

Strategic Advisory

Desktop refresh cycles | the view from post 2009

SEPTEMBER 2011

For many organizations, the year 2009 might be best known as the 'year of pause'. Many IT projects (and business initiatives generally) were put on hold, as executives waited for improvements in economic conditions before resuming funding of IT projects.

For some enterprises, this included pausing the normal course of desktop/laptop refresh processes and PCs which should have been replaced at 36 months were held for another 12 months. Stretching the lifespan of basically a third of a firm's PCs did not seem to radically affect productivity, and this is readily explained by the decline in the need for business output. Customer demand was down, production was slowed, and daily PC usage became less intense and less demanding on the hardware. Consequently, support needs/costs for less-used PCs softened (eg no

upgrades were performed on them) and some managers concluded that PCs actually lasted longer than their refresh cycle program predicted.

As it ends up, this conclusion needs qualification since the demands on those PCs during that year were abnormally low and this abnormal experience does not really require adjustment to the TCO models built in the 2005-2008 timeframe. Plus, new TCO and lifecycle studies emerged in 2009/2010 which reflected in the costs and variables of the older TCO models yet still arriving at basically the same conclusions.

Additionally, several developments in the technology marketplace (eg Windows 7 deployments, new motherboard technologies) and management environment (eg unpredictable increase in number

and complexity of compliance requirements, forced upgrades from application vendors, etc.) raise issues that need to be considered in reviewing/revising PC refresh plans for the near future.

IT management should review and reassess the refresh strategy in the post-2009 world to see what factors might have changed relevant to refresh cycles and other migration issues.

Do the earlier TCO models need updating?

In Macquarie's Strategic Advisory Services paper titled *Desktop Refresh Cycles: Recent Industry Studies*, six TCO/refresh studies were discussed from a variety of sources: customers, vendors, and analysts. The general conclusion of the various studies was that 36 months is the optimal refresh period for desktops and between 24-36 months for laptops. Each study looked at a different set of variables, with some more focused on technical issues and others on financial issues.

It's important to note these models would still apply, except in three cases:

- if new and significant variables/costs need to be added to the model
- if some significant variables/costs need to be removed from the model
- if existing variables/costs have changed significantly.

A quick glance at the variables in the studies would suggest that not much has changed:

- hardware failure rates in years 4-6 compared to 1-3
- extra support for additional, newer applications/operating systems
- cost of supporting unsupported OS variants
- higher complexity in moves, adds or changes of older gear
- standardization efforts more expensive with a wider mix of ages
- client acquisition cost
- training
- client engineering (build)
- client deployment & logistics
- software/patch deployment
- help desk support (level one)
- deskside support (level two)
- out-of-warranty repair
- retrieval/disposal costs
- disposal cost recovery (offset to costs)

- higher software testing/qualification costs (wider base for testing)
- higher number of software images to support
- more difficult application development (wider base, lower performance floor)
- warranty extension costs (beyond standard warranty)
- cost of money
- OS/software upgrades.

The most notable changes in the values of these variables would probably be that:

- Windows XP is now the 'unsupported' system, instead of NT and Windows 98/2000
- We now have two newer OS versions: Vista and Windows 7 (moving rapidly to one, not including the rise of Mac OSX in enterprises)
- software/patch deployment is getting somewhat simpler with more automation
- disposal costs are rising
- OS/software upgrades (license costs) might be increasing, in cases of VDI
- labor costs are slightly down (both support and migration line items), although some of this would be offset by the rise in the use of contract labor.

Based upon survey data from *PC Magazine*, hardware failure rates do not seem to have changed much and in fact, may have actually gotten worse. In survey data from 2008-2009, first year failure and repair rates actually rose from 12 percent in 2008 to 15 percent in 2009 for Windows desktops, and in the any age Windows desktops (business category), figures for the two largest suppliers (HP, Dell) rose slightly from 2008 to 2009 (from 17-18 percent, and from 19-20 percent, respectively).^[1]

The older TCO models are still probably useful, but newer studies on TCO and failure rates were published in 2009/2010.

