance. I democratize and exploit data to the company's advantage.

I believe that OT doesn't know IT best practices.

I know how to support the global business vision and core technologies.

I don't want OT re-inventing the wheel, especially on analytics.

"I wish that OT recognized that although I've traditionally played a supporting role to OT, and OT is the company's revenue engine, I am a vital partner and I can be a powerful ally. Also, OT needs to understand the cybersecurity and data privacy pressure I'm under."

Putting the IT/OT Relationship in Context

Understanding the technological and cultural divides between IT and OT, what steps can IT leaders take to help unlock convergence? They certainly can't just take the wheel; transformation takes time and requires mutual trust. That said there are steps that IT can take to help simplify and accelerate the traditionally long and arduous process of integrating and making OT data actionable.

Here are five recommendations for how to bring context to OT data and put the IT/OT relationship into more meaningful, productive, and mutually beneficial context.

1. Solve

Work more closely with OT to solve their age-old data silo problem by owning data integration and data engineering, removing the overly burdensome data wrangling challenges from engineers at the plant. Free them to utilize their engineering training and experience to focus on what's most important to them and the business: safely maintaining plant uptime and productivity.

2. Collaborate

Collaborate with OT to understand their unique needs and build a future-ready, adaptive and sustainable data foundation based on that understanding, including understanding that the business does not want to rip out systems that have worked well for years. Help OT build on what they've established and fully leverage their existing systems. At the same time, collaborate with OT to develop a roadmap for the next five to ten years, upgrading and replacing technologies at a pace that leverages your existing investments but captures the benefits of new technologies that can ride on your current data infrastructure.

3. Standardize

Team with OT to help establish and drive data quality standards to reduce high semantic variation across OT data, so it can be more easily contextualized with IT data, making projects more sustainable.

4. Deliver

Deliver the converged, multi-modal architecture required for IT/OT convergence and encourage cloud adoption – and help OT understand which packages are best in the cloud and best at the edge.

5. Govern

Make data governance easier to track lineage across proliferating data and analytics. And do so by making it more aligned with the way systems are managed in the OT environment and deliver improved explainability as AI is deployed. As Bharat Mistry, Principal Security Strategist at global cybersecurity specialist Trend Micro, shared in a recent article, "The biggest mistake I see is a business taking their IT security strategy and applying it to the OT world, it just doesn't work. You need to identify what's important in OT, look at your business processes and then take a risk-based approach to say where your critical assets sit."

A New Solution for IT/OT Convergence and Digital Transformation

Recognizing the imperative for OT/IT alignment, Operations Data Management leader Element has introduced Element Unify™, a cloud software solution that automates the integration, contextualization, and governance of OT/IT metadata. Unify for the first time enables simplified analytics, accelerates time to analytical value and keeps data synced and evergreen across IT/OT systems of record.

Element has been shown to rapidly unlock hundreds of millions of dollars in value for industrial enterprises. With Element, companies typically see up to a **300% faster time to insight, a 25%+ gain in employee productivity by eliminating data wrangling, and a 100% increase of the usability of data in decision making.**

Importantly, Element is not a “rip and replace” solution – it integrates easily with existing IT and OT systems, as well as the AWS and Microsoft Azure IIoT service stacks, solving the data problem through a unique “data fabric/data hub” system of record approach that connects to all data sources, feeds and consumers in a seamless manner. With Unify, industrial organizations can:

Integrate: Easily connect legacy OT and IT systems to modern data architectures, supporting improved analytical workloads in both legacy systems, like the PI System, as well as in cloud-based systems. Data preparation is fast and automated using no-code data pipelines and purpose-built transformations. This makes it easy for IT and OT to collaborate because subject matter experts who know the data can work directly in Unify without the need for an IT resource and without knowing Python. Speeding time to analytical value saves companies millions in data preparation and maintenance costs.

Contextualize: Easily create a unified environment with data transformations purpose-built to handle the complexities of OT data. Enable low code/no code data engineering for rapid integration and contextualization of OT/IT metadata – and support self-service apps and analytics. Connected metadata stored in the Element Graph makes it easy and flexible to build and deploy analytical applications at scale, resulting in hundreds of millions of dollars in value across use cases like OEE, predictive maintenance and safety. With Unify, OT can develop their own analytics without drawing on IT resources in a way that provides IT with governance over a sustainable architecture. It's a best of all worlds scenario.

Govern: Governance of proliferating IT/OT data and analytical silos has never been more important, requiring organizations to manage semantically consistent data and data models across the enterprise. Element Unify's Data Catalog tracks data lineage (complete chain from source to use), utilizes templates for fine-grained semantics control, and persists data keeping it synchronized across all systems. This builds trust in data, accelerating adoption of analytic apps.

Converging IT/OT, Driving Business Outcomes

Here are just a few examples of how industrial organizations are benefiting from Element's Unify Operations Data Management solution.

Oil & Gas: A super major's upstream operations with 30+ offshore platforms is reducing effort to contextualize data by more than 90%, enabling 60+ analytics applications and saving \$15.9M annually in the process.

Power Generation: Nova Scotia Power, a fully integrated power utility, was able to realize 2x engineering productivity and lower O&M costs by unifying its time series, Asset Performance Management, engineering and maintenance data into a single contextualized view for plant-, unit- and equipment-level predictive maintenance and reliability use cases.

Chemicals: A leading global specialty chemical company is now able to predict equipment failure and make informed maintenance decisions using Power BI dashboards. Plant managers estimate a potential savings of \$2M over five years, based on the ability to prevent four pump failures per year from just one analytic at one plant.

Food & Beverage: One of the world's largest food and agricultural companies operating more than 1,000 manufacturing plants worldwide is using Element Unify to enable their Factory of the Future initiative. They are creating an operations data fabric that improves production yields and reliability, while reducing maintenance costs, energy spend and operational emissions.



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About Element

Element powers digitally-enabled operations for the Industrial Enterprise. Tackling one of the most critical gaps in Industrial IoT – the fact that 95% of data across the Industrial Enterprise is unusable because it’s fragmented and disconnected – Element Unify breaks through the data silos by bringing IT and OT data together for the first time on a single solution. With Element Unify, IT and OT teams can collaboratively make data-driven operational and business decisions around rich, contextualized metadata, while ensuring scale, reliability and security. Industrial Enterprises can see up to a 300% increase in time to insight, reduced organizational fragmentation, and a 100% increase in data usability with Element. Customers include BP, Nova Scotia Power, and Cargill, representing over \$500 billion in revenue, \$300 billion in fixed assets, and 350,000 employees. Element is headquartered in San Francisco, CA. To learn more about Element, please visit elementanalytics.com and follow the company on Facebook, Twitter, and LinkedIn.

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