The megatrend will bring about unlikely unions between cutting-edge technology and the plethora of old-line industrial applications and consumer goods, and it will likely lead to great opportunities in new markets for semiconductor companies. But it will also challenge the supply chain that will need to support many new applications and customers. Without proper supply chain and product development strategies, the complexity involved in serving those new markets could wipe out potential profits before products even make it to market.

The challenge: To serve more with less
Although IoT will bring hundreds of new applications to the semiconductor industry, the demand will have to be met with fewer new designs. The industry has been going through an unprecedented period of consolidations due to rising research and development (R&D) costs and slowing overall growth. (See AlixPartners’ recent publication “Getting Moore out of Chips.”) The result of that consolidation will be fewer suppliers and few new products to meet demands for the new sensors, microcontroller units, and connectivity that IoT requires. And while the suppliers are going from many to few, the customer base and application for products are going from few to many. If semiconductor companies are to be successful in this space, their products will have to gain share across a broad set of applications so as to cover the high development and manufacturing costs of bringing the products to market. This is in stark contrast to the traditional leading-edge end markets, which had well-defined product lines that supported semiconductor content designed for narrow focus, such as servers, laptops, and smartphones.

Compounding the challenge of meeting the needs of a broad range of applications is the short product life cycle of many of those key end markets. Wearables and consumer retail goods...
are often as seasonable as high-fashion styles, and they have much shorter product life cycles than PCs, smartphones, telecommunications infrastructure, and other traditional markets served by semiconductor companies. Therefore, new semiconductor products targeting the IoT market must be engineered for a broad range of applications as well as for multiple generations of products before they can gain sufficient market share to recoup the original investment. Semiconductor companies must shift their supply chain and product and development strategies in line with those shifting market dynamics. And companies that can deliver platforms on time with a feature set that can gain share in many applications could stand to reap excess profits from the IoT market; others may struggle to gain a foothold on profitability in the segment.

**Why is it bad to have more products?**

- More products are operationally more challenging to manage because of increased portfolio complexity.
- Early position in the supply chain and lack of visibility to end-market demand magnify the problem.
- Proliferation of stock-keeping units (SKUs) is usually an indicator of an underlying issue and should be investigated.

Companies expand their product lines in order to capture additional market share and revenue. When it’s a disciplined process, it can result in high market share with a minimum number of SKUs to capture each market segment. As competitive, logistical, and engineering forces start to weigh in, though, companies get forced to expand their product lines with minimally differentiated and often overlapping SKUs to protect their market shares and drive revenue growth. That SKU buildup affects operational effectiveness, diverts focus from the company’s core offerings, and inserts complexity into all parts of the business (training, sales materials, ordering, etc.). The semiconductor industry in particular sustains an even greater impact because of its position at the beginning of the supply chain and its high design costs that magnify the risk of producing silicon that never achieves profitability. The resulting top- and bottom-line financial impacts typically don’t get surmounted because of the many hows and whys involved in the creation of SKUs. That is why SKU proliferation has been a hot topic for so long and why it’s so hard to fix. SKU proliferation is a symptom of the greater problem inherent in the ways a company fundamentally manages its end-to-end product life cycle.

**Getting to the root cause of SKU proliferation**

- Companies often address a SKU proliferation problem with a one-time cleanup activity.
- Lack of coordination among R&D, operations, sales, and marketing is often the culprit.
- Improper resource planning of R&D programs makes companies unable to achieve product introduction goals.

