Powering clients to a future shaped by growth

A Frost & Sullivan White Paper

Thriving Despite Disruption

Manufacturing success in the semiconductor industry best gained through optimizing and connecting processes

FROST & SULLIVAN

The challenges affecting the semiconductor industry have reverberated across the global economy. A perfect storm of surging demand, manufacturing and shipping constraints, and a market that was already operating close to capacity caused lead times to extend by months, with many industries feeling the impact. However, the semiconductor industry can recover and gain further resilience by looking beyond conventional industrial manufacturing upgrades to enterprise-wide process modernization and streamlining.

A Sunny Forecast Turned Stormy: When Rapid Growth Became Too Much of a Good Thing

The semiconductor industry has experienced healthy growth for more than a decade thanks to booming demand for chips and sensors needed in connected products and devices. The industry began to struggle to meet this demand when sales started to skyrocket in 2020, driven by the need to outfit a newly remote global workforce with laptops, central processing units (CPUs), and portable electronics. Semiconductor sales swelled to nearly $40 billion per month globally[1] and resulted in a worldwide shortage as manufacturers struggled to meet demand. At the same time, the industry wrestled with keeping critical semiconductor manufacturing plants staffed and operating while maintaining newly mandated social distancing practices.

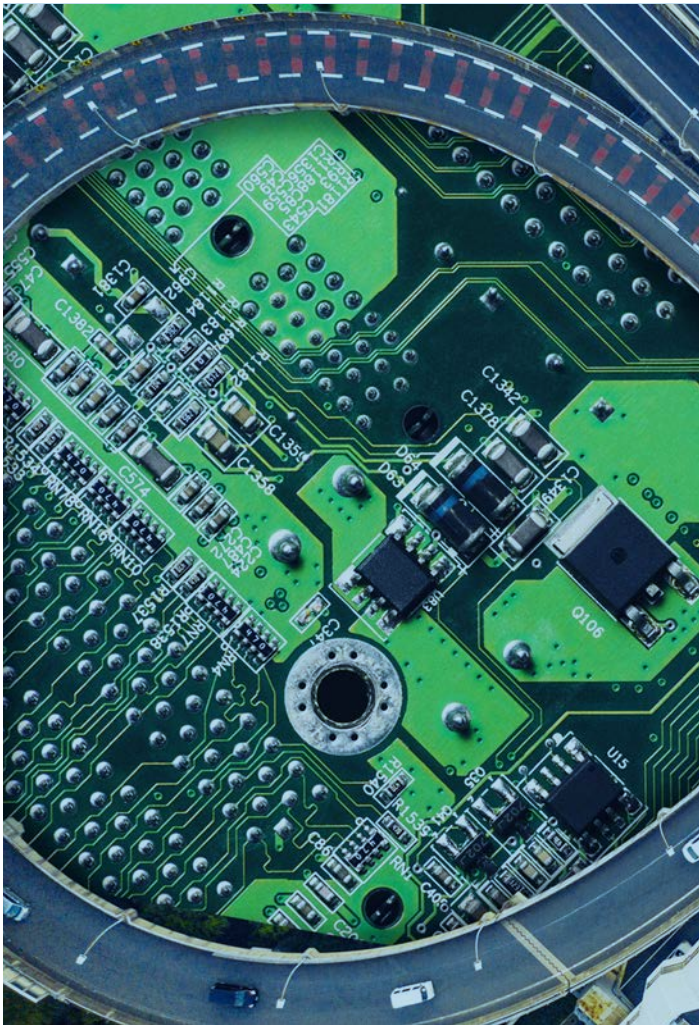
> **Semiconductor sales swelled to nearly $40 billion per month globally and resulted in a worldwide shortage as manufacturers struggled to meet demand.**

The ensuing chip shortage reverberated across global markets. Beyond delays in the deliveries of laptops, mobile phones, and gaming consoles, the automotive industry was another casualty of the scarcity. The global automotive industry purchases approximately $38 billion in semiconductors,[2] so the shortage meant many major automotive original equipment manufacturers (OEMs) had to cut production and even halt entire plant operations for days while the semiconductor industry caught up. Frost & Sullivan research indicates that the chip shortage resulted in about 1.4 million fewer automobiles being manufactured in Q1 of 2021[3] alone. While the electronics and automotive markets garner headlines for how they have been impacted by the shortfall, barely an industry has been spared: connected devices run the gamut from household Wi-Fi–enabled light bulbs to industrial equipment worth hundreds of millions of dollars. Frost & Sullivan estimates that connected device shipments will reach $65 billion globally by 2025, an increase of more than 300% from 2019.

