Aerospace & Defense

Components

White Paper – Supply Assurance™

Practical Solutions for Managing Component Obsolescence Risk for Counterfeit Avoidance

Author
Tyler Moore
Director of Supply Assurance
Arrow Electronics

May 5, 2014

Overview and Scope

Thirty year lifecycles. Minimal customer commitments. Market forces that favor change. Suppliers that are driven by short-term metrics. It's hard to conceive of a more challenging environment in which to manage the production of high performance electronic products. Now add to the mix thousands of opportunists that are just waiting to capitalize on the panic that ensues when there are large gaps between supply and demand. This is today's reality for most of us who have made careers working to support and improve the supply chain for Aerospace & Defense (A&D) products.

In this paper, we will describe meaningful qualitative differences between tiers of suppliers. Providing clarity to these differences will help leaders within the A&D community to better understand potential opportunities for avoiding the risks associated with the unwitting purchase of counterfeit electronic devices. We will expand on the theme of risk avoidance by outlining certain tools that may be used to improve the quality and quantity of options for dealing with the challenges that component obsolescence creates. We'll also explain how collaboration with top tier suppliers can fill a critical need in the process by providing an even more refined view of risk.

We will then outline certain practical solutions that A&D leaders can consider to better understand the risk that obsolescence poses for their enterprise and tools to manage that risk once it is more clearly understood.

We will share our firsthand observations of a company that was put in a position that threatened not only their brand and credibility in the A&D market, but could have suffered nearly mortal wounds to their balance sheets as a result of not fully understanding the breadth and depth of risk that EOL events create for not only a supply chain management team, but for the enterprise itself.

As we share this analysis, backed by decades of experience in serving this market, we'll provide evidence that managing obsolescence within the A&D market demands a holistic approach. This approach relies on a spectrum of tools and business practices, properly applied in collaboration with credible partners, throughout the long life span of military and aerospace programs. Lastly, we will share our view, that counterfeit risk, though real and threatening, is in many ways a byproduct of the absence of such an approach within industry itself.

Contents

Overview and Scope 1

Moore's Law and the Impact of Constant Innovation 2

Original Component Manufacturers and Their Franchised Distributors 3

Avoiding Obsolescence – A Brighter Pair of Headlights 4

Enterprise Risk Management – The Competitive Advantage 5

Summary 7

Moore's Law and the Impact of Constant Innovation

Original Component Manufacturers (OCM) are entirely commercial enterprises. They compete with one another in one of the most challenging, innovative markets that the world has ever known. It's this "innovate or die"[1] environment that most directly impacts those of us that, though appreciative of innovation, live in a practical world where long term stability is almost more important than innovation itself.

> This paradigm is best described in Moore's Law. In 1965, Gordon Moore, one of Intel's founders, then predicted the phenomenon whereby IC (Integrated Circuit) density doubled every year[2]. The accuracy of his prediction has been born out across over a dozen generations of microprocessors. Today we're able to take advantage of technology that is nearly one million times denser than the technology that existed when his prediction was made.

This has created a constant conflict between suppliers of components and component users. Suppliers feel the pressure to move resources to new products, while customers feel the need to maintain existing products, especially products with long life spans and complex system qualification processes.

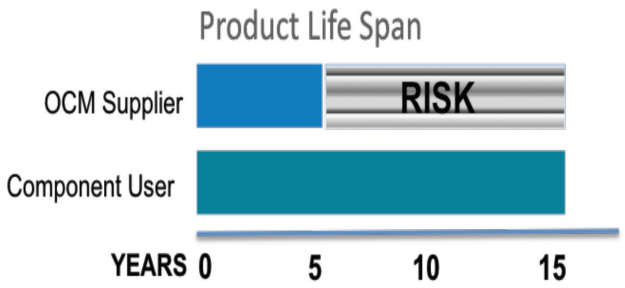
Frequently, it is core processors, memory, and logic technologies that are caught up in this pace and with it comes the challenge to users of these products.

At Arrow, we see these patterns manifest in the thousands of end of life notifications that were transmitted to us in 2011. Across the electronics industry, Silicon Experts, a leading component information provider, documented over one million discontinuances during a similar period. New generation products are introduced every year, and with each introduction, older technologies are abandoned, leaving customers to deal with the myriad challenges that obsolescence creates.

