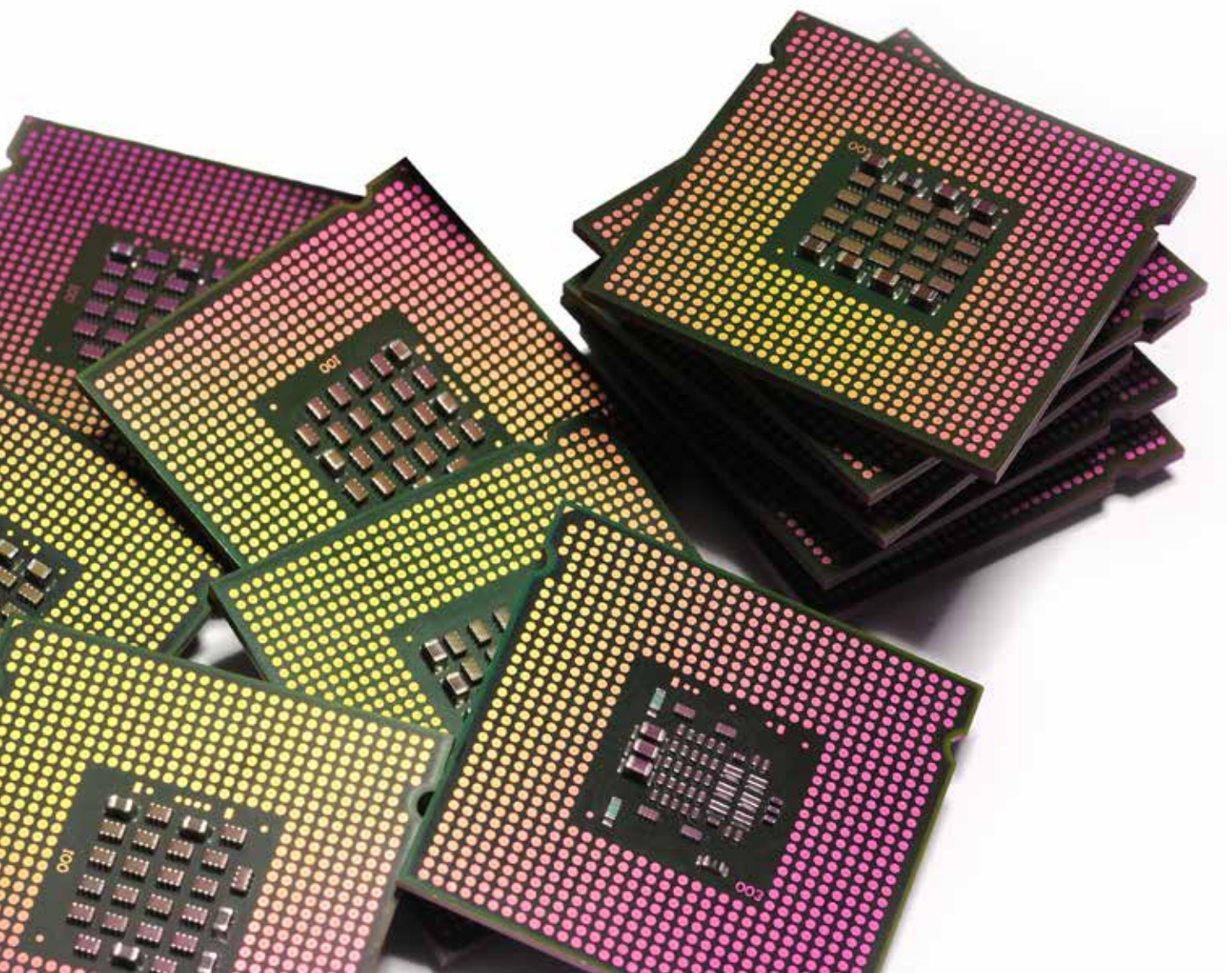


SEMICONDUCTOR COMPANIES

Is your manufacturing sourcing strategy
eroding competitiveness?

