Moving Beyond Traditional Analytics: Using Advanced Analytics to Transform the Semiconductor Supply Chain

Abstract

Much like the supply chains in other industries, the supply chain in the semiconductor industry is undergoing significant digital transformation. Intuition-based decision making is giving way to advanced analytics - a major decision enabler across the supply chain. The upside of leveraging advanced analytics? It helps organizations drive cost optimization initiatives, and improve visibility and processes for superior profits. With growing competition, it is becoming increasingly clear that semiconductor companies will need to move up the analytics maturity curve to stay competitive. To do so, organizations must embark on an advanced analytics journey and identify specific areas in the semiconductor supply chain where advanced analytics implementation can help maximize RoI.

The Growing Relevance of Market-driven Foresight

Businesses have evolved from making decisions based on gut-feel to making data-driven decisions. During this evolution, the analytics used within companies has also undergone a major transformation in terms of maturity levels (see Figure 1). Traditional analytics relied on dashboards and point data solutions, worked in silos, and focused more on descriptive and diagnostic analysis that only worked well in hindsight.

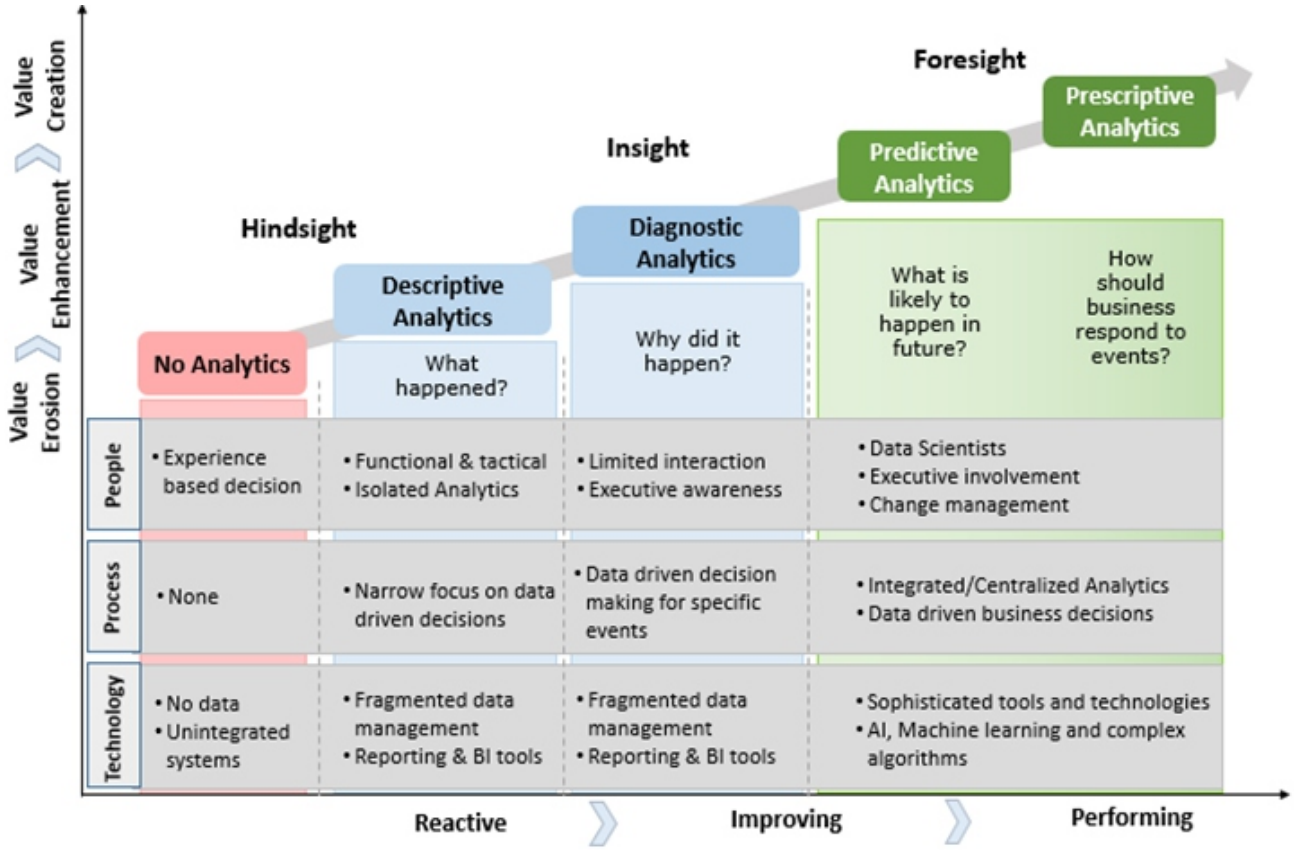

Figure 1: The Analytics Maturity Curve

In today's digital world, the inherent time lag in the traditional process causes companies to miss strategic opportunities that can increase profitability, improve service levels, maximize asset utilization, improve inventory investment, and so on. However, with increasing accessibility to Big Data, cloud computing, and other digital supply chain technologies, advanced analytics is no longer a nice to have. Organizations are enabling smart algorithms and evaluating risks and opportunities through multiple, iterative simulations to maximize profits. The burgeoning interest in advanced analytics is evident from the fact that the global advanced analytics market is poised to grow to $60.44Bn in 2021, at a CAGR of 33% between 2016 and 2021.[1]

How Advanced Analytics is Reshaping the Semiconductor Industry

Competitive pressures as well as aggressive M&A activity are forcing semiconductor companies to look for opportunities to drive more revenues, become leaner, and operate as efficiently as possible. Advanced analytics, when applied systematically across the entire value chain, provides companies with insights into such opportunities. Organizations with a myopic view of the supply chain tend to miss out on effectively utilizing new sources of data generated across different supply chain touch points. These include data pouring in from distributors, customers and suppliers, as well as channel inventory, manufacturing, social, and other causal data. What exactly are the opportunities available to semiconductor companies? To answer the question, we developed a heat-map of some of the opportunities available in the semiconductor value chain (as shown in Figure 2).