As recourse to any of these events, planned or otherwise, users face a relatively narrow set of options:

- Purchase enough to last the life of the program
- Qualify an alternate source
- Redesign
- Purchase enough to support near term (<2 yrs) requirements

Because each of these options carries distinct and, in some cases, significant expense and/or risk, avoiding obsolescence events gains a premium value to executives and supply chain managers. Understanding the full range of cost/benefit tradeoffs that different options create is critical as well. Once these options and their tradeoffs are understood, the quality of partnerships that a user has with the parts provider becomes increasingly important.



Why is lifecycle information so difficult to find? Product technical information is broadly available from countless websites. Valid, timely lifecycle information about these same parts is much more difficult to access. OCMs have a proprietary interest in keeping their product mortality plans or schedules under very tight control by making that information available to a very narrow range of customers and partners.

[1]Tom Peters, Innovate or Die, 1997

[2]Excerpts from A Conversation with Gordon Moore: Moore's Law, Intel Corp, 2005

It is easy to envision how early access to this information by an OCM's competitors could give them the ammunition to sow fear, uncertainty, and doubt about a particular product or even an entire product family. If OCM 'A' learns that OCM 'B' plans to discontinue a product family at some point, they can immediately begin targeting all of the designs using 'B''s products for redesign. Further, they can modify their own production, pricing, and marketing plans to enhance this displacement strategy. The less obvious reasons why OCMs keep lifecycle information very closely held include substantial raw material investments, production 'load-leveling', strategic customer alignment, and corporate philosophy, all of which play a part in the decisions that OCMs make regarding the discontinuance of products.

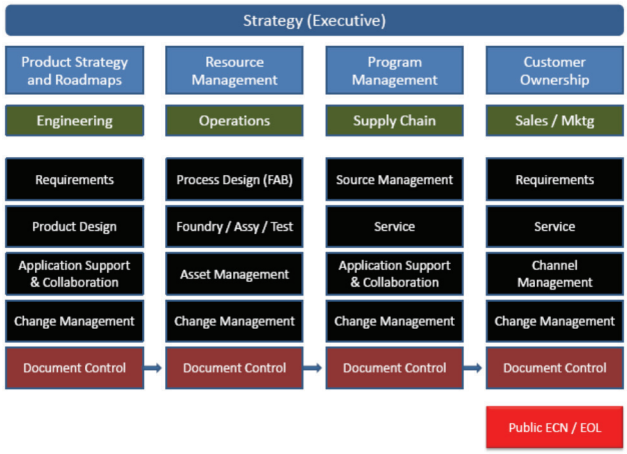


Figure 1 - A typical OCM's organizational structure with its necessary layers of management, conspires to limit the outside world's view of lifecycle plans

To better understand how product lifecycle is developed and how this information flows from deep inside an OCM, Figure 1 outlines the interrelated engineering, operations, supply chain, and customer management elements that must be managed and coordinated to yield an effective and timely ECN/EOL notification process. Understandably, competing interests within certain constituent groups, contribute to further mask the true nature of product lifecycles from the outside world.

By design then, factory-direct, accurate information about the true lifecycle plans of many suppliers' product remains remarkably opaque to most component users. Actual discontinuances and PCNs are readily available of course, but mid- (>1yr <3yr) and long-term information (>3yr) which would be truly helpful to A&D users remains frustratingly out of reach to most users.

Original Component Manufacturers and Their Franchised Distributors

Most OCMs have long established franchised channels of distribution. The nature of this franchised relationship insures that the parts that these distributors sell are sourced directly from the OCM's factory. Performance standards for quality, information control, and traceability are similar to those of the OCM itself.

Franchised Distribution

A franchised distributor is obligated to carry out certain operational, marketing, support, and in some cases engineering services in support of the Original Component Manufacturer's strategy and product roadmap.

Within this relationship, OCMs typically provide distributors with product training, design tools, automated product data streams including pricing, lead times and in some cases, design recommendations.

The franchised distributor is a critical functioning part of an OCM's channel strategy. In some cases, the franchised distributor may support the vast majority (>90%) of the end customers for a particular supplier's products.

Franchise agreements may be global or regional in scope, and are typically evergreen in their duration, though some agreements may be time bound.