By Syed Alam and James Wildenburg



The semiconductor industry today faces a monumental challenge: putting the brakes on a ballooning cost structure that is making many semiconductor companies uncompetitive. According to Accenture Strategy analysis, if we consider the top 25 fabless companies, as much as 50 percent of revenue is eaten up by the cost of goods sold (COGS)—and the situation is only getting worse. In 2018, the top 25 fabless companies spent nearly \$50 billion on COGS¹. That's up 6 percent from 2014 and continues to be a watchpoint for investors who are increasingly calling on companies to take action.

Why the sharp increase? Conventional wisdom is a major culprit. Most companies have long believed they perform best when they focus on one manufacturing sourcing strategy and optimize it to become highly efficient. But that thinking is misguided. When companies build rigid processes to support a single strategy, they lose the flexibility to make necessary operational changes to control expenses. Semiconductor companies' strict adherence to either the Wafer Buy or Known Good Die strategy is constraining their ability to more effectively rein in supply chain costs.

Compounding the problem is that too many semiconductor companies are defaulting to Known Good Die. They are falling into the convenience trap, paying management fees associated with this strategy when they do not have to or should not—just because it is easy to make foundries responsible for chip production.

Management fees associated with the Known Good Die strategy are adding 2-4 percent to companies' cost structures.

At an even more basic level, many semiconductor companies are not deploying the optimal strategy for their business because they use the wrong criteria to determine which sourcing strategy to adopt. They typically rely on the type of product a chip is destined for or the company's business model to shape their decision. This can lead to a mismatch between the strategy and the needs of business, and compromise a company's ability to control production costs.

In short, semiconductor companies are squandering millions of dollars and eroding margins because of inefficient manufacturing and testing of chips—and that must change for companies to restore competitiveness and profitable growth.

The solution: embrace a hybrid, flexible approach to manufacturing sourcing.

The hybrid, flexible manufacturing sourcing approach

With a hybrid, flexible approach, a semiconductor company can effectively use both the Known Good Die and Wafer Buy strategies, switching from one to the other when business conditions require. Such

flexibility enables a company to purchase material at different points in the manufacturing process to balance material costs, risk and yield to meet demand.

For instance, in a Known Good Die strategy, direct material costs are higher, and risk is lower, because the foundry actively manages most of the manufacturing process. The converse is true of Wafer Buy. Because a semiconductor company, assumes responsibility for (and the inherent risk associated with) producing sufficient yield to meet demand, it enjoys lower direct material costs and greater control over the manufacturing process.

By selectively using the strategies when it makes sense, a semiconductor company can maximize each strategy's strengths while minimizing its weaknesses—and, thus, make the greatest impact on profitability.



The path to competitiveness

Generating the greatest benefit from a hybrid, flexible approach requires implementing the business processes and systems capabilities that can support each manufacturing sourcing strategy. It also requires knowing which strategy to use when, and keeping tabs on performance to ensure the company attains its desired cost and product delivery targets.

Implement the business processes and systems capabilities to support flexibility.

In a Known Good Die strategy, semiconductor companies need business process and systems capabilities to support activities that occur after the receipt of Known Good Die from the foundry, when the company assumes ownership of the material. The main manufacturing steps from this point include three key backend processes: Assembly, Final Test, and Scan-Bake-Tape (SBT).

Tradeoffs between Known Good Die and Wafer Buy Strategies

	Known Good Die Strategy	Wafer Buy Strategy
Direct Material Cost	HIGH Foundry fees to manage manufacturing operations	LOW Outsource manufacturing to low cost suppliers
Supply Chain Control	LOW Managed by foundry	HIGH Managed by semiconductor company
Yield Risk	LOW Foundry responsible for good die quantity	HIGH Semiconductor company responsible for purchase of required wafers
	Known Good Die Benefits <ul style="list-style-type: none"> Focused efforts on design and innovation vs. supply chain management Guaranteed die order quantity, protected from yield risk 	Wafer Buy Benefits <ul style="list-style-type: none"> Removal of foundry management fees; ability to select low cost suppliers Increased supply chain visibility and control; reduced lead times and product priority decisions