Despite these unprecedented obstacles, semiconductor manufacturers can recuperate—and thrive—by making organizational improvements. Semiconductor manufacturing is one of the most modern and sophisticated industries. Transferring key best practices in optimization and simplification from the factory floor to other facets of the organization can create necessary, though often overlooked, enhancements that will optimize the entire organization.

It is vital that the semiconductor industry recognizes that supply challenges will persist even after the current deficit abates. Although a global pandemic had not occurred for a century before COVID-19 hit, the industry was still reeling from other supply chain issues, such as fires at silicon plants[4] and shortages of shipping containers. Future disruptions are all but certain, and their root causes may be unpredictable. Making semiconductor operations smarter and more efficient, resilient, and flexible is a business imperative.

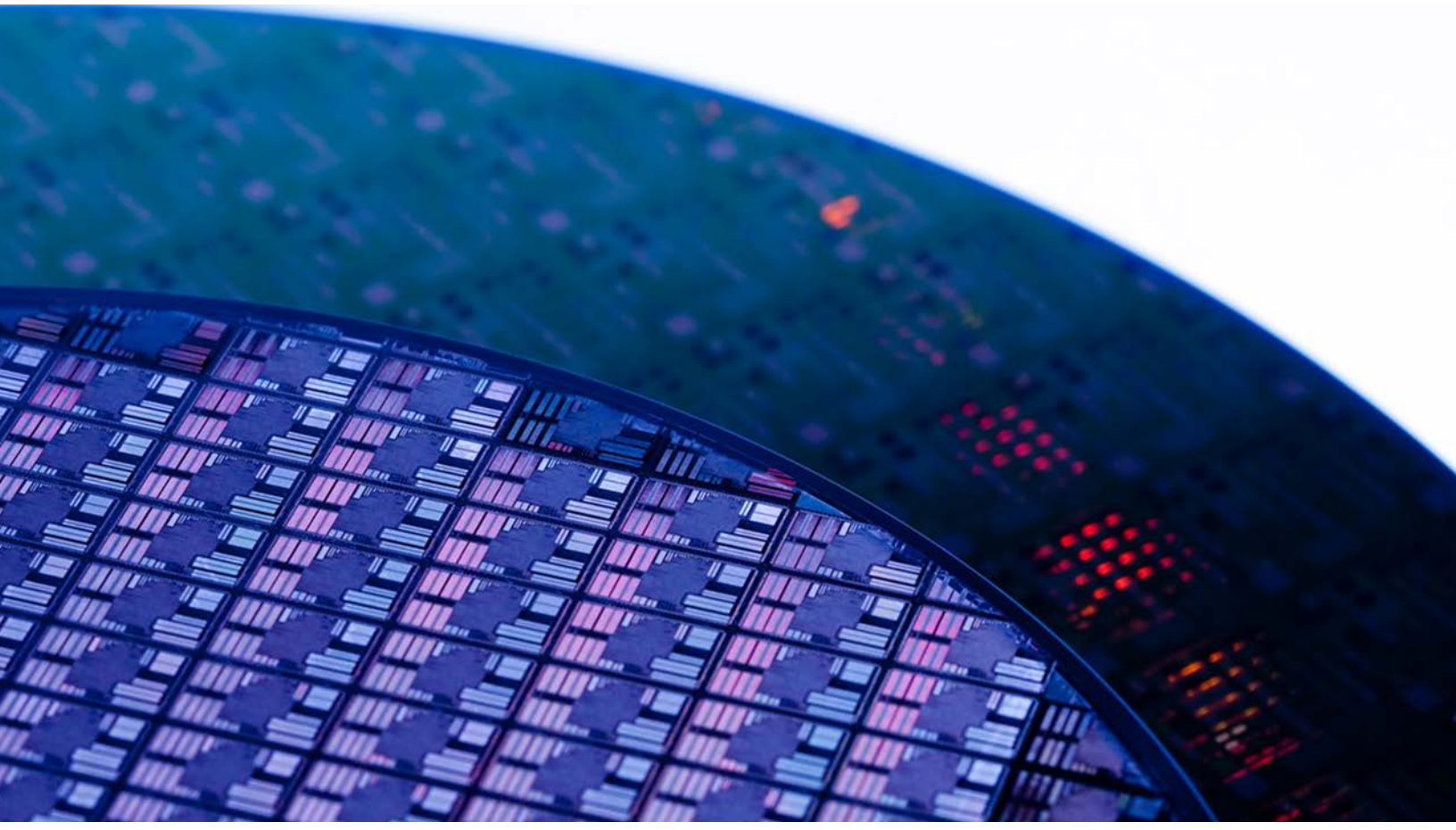
Frost & Sullivan research indicates that the chip shortage resulted in about 1.4 million fewer automobiles being manufactured in Q1 of 2021 alone.