SKU proliferation is too often viewed as the problem when it should be viewed as a leading indicator signaling a greater underlying issue. The usual approach is to wait for some technological or financial trip wire to alert management that SKUs have become a problem. The problem could take the forms of high amounts of write-offs, stresses in the planning system, or a sales team unable to explain its product offerings. A SKU portfolio review and cleanup are promptly ordered, the worst of the worst SKUs get axed, and things continue on as normal. Companies are usually unwilling to conduct the next-level root cause analysis because that would cross organizational boundaries and might pinpoint a larger breakdown in strategy and execution. The problem can often be traced back to two failure points deep in the origins of the SKU development process: (1) alignment of what the market is looking for and what is making it through the R&D stage-gate process and (2) the ability to meet product introduction milestones. Coordination is critical for designing flexibility into a product so it can accommodate the largest market segment by easily and quickly incorporating the latest manufacturing configuration changes. Timing of introductions is the other failure point, which can result from improper staffing of programs to meet milestones. Failure at either of those points can cause ripple effects that last quarters—or years—into the future and can ultimately determine a product line’s profitability.

**Identifying the source of the problem**

- Analyze the rationale for SKUs by way of the four-quadrant semiconductor SKU matrix.
- Determine through quadrant comparisons the root cause factors driving SKU proliferation.
- Analyze revenue contribution to quantify the opportunity value of addressing the issue.

To get at the root cause of SKU proliferation requires a look back in time to the reason the SKU was introduced. Our semiconductor SKU creation matrix (figure 2) identifies four buckets segmented by two dimensions of SKU creation:
(1) Was the need for the SKU generated from internal (engineering or marketing groups) or external customer or market pressures? and (2) Was the SKU planned on the road map, or was it created in reaction to a market event or customer?

**FIGURE 2: Semiconductor SKU creation matrix**

- **Quadrant 1** contains the SKUs on the road map, representing the communicated go-to-market plan.
- **Quadrant 2** contains the SKUs created to achieve higher yields or lower costs. They are often revisions to SKUs initially introduced through quadrant 1.
- **Quadrant 3** contains the SKUs created in reaction to unmet market demand or competitive holes driven by the competition.
- **Quadrant 4** contains the SKUs that got reintroduced after clearing out bugs or correcting defects.

A healthy semiconductor company’s distribution of SKUs is *proactive and planned*, leading to better margin contribution. The SKUs of unhealthy semiconductor companies are *reactive*, leading to low—or even negative—margin contributions. Such an analysis is performed by looking at total revenue contribution from the four quadrants for the entire life cycle of a product family to identify macrotrends and by looking at data that trended during the time it took to identify events that triggered reactive behaviors (figure 3). Additional analysis includes comparisons of metrics including average revenue per SKU, average life length of SKUs, and average number of customers per SKU. At this level of analysis, root cause and financial opportunity get developed in parallel for management’s insight into cross-organizational solutions.

**Solution paths**

1. **Ensure visibility at the executive level.** Develop management’s awareness by using metrics and dashboards that track SKUs from early in the R&D funnel through end of life. Given that an average of 16% of a semiconductor company’s revenue is spent on R&D, executive-level visibility into the SKU management process will facilitate cross-organizational alignment with the portfolio strategy.

2. **Establish a strong strategic product planning process.** Companies that have robust R&D planning processes factor in a variety of marketing inputs such as market drivers, competition, cost, prices, and forecasts to ensure the best product introduction outcome. Applying that process in the early stages can determine whether additional SKUs are nonstrategic. In addition, once a product is introduced, it must be managed correctly during each stage of the product life cycle: new product introduction, high-volume manufacturing, and end of life.

3. **Design supply chain flexibility into the R&D process.** Profitable SKUs must be designed to “be planned,” which requires the involvement of supply chain and manufacturing so that the product will be designed with a balance of flexibility to postpone differentiation until a time frame in which customer demand becomes better known and cost savings avail in volume production.

**Conclusion**

For success in the IoT market, semiconductor companies must adjust their organizations’ go-to-market strategies as needed. For profitability, rigorous assessment of the portfolio and close alignment of product development and supply chain goals are critical. We believe the IoT megatrend can be a huge opportunity for the semiconductor market—but only for companies that have developed the right products within a supply chain that is well suited to serve the IoT customer base.
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