TCO/reliability studies from 2009 and 2010

How to reduce your PC TCO 30 percent in 2011

This 10-page report, from 3/20/09 is attributed to Federica Troni, Brian Gammage, and Michael A. Silver of Gartner, Inc., and contends that TCO can be dramatically reduced by refreshing systems to be more easily and effectively managed.^[2]

The analysts argue that competitive price declines in business PCs help reduce TCO, but that some of this gain is offset by the enterprises' move from desktops (lower lifespan costs) to notebooks (higher lifespan costs). The ratio of notebooks to desktops is increasing and this will be reflected in higher lifespan costs.

The main factor contributing to a possibly lower TCO is the adoption of technologies and practices which better manage the PCs. Automated tools for imaging, patch management, and support (if used more widely in an installed base) can have a significant impact on TCO.

This is not surprising and has been a theme of most of the enterprise focused TCO studies (by Gartner and others), but here it is set forth as something to refresh towards beginning in 2009. Their recommendations include:

'...prioritize wherever possible the adoption of technologies that increase standardization, rationalize PC images and extend the level of automation for management processes.'

Interestingly, they adjusted their model upward to a five year lifespan for desktops and four years for notebooks, but they note that this is more of a concession and something that is probably short-lived:

'Typically, organizations have kept desktop PCs for four years and notebooks for three. With the current economic

downturn, many organizations are looking at extending their PC lifecycle as a means to defer purchases and reduce capital costs. We have accounted for this trend in our 2010 scenario, extending the life cycle to five years for desktops and to four years for day-extender notebooks. When considering an overall TCO perspective, extending the lifecycle of PCs has mixed TCO repercussions. On the one hand, it reduces capital expenses, but on the other hand, it also increases IT labor costs and end users' costs (see *Toolkit: Age Matters When Considering PC TCO*).

The current move to longer lifecycles may in fact be followed by a wave of shorter life cycles from 2011 through 2013 time frame because of pressures related to Windows 7 migrations and XP support.¹

This clearly points out the abnormal character of this period, and reminds us that holding on to a PC longer than normal might actually be 'penny wise and pound foolish'. The reference to the Toolkit note (examined below) implies the same.

Toolkit: age matters when considering PC TCO

This 1-page note from 3/25/09 is attributed to Gartner's Michael A. Silver, Mark A. Margevicius, Federica Troni, and Leslie Fiering (two of whom were authors of the previous study), and draws attention to the fact that age matters in TCO lifespan trade-offs.^[3]

It specifically recommends lifecycles in the three year range:

'Significant money should not be spent on parts or labor to repair a desktop PC after its 3 year post-warranty is over.'

'Buy notebooks with a 3 year standard warranty and retain a 3 year lifecycle for notebook PCs.'

The desktop recommendation could be stretched to include a four year cycle, but given that we do not know ahead of time which desktops will break in year four, we need to manage this to acceptable risk levels (suggesting a desktop refresh cycle shorter than four years).

Keeping notebooks past their prime: a study of failures and costs

This 12-page document is attributed to J. Gold Associates and is dated April 2009. While the full report, including the model used by it, is only available via purchase, the discussion and summary are available for download at a number of websites.^[4]

The stated purpose of the study was "to analyze the failure rates and associated costs for enterprise-class notebook computers deployed in businesses." It additionally discusses the impact of standard versus extended warranties.

The press release announcing the study gives us the basic conclusion relevant to our discussion:

'Keeping notebooks an additional 2 years (into years 4 and 5) actually costs \$960 per machine, which is equivalent to a typical replacement cost.'

The study's model uses these failure rates per year of service:

Year 1	-	12%
Year 2	-	15%
Year 3	-	18%
Year 4	-	24%
Year 5	-	32%

Since this first-year figure is slightly lower than that in the 2009 PC Magazine survey for laptops, the conclusions of this study could possibly be understated. In that case, the notebook refresh would be 3 years or less.

Using TCO to determine PC upgrade cycles

This May 2009 document is attributed to John Mahvi (IT PC Fleet Manager for Intel internal IT) and Avi Zarfaty (finance strategic analyst within Intel IT) and describes Intel's own internal TCO model, discussion, and findings.^[5]

An earlier version of this 8-page document was discussed in our 2008 analysis and this 2009 update reflects changes within Intel's own IT infrastructure.

In the current document, Intel explains that they moved to a largely mobile/notebook environment and that even with higher acquisition costs, overall TCO went down.