Franchised distributors also receive automated product information concerning: Product Changes, Engineering Changes, Lifecycle Changes, as well as Lead Time Updates.

In contrast, open market sellers of these components do not benefit from a direct relationship with an OCM. Although the best open market sellers maintain stringent quality control measures once a part enters their facility, the very nature of their acquisition strategies introduce variables that may impact the ultimate quality and usability of devices acquired via open market channels. (Consider the impact of unclear holding, environmental controls and other quality elements as a part travels through unknown sources before becoming available for sale.)

Furthermore, open market suppliers lack the access to people and information that franchised distributors receive as part of their working agreement with the OCM.

From these differences, based on product quality and visibility to product information, there are three distinct tiers related to the sales and support of electronic products.

Figure 2 - Component Source Tier Structure

*It should be noted that there are wide varieties in the sourcing practices & quality controls across resellers in the open market. It is dependent on all buyers in the A&D market to thoroughly investigate the quality controls of any open market reseller in order to mitigate the risks associated with counterfeit parts and compliance with federal regulations

Avoiding Obsolescence – A Brighter Pair of Headlights

Just as component manufacturing has advanced dramatically over recent decades, so has our ability to gather and interpret information about those technologies. Furthermore, academics and technologists have taken up the challenge of layering analytical methods on top of product information to create prediction tools. These tools give component users a sense of the potential (obsolescence) problems latent in their parts lists. These tools range in cost and complexity and are sold under a range of brand names:

- Silicon Expert
- I.H.S.
- Part Miner
- Total Parts Plus

Tools of this type rely on data mining based algorithms, such as those proposed by P. Sandborn et al. of the University of Maryland, CALCE[3], which focus directly on DMSMS and provide the predictive foundation for many of the tools mentioned above.[4 5] The data used in these tools may be gathered in the public domain, and may also include proprietary information from suppliers themselves. At their core, these tools attempt to "predict" obsolescence events. The accuracy and efficacy of these tools are dependent on the degree to which the future adheres to historical patterns and the specific conditions that any given user faces related to any specific EOL event (minimum buy quantity, product cost, and total predicted volume).[6] Even with these limitations however, these tools are key in the short term (<1 yr) tactical response to EOL risk, as well as a guiding resource for longer term strategic planning.

Given their predictive nature, users will inevitably find themselves faced with situations where the tools are predicting an imminent risk and the user will consequently need to obtain further clarity before taking action. In the electronic component ecosystem, component manufacturers and their franchised distributors can provide a next-level of analysis and specificity regarding the identified risk for an at-risk part that goes beyond the directionally correct guidance which the tools provide.

Engaging with a franchised distributor can help to significantly improve the quality and usability of the information that these services provide, as well as help component buyers and users gain the critical insight necessary to effectively deal with discontinuance risk.

[3]Sandborn P, Forecasting Technology and Part Obsolescence, CALCE Electronic Products and Systems Center, University of Maryland, November, 2010

[4]Silicon Expert press release, SiliconExpert Technologies Releases Component Risk Analysis and Obsolescence Forecast Algorithm, November 19, 2008

[5]PartMiner Inc. press release, Lifecycle Forecasting and Bill of Materials Management Added to PartMiner's CAPS Component Database, November 3, 2003

[6]Sandborn P., Pradhakar V, Ahmed, O, Microelectronics Reliability, Vol. 51, ' Forecasting electronic part procurement lifetimes to enable the management of DMSMS obsolescence ', 2011

Enterprise Risk Management – The Competitive Advantage

The market and supplier dynamics already discussed create the attractive conditions from which counterfeit or sub-quality parts are propagated into the supply chain. Channel confusion or disregard for resellers' source of supply further stimulates the growth of the counterfeit markets. Yet, as we discussed, tools exist which can help users identify parts that are likely to become counterfeiting targets. These tools continue to improve in their accuracy and efficacy to the problem. And yet the problem of counterfeits and substandard parts entering the supply chain persists.

It is our position that a significant contributing factor to the problem of counterfeit propagation starts with inadequate or misunderstood risk analysis and risk management by senior leaders within A&D enterprises.

