

MOCA – Mitigation of Obsolescence Cost Analysis

CALCE Electronic Systems Cost Modeling Laboratory
University of Maryland



Electronic Systems Cost
Modeling Laboratory

The rapid growth of the electronics industry has spurred dramatic changes in electronic parts. Increases in speed, reductions in feature size and supply voltage, and changes in interconnection and packaging technologies are becoming events that occur almost monthly. Consequently, many of the electronic parts that compose a product have life cycles that are significantly shorter than the life cycle of the product. This life cycle mismatch problem requires that during design, engineers be cognizant of which parts will be available and which parts may be obsolete during a product's life. This problem is especially prevalent in avionics and military systems, where systems may encounter obsolescence problems before being fielded and nearly always experience obsolescence problems during their field life. This problem is exacerbated by manufacturing that takes place over long periods of time, and the high cost of system re-qualification that makes the design refreshes extremely expensive.

Many part obsolescence mitigation strategies exist including: life time buy, last-time buy, part replacement, aftermarket source, uprating, emulation, re-engineering, salvage, and ultimately redesign of the system. Design refresh (or redesign) has the advantage of treating multiple existing and anticipated obsolescence problems concurrently and additionally allows for functional upgrades. Unfortunately, design refresh is also often a very expensive option, not just in non-recurring engineering costs, but also in potential system re-qualification costs.

The MOCA Software Tool

A methodology and its implementation (MOCA) have been developed for determining the part obsolescence impact on life cycle sustainment costs for the long field life electronic systems based on future production projections, maintenance requirements and part obsolescence forecasts (Figure 1). Based on a detailed cost analysis model, the methodology determines the optimum design refresh plan during the field-support-life of the product. The design refresh plan consists of the number of design refresh activities, their respective calendar dates and content necessary to minimize the life cycle sustainment cost of the product (Figure 2). The methodology supports user determined short- and long-term obsolescence mitigation approaches on a per part basis, variable look-ahead times associated with design refreshes, and allows for inputs to be specified as probability distributions that can vary with time. MOCA integrates with Price Systems parametric cost modeling tools, Frontier Technologies ICE tool and the Titan Poet environment.

Example MOCA Analysis

A case study was performed for an avionics unit consisting of 2 boxes that contained a total of 20 boards (12 of the boards are unique and one board is common to both boxes). A total of 831 parts (116 unique)

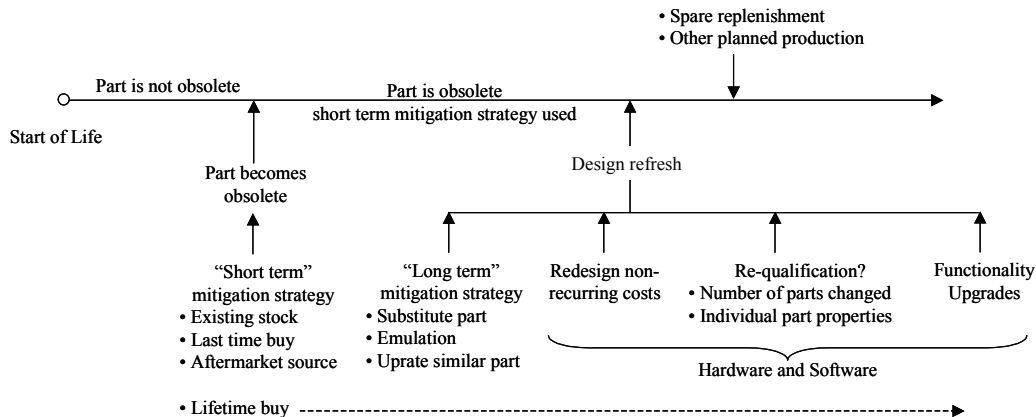


Figure 1 – Timeline of events managed in the MOCA design refresh planning tool.