In Wafer Buy, semiconductor companies are responsible for the activities that occur after the receipt of an unprobed wafer from the foundry. Because they assume ownership of the material earlier in the supply chain, they must be able to orchestrate the additional manufacturing steps run by the foundry in the Known Good Die strategy: bump, sort/probe, and wafer-to-die conversion. A company that relies on Known Good Die will need to develop new supporting capabilities unique to probe:

- Procurement of probe hardware
- Probe hardware planning process
- Storage process
- Probe hardware repair and maintenance process
- Pick map process for probed wafers
- Wafer acceptance test criteria/limit process

Determine which strategy to use when.

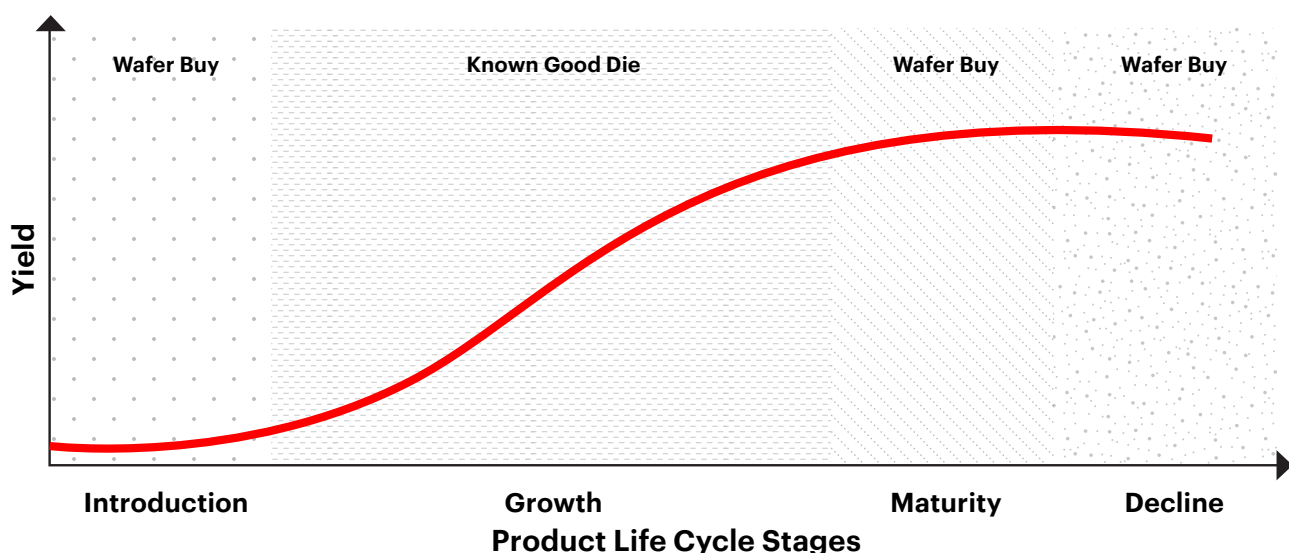
With the necessary business process and system capabilities in place, a company must determine which strategy to use when. That decision is primarily a function of where a product sits in its lifecycle, as illustrated by the semiconductor yield curve.

When a product is developed and introduced, Wafer Buy is the right choice. At this stage, the product design is still being finalized, so a company should have as much insight into the product as possible. Wafer Buy allows for maximum visibility into all stages of manufacturing, enabling the company to collect valuable data during the bump and probe process to optimize manufacturing, more deeply understand design issues, and begin to improve yield prior to high-volume demand.

Additionally, because the complexity and risk of managing the supply chain at this stage are low given low initial sales volumes, it is easier for the company to manage the supply chain itself and minimize costs.

As the product moves into the growth stage, demand begins to ramp up and yield becomes more volatile. At this time, minimizing risk to production and mitigating any potential supply issues is critical—which is one of the biggest strengths of Known Good Die. Paying the foundry management fees for Known Good Die may be less costly overall during growth, as it reduces supply risk and enables the company to maximize production.