Product discontinuance events create significant potential for product cost increases, design cost increases, system-availability impacts, and supply chain delays. The cost factors created by discontinuance are well documented and can exceed $1M for a single commercial off-the-shelf redesign and inject nearly a year of design time delay.[7]

The risks that are less apparent however, may be risks that occur at an enterprise level. These risks, which can be substantial and threaten an enterprise's health and sustainability, fall into four distinct areas:[8]

- Hazard Risk
  - Liability, Property, Natural Catastrophe
- Financial Risk
  - Pricing, Asset, Currency, Liquidity
- Operational Risk
  - Customer Satisfaction, Product Failure, Integrity, Reputational Risk
- Strategic Risk
- Competition, Societal Trends, Capital Availability

As a franchised distributor, when we view the typical OEM (or customer response to discontinuance events, the risk analysis process predominantly focuses on items related to financial risk, price and inventory holding costs). The resulting response is biased toward minimizing the cost and quantity of products purchased. Anecdotally, buyers of these products describe the pressures that formulate their response. They are typically concerned with Purchase Price Variance (PPV) metrics, Return on Working Capital (ROWC), inventory turns, inventory levels, and limitations related to the DFAR which may preclude them from purchasing more raw materials than they may actually need for future production. All of these pressures contribute to a consistent underestimation of their product needs.

Arrow's own internal analysis, completed over the past decade, indicates that a typical end of life announcement generates product orders to the OCM that covers only 60% of future demand for that part. A full 40% of future demand is not captured during the last time buy process setting up a substantial supply gap for years to come.

Failure to fully consider the full range of risk dimensions that these events create, and this bias toward minimizing the capital costs of discontinuance events serves as the catalyst which creates a significant gap between long-term supply and demand. This unmet demand drives the well-meaning buyers into the open market for these parts and potentially creates significant exposure to other enterprise level risks.

[7]DMSMS Non-Recurring Engineering (NRE) Cost Metric Update prepared by ARINC Engineering Services LLC (Shaw W., Speyerer F.), September, 2010

[8]Overview of Enterprise Risk Management, Casualty Risk Management Society, May, 2003

A real life example of a single component EOL driving enterprise-level risk

An upper tier semiconductor manufacturer published an end of life notification per normal policy and practice.

Within the A&D enterprise using a particular component, a local supply chain team made the decision and commitment with regard to the level of investment that they would make in the EOL component.

The team decided to make an investment amounting to approximately three year's usage:

- At the time of this decision, long term service requirements were easily visible but not clearly accounted for in the last-time-buy
- At this time, then current sales forecasts were visible and indicated a larger demand than would have been supported with the committed LTB
- At this time, redesign was not under consideration and redesign times were known to be greater than 3 years including system qualification

Shortages materialized within 30 months of the Last Product Shipment (LPS) date from the OCM.

No redesign had been started at the 30 month post LPS milestone.

Because of the particular systems effected, not only was the overall enterprise facing catastrophic customer service and support issues, but also nearly debilitating financial impact putting an entire quarter's earnings at risk.

Through significant time and effort of chief executive and technology levels, solutions were created. Though less expensive when measured against the catastrophes they helped to overt, these solutions amounted to over 11× the original cost of a full life time buy that would have incorporated 5 years of production including the optimistic sales forecast, forecasted service requirements, and stock to cover redesign and requalification time - which has started at this time.

By fully evaluating the full spectrum of risks that EOL events create for an enterprise, we believe that many users will respond differently from the norms we observe today.

A framework and tools for implementing such an approach to risk analysis are well documented in ISO31000 and IEC/ISO31010 standards.[9] [10] Under this framework, users should gain significantly better visibility and understanding of the principles and techniques that should be used to evaluate these risk-generating events.

Using this framework, entities can expect to build a better response framework focused on:

- Avoidance: Exiting or fully mitigating activities
- Reduction: Diminish the likelihood or impact of events
- Alternate Actions: Identify feasible alternates
- Risk Sharing or Insurance: Strategies to share or apportion risk to other constituents
- Acceptance: Cost/benefit decisions

ERM (Enterprise Risk Management) is not only a tool for dealing with the downside potential of obsolescence events. When implemented holistically across a program or enterprise, ERM can become a significant competitive advantage. Relating this to the current context of defense acquisition, enterprises that are able to deal most effectively with obsolescence risk and the concomitant risk of counterfeits that occurs will become the competitive leaders in service to the DoD.

