Building Obsolescence–Resistant Systems: How to Nip Obsolescence in the Bud

By Tracy Daubenspeck

Nearly everything is subject to obsolescence. Companies go out of business or change product lines, technologies evolve over time and old technologies are abandoned, materials are phased out due to regulations or because of improvements; the list goes on. Military systems are subject to obsolescence and because they typically have long life cycles and particularly long acquisition periods, the problem is often exacerbated. Diminishing Manufacturing Sources and Material Shortages (DMSMS) management is a multidisciplinary process to identify issues resulting from obsolescence, loss of manufacturing sources, or material shortages; to assess the potential for negative impacts on schedule and/or readiness; to analyze potential mitigation strategies; and then to implement the most cost-effective strategy.[1] Because conventional wisdom tells us that 70 percent of the total life-cycle cost of a system is in the sustainment phase, and because those costs are essentially locked in during the design phase,[2] it makes sense to apply the principles of DMSMS management during the design phase to ensure that the most obsolescence-resistant products are used in the design and to continue to reinforce that strategy as the system is built, delivered, sustained, and upgraded.

As stated above, DMSMS management is a multidisciplinary process and is typically handled by an integrated process team often referred to as the DMSMS Management Team (DMT). The composition of the DMT may vary as a system progresses through the life cycle but a typical team is composed of members from engineering, logistics, and supply, technicians, the prime contractor, DMSMS specialists, and, potentially, ad hoc members from other groups such as contracting or legal. Early in the life cycle, when designs are being vetted for use in a system, there are three key activities. The first is to establish a DMT, its associated processes, and a DMSMS management plan. The second is to get DMSMS management requirements in contracts. The last is to evaluate design proposals to ensure that the designs will be as DMSMS resistant as possible. "SD-22, DMSMS: A Guidebook of Best Practices for Implementing a Robust DMSMS Management Program" covers all three of these topics; we will focus on the last two.

The importance of good contract language cannot be overstated. In my experience working with more than 70 different programs during the past 10 years, one of the biggest problems facing DMSMS managers is in the area of contracts. Many contracts make no

[1] Defense Standardization Program Office, "SD-22, Diminishing Manufacturing Sources and Material Shortages (DMSMS): A Guidebook of Best Practices for Implementing a Robust DMSMS Management Program," 2016, https://acc.dau.mil/CommunityBrowser.aspx?id=46237.

[2] Capt. Gary Jones, Lt. Col. Edward White, and Lt. Col. Jonathan D. Ritschel, "Investigation into the Ratio of Operating and Support Costs to Life-Cycle Costs for DoD Weapon Systems," Defense Acquisition Research Journal, January 2014, http://dau.dodlive.mil/2014/01/01/investigation-into-the-ratio-of-operating-and-support-costs-to-life-cycle-costs-for-dod-weapon-systems.

mention of DMSMS management. Many more have vague references that often result in limited or no action on the part of suppliers. Good DMSMS contract language has several key elements: responsibility for DMSMS management is spelled out, DMSMS management requirements are flowed down to subtier suppliers, and DMSMS data requirements are detailed. Getting this language in place ensures that DMSMS is considered and managed during designs and that subtier suppliers are engaged as well. In addition to "SD-22, SD-19 Parts Management Guide," and "MIL-STD-3018 Parts Management," contain information pertinent to DMSMS contract language. A Navy memo from the Assistant Secretary of the Navy (Research, Development and Acquisition) dated May 12, 2006, and titled "DMSMS Guidance for Developing Contractual Requirements," also has good content. While in the ideal, DMSMS contract language is in place from day 1, it is never too late to get proper contractual language in place.

Key considerations for DMSMS management activities during design include standards-based designs, open architecture, the use of newer but mature technologies, the selection of parts with multiple suppliers, and considering the health of the supply chain. The first three activities listed fall into the realm of engineers and technicians with experience in the technical area being evaluated, while the last two are most typically handled by logisticians.