The variables and costs in this updated model included all of the ones from the 2004 study, and did not include soft costs of longer than optimal refresh cycles (eg, user downtime, security failure costs, missed business opportunities), nor the associated soft benefits (eg higher worker productivity, faster response times, performance headroom for future applications). Additionally, they did not include certain hard effects such as improved security, simplified systems management, and energy savings.

The Intel analysts noted that increases in the following factors could lengthen the refresh cycle:

- acquisition and deployment costs
- salvage value
- disposal costs.

And, increases in the following factors could shorten the refresh cycle:

- baseline support costs
- baseline support cost growth rate
- out-of-warranty costs.

Intel factored in the time cost of money, opting to use EAC (equivalent annual cost) instead of NPV (net present value) due to the differing time periods/windows in the model.^[6]

Their conclusions sound similar to their 2004 results:

'From this analysis, we saw that the optimal refresh rate for notebook PCs at Intel is about a 3 1/2 year cycle.'

This led them to standardize on the (slightly shorter) 3 year cycle:

'Our analysis, based solely on hard operational costs, led Intel to return to a 3-year refresh cycle from longer intervals imposed during the slow economy. The detailed cost model revealed that delaying PC deployments shifted costs into later periods and failed to optimize cash flow from a discounted cash flow perspective. The short-term gain in the current period was simply not enough to merit the prolonged lifecycle.'

Using total cost of ownership to determine optimal PC refresh lifecycles

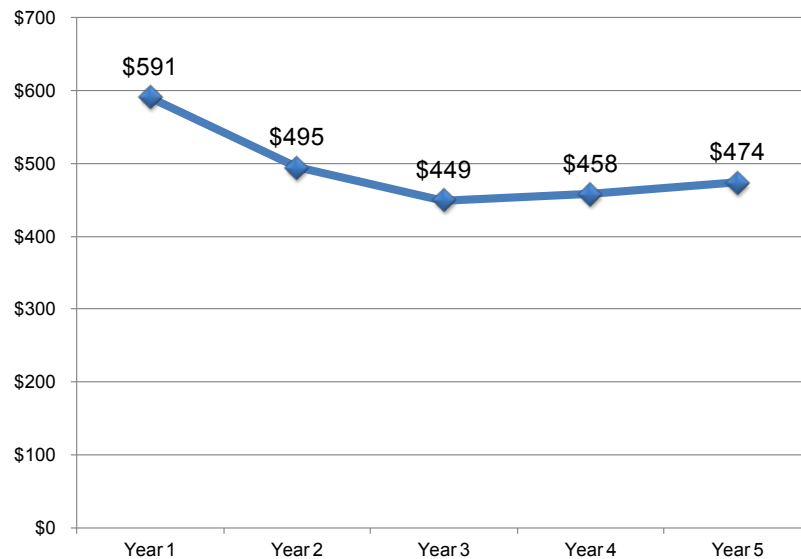
This 25-page paper, also dated May 2009, is attributed to Timothy Morey and Roopa Nambiar of Wipro Consulting Service Product Strategy and Architecture Practice. This project was commissioned and paid for by Intel, but used a different cost/TCO model than Intel's.^[7]

The Wipro data was obtained from 106 enterprise firms (as defined by having over 5,000 PCs for North America and over 2500 PCs for Europe), and included detailed discussions of energy usage, security costs, and vPro technology. Only IT budget items are used in the model (eg energy savings are typically not in the IT budget and were therefore excluded) and the study included a separate analysis for desktops and laptops.

Their model was based on 400 data elements from each of the 106 companies and the age range profile for desktops and laptops were probably optimistic for some large firms today:

IT PC annual TCO by refresh rate

[Equivalent annual costs in USD]



Their model assumed:

'Around 20 percent of the laptop PCs and 19 percent of the desktop PCs in the model company are older than three years.'

The importance of this, of course, is that if a firm had higher percentages in the older-than-3-years category, then the costs of the longer refresh could be considerably higher.

Their financial conclusion for both desktops and laptops:

'Maintenance and out-of-warranty support costs increase sharply in years 4 and 5; for most firms, 3-year lifecycles are cost optimal.'