[9]Risk Management – Principles and guidelines, ISO 31000, International Standard, First Edition, 2009-11-15

[10]Risk Management – Risk Assessment Techniques, IEC/ISO 31010, International Standard, Edition 1.0 2009 – 11

Summary

Exposure to end of life or product discontinuance events is not likely to diminish in the foreseeable future. Commercial market forces effecting Original Component Manufacturers are in many ways in direct opposition to the long life support needs of Aerospace and Defense companies. The gap between the interest of these groups creates a fertile ground in which profit seeking players seek any and all options to fill the seemingly insatiable demand for hard to find or obsolete products. As a result, component users in the Aerospace & Defense sector, as well as other sectors characterized by a need for long product life or high reliability, are bombarded by sellers offering these parts.

These sellers can be categorized into three tiers: the original manufacturers; those manufacturer's franchised distributors, and all others. Within this last tier, the origins, chain of custody, storage conditions, prior usage conditions, and other characteristics of these parts are very difficult to determine. Aggressive inspection schemes and processes meant to validate the veracity of resellers' authenticity claims are certainly necessary and warranted in an environment where, for practical reasons, certain parts are only available via open market resellers.

To get ahead of the problem, we must deal with two of the driving forces that create the conditions in which open market acquisition has become the norm:

> Restricted visibility to oncoming risk

> Inadequate response to discontinuance life-time-buy events

A range of commercially available tools have been created and continue to be refined which give component users a clearer view of risk as it evolves. These tools provide particularly high utility for A&D users when they are implemented on an ongoing basis where information is constantly refreshed. Where A&D customers or prime contractors may have shifted bill of material management downstream to their manufacturing providers, these providers must be held accountable for implementing tools of this type as well.

As good as these tools are, they are still limited in their ability to accurately predict the behavior of the OCM, which, as we have shown, is a function of multiple organizational inputs as well as market forces. There are a variety of competitive reasons explaining why an OCM may not want to openly broadcast the actual lifecycle plans for their components prior to the official EOL announcement.

This is where a partnership with an OCM's franchised distributor makes real sense. By virtue of their close alignment with the OCM, the franchised distributor is likely to be able to offer the A&D user a refined view of the risks that the commercial lifecycle management tools may illuminate. The franchised distributor will have access to certain people and roadmap information that can add clarity to a component user's LTB (Last Time Buy) decision making process.

Finally, we have outlined our observations concerning buyers' common response to LTB events. It is not uncommon to see very tactical responses to EOL events when in fact these events create a very strategic and potentially threatening set of circumstances for the A&D enterprise.

Specific tools were discussed to help A&D managers respond to EOL events in a more holistic way. We believe this holistic response will lead to noticeable changes in buyers' response to EOL announcements. We also believe that given the environment created by changes in legislation concerning the propagation of counterfeit parts, enterprises that implement this risk management framework will achieve a significant competitive advantage over their peers that do not implement ERM (Enterprise Risk Management).

Understanding that counterfeit components are the symptom, not the disease, is an important first step toward addressing the problem they create. Understanding and acting on the fact that tools and partnerships are available today that can give much improved clarity to obsolescence risk is critical. And finally, implementing these steps in the context of an enterprise that is holistically aware of the risk exposure and management strategies that discontinuance creates, offers the A&D enterprise the best chance of truly solving this problem.

Arrow Electronics, the world's leading franchised distributor, operates one of the most complex supply chains in the world. Arrow's supply assurance program supports customers' ongoing demand for electronics parts after a component manufacturer has discontinued production of finished components and die-level products. Arrow maintains direct connections with its suppliers for information concerning engineering changes, lifecycle changes, and lead time information, while ensuring that a wide range of factory-direct EOL product inventory – including over 1400 QML devices – are available to customers long after the OCM has discontinued production. To learn more about product obsolescence solutions, email supplyassurance@arrow.com or call:
1-800-833-3557 (customers new to Arrow)
1-800-777-2776 (existing customers).

Five Years Out

Arrow Electronics, Inc.
Aerospace & Defense
7459 South Lima Street
Englewood, CO 80112, USA