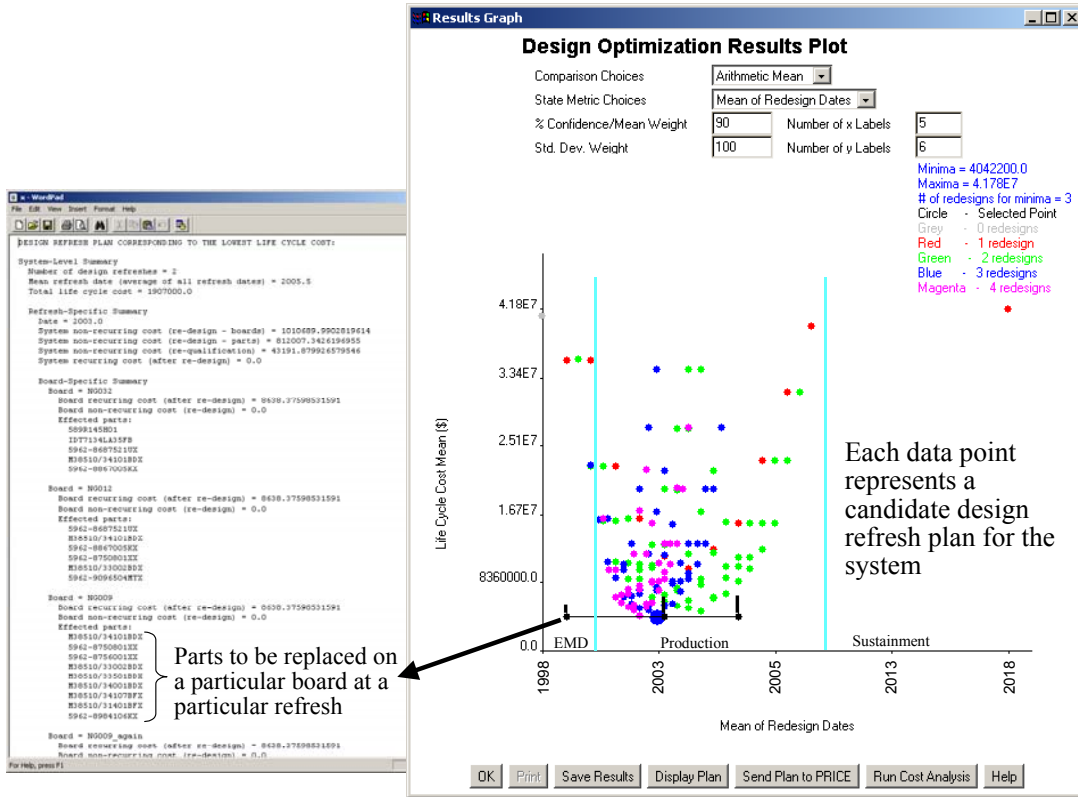


Figure 2 – MOCA output for an electronic system. MOCA generates results for all possible combinations of design refresh locations (dates). The data points on the plot each represent a different refresh plan (a refresh plan is a group of one or more design refreshes). One plan is expanded to show the refreshes associated with it.

were included on the boards. The system is designed for a 20 year sustainment life with scheduled manufacturing taking place during the first 12 years.

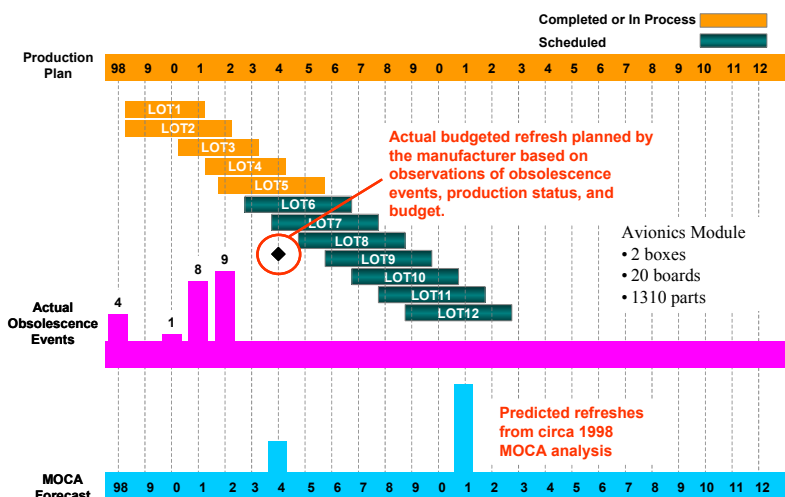


Figure 3 – Comparison of MOCA forecasted optimum design refresh dates (forecasted from the 1998 design data), and the first major redesign date determined by the manufacturer.

The original design for the avionics unit was performed in 1998. In order to verify the MOCA analysis, the system was modeled as though the analysis was being performed in 1998 using TACTech part lifecycle forecasts performed when the original unit design was performed.

The optimum refresh plan forecasts from MOCA are compared to the actual refresh plans determined from the state of the obsolescence events and production (Figure 3).

For more information on MOCA contact: Peter Sandborn, (301) 405-3167, Sandborn@calce.umd.edu