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Obsolescence Driven Design Refresh Planning for Sustainment-Dominated Systems

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Many technologies have life cycles that are shorter than the life cycle of the product they are in. Life cycle mismatches caused by the obsolescence of technology (and particularly the obsolescence of electronic parts) results in high sustainment costs for long field life systems, e.g., avionics and military systems. This article presents a methodology for performing optimum design refresh planning for sustainment-dominated electronic systems based on forecasted technology obsolescence and a mix of obsolescence mitigation approaches ranging from lifetime buys to part substitution. The methodology minimizes the life cycle cost by determining the optimum combination of design refresh schedule for the system (i.e., when to design refresh) and the design refresh content for each of the scheduled design refreshes. The analysis methodology can be used to generate application-specific economic justifications for design refresh approaches to obsolescence management.

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Notes

[1]The usage of the term “sustainment” in this article is consistent with the Brundtland Report definition (Brundtland Commission, 1987): “Development that meets the needs of present generations without compromising the ability of future generations to meet their own needs.” In the context considered in this article, “present and future generations” refers to the users and maintainers of a system.

[2]The military refers to electronic part obsolescence (and more generally technology obsolescence) as DMSMS—Diminishing Manufacturing Sources and Materials Shortages.

[3]Data from industry studies indicates that the average original manufacturer procurement lifetime is approximately 10 years for microcircuits, however, lifetimes vary depending on the part type, for more information, see Livingston (2000).

[4]Note: obsolescence forecasting is an “outside looking in” form of product deletion modeling; e.g., Avlonitis, Hart and Tzokas (2000), performed without access to the internal business knowledge of the manufacturer of the part.

[5]Technology refresh is used as a reference to system changes that “have to be done” in order for the system functionality to remain useable. Technology insertion is a term used to identity the “want to be done” system changes, which include both the new technologies to accommodate system functional growth and new technologies to

replace and improve the existing functionality of the system; see Sandborn et al. (2003).

[6]A last time buy means procuring and storing enough parts to sustain manufacturing and fielded units until the next design fresh.

[7]Software becomes obsolete because the system that must execute it changes (possibly due to hardware changes caused by hardware obsolescence), the software vendor terminates support, or media obsolescence, formatting or degradation terminates access to it.

[8]TACTech was acquired by i2 and is the basis for the TACTRAC obsolescence forecasting tools.