Semiconductor Yield Curve



As the product matures, sales level off and decline, and yield becomes more predictable, the optimal strategy once again is Wafer Buy. In the twilight of a product's lifecycle, managing cost becomes paramount to maintain as much margin as possible in the face of pressure from newer competing products. By regaining full control over the manufacturing process, a semiconductor company can stop paying management fees to foundries and focus on driving down direct costs by outsourcing manufacturing to low-cost suppliers. It also can quickly shift production priorities to respond to inconsistent demand that is common at this stage.

Technology also plays an important role in determining which strategy to use. When a product using new technology (such as 5nm-14nm) is introduced, yields are not stable for initial wafer lots—thus making Known Good Die more suitable. Yields for older technology (such as 28nm and higher) will stabilize relatively quickly, making Wafer Buy the optimal strategy for most of the product's lifecycle.

Monitor the performance of each strategy to ensure operations and cost optimization.

However, simply plugging in the right strategy does not guarantee results. A company must continually monitor three key factors to understand how well it is executing each strategy and whether opportunities for improvement exist.

One is the product yield curve. Because a product's yield curve changes as it moves through the product lifecycle, companies should monitor yield closely. Steady yield calls for Wafer Buy and volatile yield signals a likely switch to Known Good Die.

A second is test hardware economies of scale. In Wafer Buy, a semiconductor company must purchase the test hardware needed for probe manufacturing operations—an upfront cost.

But it also can create economies of scale by applying Wafer Buy to additional products over time, thus reducing long-run average costs.

A third is operational efficiency metrics, including on-time delivery of material from foundries and cycle time. Such metrics enable semiconductor companies to not only determine if they are executing the strategies efficiently, but also to identify whether foundries are delivering on their commitments and suppliers are being appropriately managed through bump and probe activities.



Take action to boost the bottom line

The global semiconductor industry is forecast to show strong growth in the next few years, with revenue growing by 10.7% and 13.4% in 2020 and 2021².

But top-line growth is not the biggest problem semiconductor companies face. Given the dynamic nature of the semiconductor industry, and the increasing pressure from investors for better returns, semiconductor companies need to think more creatively about how to address their increasingly unwieldy cost structure to shore up their bottom line. In particular, they should adapt their sourcing processes, yield management capabilities, costing methods and ERP systems to flexibly support both Wafer Buy and Known Good Die strategies, which can help them rein in COGS.

Benefits of improved margins and competitiveness await semiconductor companies who embrace this creative thinking.

CONTACT THE AUTHORS

Syed Alam

syed.f.alam@accenture.com

James Wildenburg


james.wildenburg@accenture.com

Co-author

Vanessa Naik

vanessa.l.naik@accenture.com

JOIN THE CONVERSATION

 @AccentureStrat

REFERENCES

- ¹ Accenture research and analysis, CapIQ
- ² Semiconductor Forecast Database, Worldwide, 3Q19 Update

ABOUT ACCENTURE

Accenture is a leading global professional services company, providing a broad range of services and solutions in strategy, consulting, digital, technology and operations. Combining unmatched experience and specialized skills across more than 40 industries and all business functions—underpinned by the world's largest delivery network—Accenture works at the intersection of business and technology to help clients improve their performance and create sustainable value for their stakeholders. With 492,000 people serving clients in more than 120 countries, Accenture drives innovation to improve the way the world works and lives.

Visit us at www.accenture.com

ABOUT ACCENTURE STRATEGY

Accenture Strategy operates at the intersection of business and technology. We bring together our capabilities in business, technology, operations and function strategy to help our clients envision and execute industry-specific strategies that support enterprise wide transformation. Our focus on issues related to digital disruption, competitiveness, global operating models, talent and leadership help drive both efficiencies and growth.

For more information, follow [@AccentureStrat](https://twitter.com/AccentureStrat) or visit www.accenture.com/strategy