Expanding Data and Advancing Technologies Challenge Manufacturers

Current advances in semiconductor manufacturing rely on data and analytics to achieve success in productivity and quality. However, leveraging information across an organization can evade even the most sophisticated manufacturer. The increase in data generated by equipment used in manufacturing processes, logistics, and in the field creates many possibilities, albeit with frustrating complexity. Frost & Sullivan finds that 70% of organizations experience at least 25% growth in data generation every year,[5] and businesses are struggling to capture, organize, and utilize this information. By some estimates, just 20% of business data is used by organizations.[6]

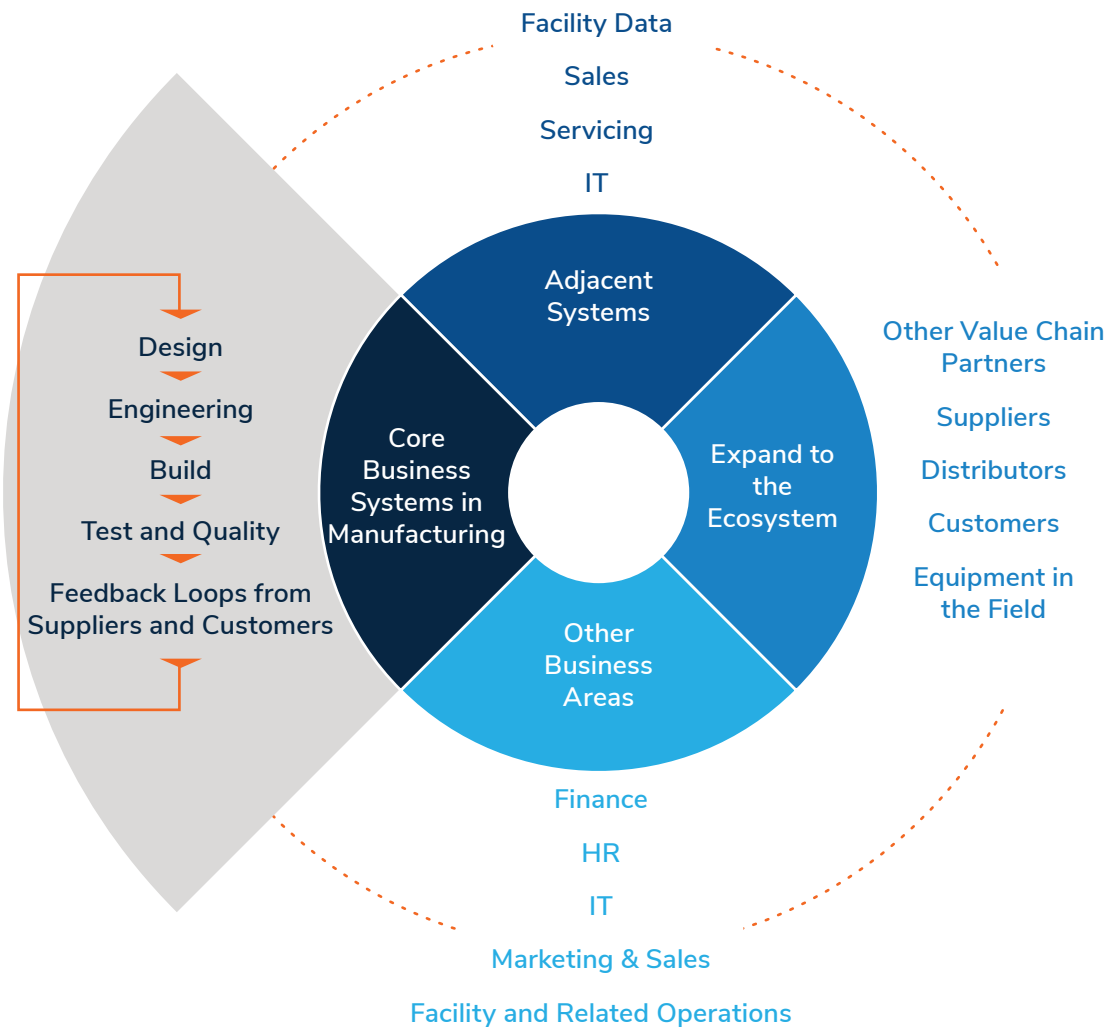
Semiconductor manufacturers are among the most data-heavy entities within manufacturing, but businesses often limit modernization efforts to a department or facility, resulting in fragmented data systems that can impede organizational improvements. Data is often isolated in departmental silos, hindering the organizations' ability to attain the critical insights that are possible from interconnected data. Collating and correlating information and outcomes across departments, such as converging IT data (business processes, electronic reporting, finacials) with OT data from manufacuturing and operations, provides businesses the unprecedented process visibility vital to improving processes.