Fig 2: Focus Areas for Supply Chain Analytics Implementation

Sales and Operations Planning (S&OP): Advanced analytics in S&OP areas helps optimize the forecasting of results and business decisions as well as identify demand shaping initiatives, using the what-if analysis and predictive analytics - based on market, business intelligence, and recent trends. Another area of concern for semiconductor companies is capacity planning, considering the high cost of manufacturing. Organizations can use advanced analytics to accurately predict buying quantity and time in an agile manner.

New Product Introduction: Attribute-based forecasting and early demand signals or leading indicators and demand sensing techniques are useful in extrapolating the total demand for new products. Similarly, deploying analytics during the R&D phase can help users better manage resources, diagnose projects that are lagging, and take corrective actions based on past projects. The application of advanced analytics in R&D has been shown to reduce the duration of IC projects by 10%.[2]

Customer Proximity: Advanced analytics is critical to aligning the supply chain with customer wants and behaviors, as well as performing pricing analytics – an area where the semiconductor industry typically leaves money on the table. Advanced analytics helps semiconductor companies bring new rigor to pricing by adopting a detailed analytics-based approach, combined with new statistical-analysis tools that can clean up and analyze large volumes of transaction data.

Inventory Management: Inventory optimization is one of the areas where using advanced analytics enables organizations to analyze inventory drivers, right size the inventory, and manage inventory in real time, based on actual demand changes.

Procurement: In the procurement space, sophisticated algorithms can analyze vendors based on price, quality, and cycle time to ascertain the optimal mix of package allocation on the vendor's side. Advanced analytics helps determine the lowest landed cost at any point in the supply chain and facilitates greater collaboration, helping transform procurement from transactional relationships between suppliers and customers to strategic relationships based on an analysis of value contribution versus margin.

Delivery: Advanced analytics also helps improve delivery performance and supply chain resilience. Built in sensors and alert systems provide an indication of manufacturing failure or delays that might impact customer delivery. The failure to fulfill promises often leads to escalations, which can be prevented by taking preemptive actions based on prescriptive

analytics. Business continuity event simulations and material flow heat maps enable quick customer impact analysis, and through simulation techniques, help identify corrective action to prevent the problem from occurring.

Fab Operations: Semiconductor companies are typically the leaders in generating and analyzing data. However, only a few have effectively applied advanced analytics to fab operations to improve areas such as predictive maintenance and yield, R&D and sales, pricing, market-entry strategies, sales force effectiveness, cross-selling, and portfolio optimization. For instance, the cost of building a wafer fabrication plant and a high-end clean room environment typically runs into billions. The financial pressure to overcome the steep cost of asset depreciation is daunting, which means that rapidly achieving break-even utilization of a plant is as important as achieving profitability. This is where advanced analytics provides the competitive edge by increasing the collaboration between various functions of sales (account management, pricing and forecasting), R&D, manufacturing and supply chain.

What Should Companies Do to Stay Ahead of the Curve?

Latest market research suggests that companies with well-established advanced analytics strategies can improve both revenue and operating margin by 15%.[3] It is clear that the time is ripe for semiconductor companies to embrace analytics across their decision-making process, spanning the entire value chain, to stay relevant in a hypercompetitive market. How can companies go about doing this?

Assessing the triage of people, processes, and technology within the context of the market ecosystem is an essential first step. On the people front, it's important to create a 'centralized supply chain advanced analytics group', comprising experts, that is focused on enhancing business goals. This group should be created outside the IT department, with IT acting as the enabler. True value can be generated only if the analytics group understands the business and is focused on uncovering 'hidden insights' through their analysis.

Building predictive and prescriptive models requires advanced statistical models, artificial intelligence, and machine learning capabilities. While it is critical to build analytical capabilities internally, it may also make good business sense to leverage experienced third party services as trained resources are scarce. On the process front, it is important to establish a data-

driven culture and invest in the development of a framework for measuring the success of the analytical models. This will, in turn, help build a culture of continuous improvement as the markets evolve.

On the technology front, companies need to ensure they have the right infrastructure in place to collect, store, and support data. For instance, Master Data Management (MDM) should involve business, not just IT.

Bottom line: when used effectively, advanced analytics can transform the semiconductor supply chain, driving competitive advantage and spurring growth.

References

[1] Zion Market Research, Global Advanced Analytics Market Is Set for a Rapid Growth and is Expected to Reach Around USD 60.44 Billion by 2021, October 2016, accessed January 2018, https://www.zionmarketresearch.com/news/global-advanced-analytics-market

[2] McKinsey, Improving the semiconductor industry through advanced analytics March 2016, accessed January 2018, https://www.mckinsey.com/industries/semiconductors/our-insights/improving-the-semiconductor- industry-through-advanced-analytics

[3] Forbes, Advanced analytics drives double digit growth, says EY and Forbes survey, February 2017, accessed January 2018, https://www.forbes.com/sites/forbespr/2017/02/15/advanced-analytics-drives-double-digit-growth-says-ey-and-forbes-insights-survey/#25cea7124ca5

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