There are many types of standards to consider, including international standards, industry standards, and government standards, each with their own strengths and weaknesses. The important thing with standards, with regards to DMSMS, is to select the one that will give the system the most benefits in terms of a long life cycle and availability of parts. A good example is the PCI Express serial computer expansion bus standard. This standard was formalized in 2004 and has continued to be maintained and upgraded. The latest version, 4.0, is scheduled to be published in 2017. This standard has maintained a great deal of backwards compatibility over the years while increasing speed by a factor of 4 and throughput by a factor of 7.[3] In computer hardware terms, this is a very durable standard and is probably still a good choice for future designs.

Open architecture, similar to standards, is a design method that uses interfaces that have defined interconnections and communication protocols. Any device that is similarly designed should fit appropriately and be able to "talk" with the other devices in the system. Open architecture applies to both software and hardware. In open architecture software, software modules in an application or the application itself have documented interfaces that allow other developers to design modules that "bolt on" and work correctly.

There appears to be a tendency among designers to use familiar products in their designs. While this is no doubt more efficient, it is not always the best choice when developing a system expected to last decades. Most products fall into a predictable life-cycle curve starting with

[3] Wikipedia article, "PCI Express," 2016, https://en.wikipedia.org/wiki/PCI_Express.

introduction, progressing through market acceptance, and ending in discontinuance. In a perfect world, system designers would select long life-cycle parts that have just passed the market acceptance point in their cycle.

> **HOW NOT TO USE STANDARDS**
>
> Many years ago, while working as the lead of a circuit card manufacturing shop, I worked on a project to build some first article cards for testing. The production run went fine and the cards were ready for in-house testing when the project was stopped. When I investigated to determine the cause of the stop in production, I was told that the designer of the card had used an early version of the PCMCIA memory cards in the design and that the memory cards were no longer available. The PCMCIA standard was well established at the time that these cards were designed and built, and the replacement product met the specifications of the standard. However, the designer had used a feature of the memory card that was not part of the standard. The new memory cards did not have this feature and it rendered the circuit cards unusable. The entire run had to be scrapped and months passed before a new design was finalized and new circuit cards were delivered.
>
> **–Tracy Daubenspeck**

Vendor and supply chain health considerations should also be examined for each part being evaluated. This evaluation is risk based with criticality, cost, and lead time of a part being one set of considerations and the health of the supply chain being another. If the part is only available from a single vendor, is a special order part, or contains exotic materials, the health of the company and its supply chain are very important. If the part is a commercial off-the-shelf item available from several vendors, the health of a given supplier may not be so important. When selecting a part that is high risk, it is often a good idea to document approaches to mitigate that risk, for instance, buying the technical data package and/or the rights to the manufacturing process, or considering a contractual option to obtain those data rights and/or technical data package once a company is ready to discontinue support.

As long life-cycle systems are typically upgraded periodically during their life, the actions detailed above should be used during the design phase of the upgrades as well. In addition, a database that keeps track of all parts used in a system, the rationale for their selection, and information related to their expected life cycle is an invaluable tool to aid in future obsolescence mitigation activities.

I have focused this article on ways to avoid obsolescence problems later in the life cycle by designing obsolescence-resistant systems and ensuring that sound suppliers are used. However, no amount of effort in the design phase can ward off obsolescence for the entire life of a typical military system. A good, proactive DMSMS program and an effective DMT will discover and handle most obsolescence well in advance of an impact from that obsolescence and before options like last-time procurements run out, avoiding redesigns where possible and allowing for planned redesigns or technology refreshes when not. DMSMS management practices have a proven track record for avoiding unnecessary redesign costs and schedule delays and ensuring that obsolescence issues are not the cause of availability problems.

About the Author

Tracy Daubenspeck is a technical project manager for the Obsolescence Management Division at Naval Undersea Warfare Center in Keyport, WA. In that capacity, he manages the execution of obsolescence management projects in the division. Mr. Daubenspeck is a co-chair of the DoD DMSMS Working Group's Problem and Solution Committee and an active participant in both the Navy's and NAVSEA's DMSMS working groups, where he works to develop DMSMS management best practices. He was a major contributor to the revised SD-22 DoD DMSMS Guidebook that was published in 2012 and revised in 2015 and 2016. He worked with the DoD DMSMS community and the Department of Commerce to develop a DMSMS cost metrics survey that was conducted in 2014. The results of that survey were published in early 2015.