Businesses may not realize that they have disjointed systems if they have always operated under the assumption that independent divisions, such as sales, finance, and engineering, would use different platforms and vendors. Partnering with a solution provider that has a broad portfolio across business functions can provide a semiconductor business with several advantages. A vendor with industry expertise can go even further in helping businesses modernize operations.

As noted in chart 1, businesses can mitigate a broad range of systemic challenges by migrating processes to a common platform. A clear example is coordinating supply chain management, manufacturing, warehousing, and logistics activities for enhanced value chain visibility and productivity. Businesses can also pull in finance, sales, and marketing to gather insights quickly and easily on customer preferences and business practices to benefit both the business and future client interactions. Suppliers such as Oracle provide an extensive suite of cloud-based solutions developed to work within departments and to connect across organizations. Oracle services can also help businesses modernize their supply chain and logistics processes, helping enable data sharing and feedback loops with a businesses' value chain partners.

Optimize Business Outcomes Through Integrating Silos



Being able to address a business' end-to-end needs is a vital, if somewhat rare, feature of a leading provider. Along with improving holistic business efficiency, a solution provider can also address three other pressing, and expensive, organizational challenges.

Visibility hindered by multiple systems and vendors: Adept data and system utilization enable better business performance while also providing a clear view of operations across locations, business units, processes, and other former silos. Unifying systems with a vendor that works among all departments also provides this visibility more efficiently than layering yet another third party across a company's systems.

Increasing value from IT-related expenditures: Limiting the number of vendors and solutions an IT team has to manage helps pivot expensive IT resources toward higher-value, business-first tasks. A Frost & Sullivan survey of more than 1,600 IT executives shows that while cybersecurity is the top challenge in IT, system integration and managing multi-vendor solutions is a close second (tied with network stability).[7] Along with building better value, shifting IT into an innovative and strategic function creates more engaging work and may improve employee productivity and retention.