The SquareTrade laptop reliability study

This report is attributed to Austin Sands and Vince Tseng of SquareTrade, Inc., a third-party warranty service provider contracted by many consumers. Published 11/16/09, the study is not a TCO study per se, but since hardware failure is one of the more expensive items (both parts and labor) in a TCO model, the data is relevant for our consideration.^[8]

The study is described as:

'SquareTrade analyzed failure rates for over 30,000 new laptop computers covered by SquareTrade Warranty plans and found that one-third of all laptops fail within 3 years.'

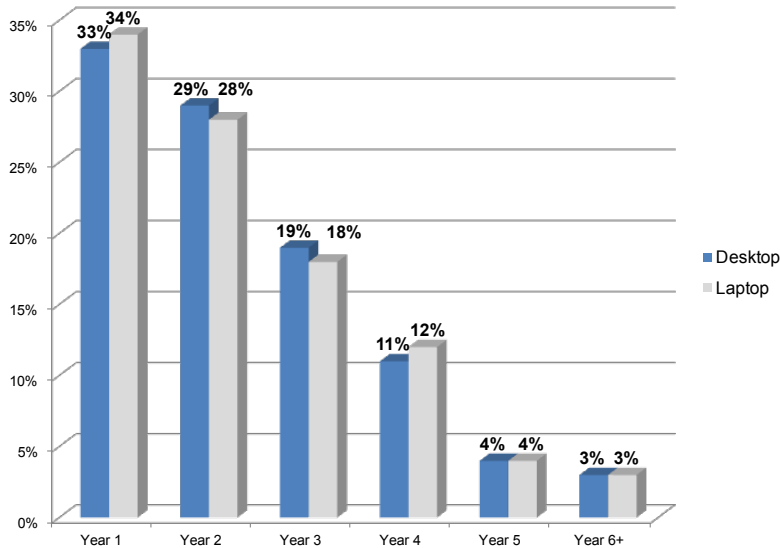
'Looking at the first 3 years of ownership, 31% of laptop owners reported a failure to SquareTrade. Two-thirds of this failure (20.4 percent) came from hardware malfunctions, and one-third (10.6 percent) was reported as accidental damage.'

The sample base included only new units rather than refurbished or used, and only included covered hardware failures (not software issues). Results were broken down by manufacturers and by netbook versus notebook categories.

Shown below, the distribution of failure rates over time might be representative of business users too, even though these failures would mostly be from consumer usage situations.

PC age distribution

[in the model company]



One of the laptop manufacturers disputed the validity and usefulness of the data, to which SquareTrade responded. However, it should be noted that this non-accidental failure rate for year one (4.7 percent of units) is even much lower than reported by the *PC Magazine* survey respondents earlier that year for the same type/ time period (around 15 percent), even though it is higher for the overall lifespan.

At any rate, this high of a failure rate over the first three years of usage is one of the typical drivers for shorter refresh cycles for laptops.

PC leasing trumps purchasing

This document is the most financially-oriented of the studies reviewed, with special focus on the time value of money and financing options.^[9]

Attributed to Cal Braunstein of Experture/Robert Frances Group and dated March 2010, this analysis paper builds upon their earlier document, titled *The Downside of Keeping PCs beyond Three Years and How Leasing Can Help* (cited in the 2008 Strategic Advisory Services paper).

Their model has been updated with increased product cost (from \$600 to \$1,000, reflecting a laptop starting point) and with lower IT support costs (reflecting more automated environments and pre-integrated systems).

Their conclusions echo what their earlier study concluded:

'RFG believes a PC lease and refresh strategy can yield a total cost of ownership (TCO) savings of up to 15 percent (possibly more) over a purchase-and-hold strategy over a five year period. Minimizing PC costs requires IT and business executives to adopt a holistic view of PC TCO that includes consideration of breakage, operational, and residual value costs, as well as processes that leverage actual cost data. The optimal PC TCO returns typically occur within the 36- to 48-month range. This suggests a PC refresh rate between three and four years. However, achieving this rate can be challenging, due to implementation, asset management, and political issues. Leasing can be a powerful tool to help maintain this desired refresh period and can lead to predictable spending patterns. It can also help to introduce best practices and technologies for PC management, and reduce support requirements by streamlining system images and imaging.'

