







Q

Home ► All Journals ► Engineering & Technology ► The Engineering Economist ► List of Issues ► Volume 51, Issue 2 ► Obsolescence Driven Design Refresh Plann ....

## The Engineering Economist >

A Journal Devoted to the Problems of Capital Investment

Volume 51, 2006 - <u>Issue 2</u>

695 84 0
Views CrossRef citations to date Altmetric
Original Articles

# Obsolescence Driven Design Refresh Planning for Sustainment-Dominated Systems

Pameet Singh & Peter Sandborn

Pages 115-139 | Published online: 21 Sep 2006

66 Cite this article



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.

## ACKNOWLEDGMENTS

The authors thank the Northrop Grumman CPOM program for providing the case study data used in this work. MOCA development work has been funded in part by the Air Force Research Laboratory and Wright-Patterson AFB, sponsored by the ManTech Sustainment Initiative, Manufacturing for Sustainment under contract F33615-99-2-5503; the CALCE Electronic Products and Systems Center; and the National Science Foundation (Division of Design, Manufacture, and Industrial Innovation) Grant No. DMI-0438522.

# Notes

<sup>1</sup>The usage of the term "sustainment" in this article is consistent with the Brundtland Report definition (<u>Brundtland Commission</u>, 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.

<sup>2</sup>The military refers to electronic part obsolescence (and more generally technology obsolescence) as DMSMS—Diminishing Manufacturing Sources and Materials Shortages.

<sup>3</sup>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 <u>Livingston (2000)</u>.

<sup>4</sup>Note: obsolescence forecasting is an "outside looking in" form of product deletion modeling; e.g., Avlonitis, <u>Hart and Tzokas (2000)</u>, performed without access to the internal business knowledge of the manufacturer of the part.

<sup>5</sup>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. <u>(2003)</u>.

<sup>6</sup>A last time buy means procuring and storing enough parts to sustain manufacturing and fielded units until the next design fresh.

<sup>7</sup>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.

<sup>8</sup>TACTech was acquired by i2 and is the basis for the TACTRAC obsolescence forecasting tools.

### Related Research Data

Re-engineering option analysis for managing software rejuvenation

Source: Information and Software Technology

Electronic part life cycle concepts and obsolescence forecasting

Source: IEEE Transactions on Components and Packaging Technologies

Scenario analysis of demand in a technology market using leading indicators

Source: IEEE Transactions on Semiconductor Manufacturing

A survey of maintenance models: The control and surveillance of deteriorating systems

Source: Naval Research Logistics Quarterly

A model for equipment replacement due to technological obsolescence

Source: European Journal of Operational Research

Generating redesign suggestions to reduce setup cost: a step towards automated redesign

Source: Computer-Aided Design

Good buy? Delaying end-of-life purchases

Related research 1



Information for

**Authors** 

**R&D** professionals

**Editors** 

Librarians

**Societies** 

Opportunities

Reprints and e-prints

Advertising solutions

Accelerated publication

Corporate access solutions

Open access

Overview

Open journals

**Open Select** 

**Dove Medical Press** 

F1000Research

Help and information

Help and contact

Newsroom

All journals

**Books** 

### Keep up to date

Register to receive personalised research and resources by email



Sign me up











Accessibility



Copyright © 2025 Informa UK Limited Privacy policy Cookies Terms & conditions



Registered in England & Wales No. 01072954 5 Howick Place | London | SW1P 1WG