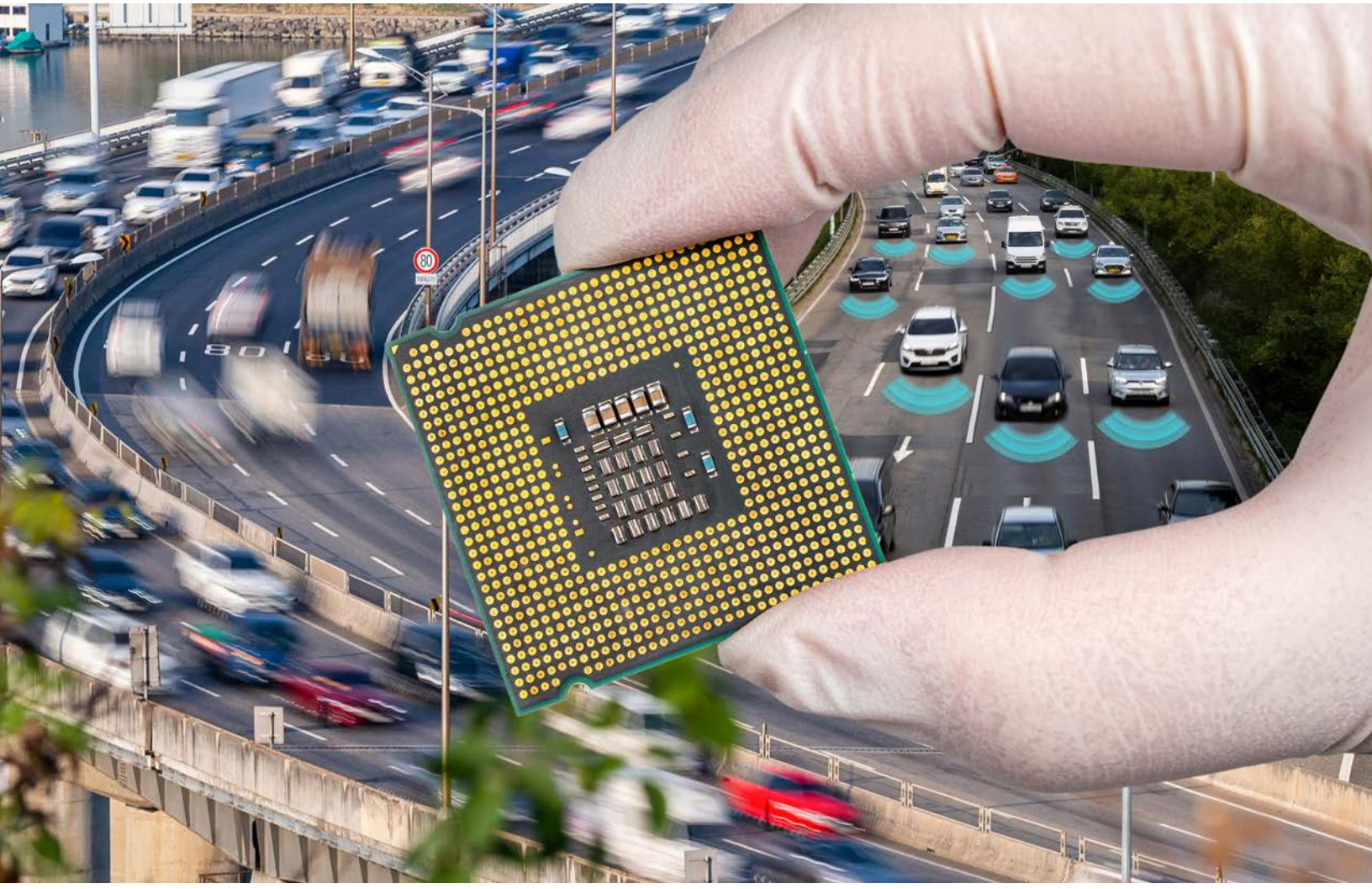
Elevating security, reducing risk, and increasing resilience: Working with different vendors for applications, tools, and services can allow security vulnerabilities to sneak in between systems. Leveraging a vendor that can design and implement an entire stack of technology for mission-critical applications eliminates gaps, tightens security, and often reduces costs. For example, Oracle's Cloud@Customer provides end-to-end tech stack solutions and cloud-like benefits—agility, flexibility, automation, and subscription pricing—on-premises.

The Market Speaks: Unified Solutions Increase Efficiency and Optimize Business Processes across the Semiconductor Value Chain

Businesses across the semiconductor ecosystem are confronting shortages and intensifying competition. Moving to a single supplier platform that unifies the data and interactions of processes across an organization helps streamline and simplify operations and makes a business better able to respond to changing market conditions. The following examples along the semiconductor value chain all used Oracle's extensive cloud-based platform solution to realize savings and improved operations. Oracle's software-as-a-service (SaaS) business applications can run in the cloud or in a cloud-like environment on-premises, while created and secured by Oracle, allow the customer to retain full control of their data.

- Qualcomm, a leading supplier of semiconductor parts to the wireless industry, gained a 50% cost savings by migrating its organization to a single enterprise resource planning (ERP) and accounting platform. Shifting nearly a dozen small country operations to a unified, cloud-based system was enough to pay for the upgrade. Further standardization across the organization created additional savings, and the vendor's dashboard solution enhanced operational efficiency.
- IT networking and cloud operations leader Juniper Networks wanted to improve its supply chain management, customer service, and reduce costs. By implementing Oracle's Supply Chain Planning solution, which included a key feature of backlog order management, Juniper Networks recognized 25% cost savings on inventory within two years, increased lead time attainment by 55%, and improved key customer service metrics. In the first three years, the solution realized a 350% return on investment.
- Cohu, which provides the broadest available equipment and service portfolio for back-end semiconductor manufacturers, saw an opportunity to improve its operations and competitive positioning through a more unified approach to its systems and processes. Cohu benefited from a long history of successful acquisitions; however, this brought with it disparate platforms, systems, and processes. Cohu turned to a supplier that had already standardized its applications in the cloud to go live with unified systems for its ERP, supply chain, and sales applications. The results have given Cohu the ability to run management reports with more ease—while containing more data and insights—than it could with prior disparate systems. Its IT team, which previously had felt like a separate entity within the organization, is now more business- and future-focused. Long term, as Cohu eyes acquisition opportunities, it can more quickly integrate new entities into the business using a single ERP solution.

- Disjointed, manual systems and protocols threatened the rapid growth of a global sensor manufacturer. Outsourcing the modernization of business processes to multiple partners would be too time consuming and would not have solved the issue of disconnected processes. Instead, the manufacturer turned to a solution provider who was able to get the processes to speak to each other and extend the related platform, communication, and analytics to supply chain partners. This enabled the manufacturer to increase process, manufacturing, and supply chain efficiency; improve planning and inventory turns; and achieve a level of organizational visibility that was impossible under its previous system.
- A major light-emitting diode (LED) manufacturer had multiple platforms across different business units. Migrating these platforms to one system would enable the LED manufacturer to get products to market faster—in terms of both planning and throughput—and create more efficient business processes across the organization. It found that partnering with a single solution provider with a broad value proposition helped bridge everything from condition monitoring to ERP, thereby optimizing business systems and enabling the creation of more competitive go-to-market solutions.



Unifying Operations Creates a Compelling Advantage

The semiconductor industry has a long history of advanced manufacturing practices. Market forces are compelling it to find new and innovative ways to reduce costs and improve processes. Questions that the semiconductor industry should be asking itself include:

- How disparate are systems within and across departments? Does HR have different vendors for analyst tracking and training and performance reviews? Do any of these vendors also service finance, sales, and supply chain management? (Most likely these are all different solutions and vendors.)
- How much time are different business units spending on reconciling these systems and relationships? How long does it take to pull an organization-wide report for management or compliance reasons? How much effort does it take to maintain internal legacy systems, and would that time be better spent focused on growth, strategy, and innovation within the core competencies of the business?
- How much organizational effort is going towards generating and utilizing analytics? Do data discovery, collation, preparation, and modeling require extensive amounts of time and resources? For example, hard disk drive and data storage company Western Digital was able to reduce data refresh times from over eight hours to 20 minutes, by adopting Oracle's ERP cloud and integrating it with existing Oracle on-premises and Oracle Analytics Cloud. Is the organization confident that they are correlating and analyzing the right data in the right way, or are they concerned about missing something? Conversely, is the business spending too much time on data that turns out to be unimportant? Does managing data take a disproportionate amount of time and energy, as opposed to analyzing, visualizing, and utilizing the right insights?
- Do any current vendors have the ability to provide services across the organization and enable a platform that facilitates visibility and collaboration across departments, regional operations, and even ecosystem partners? Do they have actual semiconductor industry expertise? For example, along with a broad suite of solutions, Oracle already manages more than 70% of semiconductor manufacturing data, having serviced the industry since the late 1990s. This level of market understanding and experience is a rarity when triangulating solution providers' features, abilities, and experience.

Semiconductor manufacturing is a complex industry with a large, dynamic, and global supply chain. The next step in semiconductor manufacturing evolution is to go beyond the factory walls and begin incorporating all data-driven processes into a cohesive, unified platform. Organizational visibility and efficiency will soon follow along with the ability for businesses to focus more on core competencies and less on maintaining disparate systems and multiple vendor relationships.

Endnotes

1 The Semiconductor Industry Association

2 Frost & Sullivan's The Global Semiconductor Chip Shortage Crisis and Its Effects on the Automotive Industry, July 2021

3 Ibid.

4 Numerous incidents have occurred, such as Japanese chipmaker Renesas' fires in March 2021 that incapacitated 5% of clean rooms and 2% of its manufacturing equipment (https://www.theregister.com/2021/03/21/renesas_fire/), and the explosion in June 2021 at Hoshine Silicon in the Shihezi Economic and Technological Development Zone of China's Xinjiang region, which accounts for about a quarter of all of China's silicon metal output (https://www.pv-magazine.com/2021/06/09/silicon-fab-explosion-in-xinjiang-threatens-further-poly-shortage/).

5 Frost & Sullivan's Post-Pandemic Digital Transformation Creates Opportunities in Data Use and Management, April 2021

6 Oracle

7 Frost & Sullivan's Top End User Priorities in Digital Transformation, September 2019

FROST & SULLIVAN

Growth is a journey. We are your guide.

For over six decades, Frost & Sullivan has provided actionable insights to corporations, governments and investors, resulting in a stream of innovative growth opportunities that allow them to maximize their economic potential, navigate emerging Mega Trends and shape a future based on sustainable growth.
Contact us: Start the discussion