'IT executives should employ a PC refresh policy and the necessary supporting operational procedures to attain the optimal PC TCO returns, which typically occur in the 36 to 48 months range.'

'RFG finds a three year lease and refresh strategy saves a company five percent over a purchase and hold plan over five years.'

Special note on budget category systems

In the competitive enterprise market for PCs, cost is generally 'king'. Manufacturers try to reduce their costs incessantly, while still giving their customers a true to spec product. Unlike higher end server systems, business desktops do not have all the error detection and correction circuitry (eg no chip kill features) and rarely have self-healing capabilities (eg autonomics). These reliability enhancements cost extra in that world and sometimes (if included in a bid response) would render a vendor's offering uncompetitive in price.

This is especially true in the class of products known as budget, value, or volume systems. These systems have lower features, performance, and reliability (by design) than the other typical product families by the same manufacturer (eg business desktops, performance laptops, gaming systems).

What this means is that in this budget segment, the systems are basically engineered to last for the length of the warranty only. If the warranty is for three years, a buyer can have confidence that the system will work for three full years of use, regardless of how long the system sits at the desk. In other words, if a three year warranty system is used only 50 percent of the time, it will last for six calendar years. If it is heavily used (eg twice the daily wear and tear), it will only last for 18 months. In each case, the system gives us three years of product life.

This reality has to be factored into our refresh plans and into our expectations of desktop, laptop, and workstation reliability. The more expensive a solution is (especially in high-end laptops and engineering workstations), the longer the solution can be expected to 'last' past its warranty period. (This has been documented for laptops, in the various reliability/failure rate studies referred to in this paper.) The less expensive a solution is (especially in volume, value-focused mainstream business desktops), the more we can expect to have problems after the warranty period has expired.

Where are the recent TCO studies?

There were no studies on PC desktop TCO or failure rates published during the 2010-2011 timeframe. One searches in vain for TCO discussions (about the PC) on the analyst sites of Forrester, Gartner, Computer Economics or Yankee Group. There are a couple of discussions on uptake of Windows 7 (with discussion of budgets), but no actual TCO model construction.

All of the TCO studies during this period were about either the Cloud, smartphones/tablets or virtual desktops (eg VDI). Some of these studies contained TCO assumptions about desktop PCs (for comparison with server-based virtual desktops or cloud-based virtual desktops), but the numbers used were from earlier studies or were actually higher.

Accordingly, no contrary data appeared to suggest that the TCO analyses of the 2003-2010 period were now inaccurate or irrelevant.

Why is this important to consider today?

Many companies are starting the next round of refresh in 2011/2012 as they move to Windows 7, the more power efficient Intel/AMD chips,

better managed platforms, and Office 2010. At the same time, some companies are considering if/where thin-client and desktop virtualization architectures might fit in various user sub populations.

Expected technology changes in the end user computing (EUC) space have to also be factored into refresh timing, with solid state drives (SSDs), unified extensible firmware interface (UEFI)—the coming replacement for BIOS, Thunderbolt versus USB 3.0, Windows 8, changes to user-interface methods, and client-side hypervisor ilooming.

It has become apparent in most companies that EUC assets must now have extra headroom, for two major reasons:

- critical software vendors are issuing upgrades which increasingly require more resources, certain patch levels, motherboard-based features (eg AES, TPM, vPro)
- unpredictable compliance requirements might 'eat up' the extra headroom by requiring new monitoring processes/software (such as encryption and sandboxing).

Many healthcare firms were caught by surprise by such issues in the 2002-2004 timeframe, with HIPAA requirements forcing hard drive upgrades (eg to support encryption) and specialty software vendors requiring more memory or performance than we had installed in the average desktop at that time.

This period of rapid technology change and new PC investments requires us to think carefully and prudently about refresh cycles. We have to make sure that the plans and policies we put into place today both manage our TCO costs effectively and yet preserve our flexibility to adopt emerging technologies for our organizational objectives.

The studies during 2009-2010, with their revisions in cost elements and cost values, still end up agreeing with the studies of 2004-2008. The 'default' refresh period should still be around the three year mark, with policy exceptions for short periods and longer periods permitted upon business justification. The absence of contrary data in the post-2010 period also implicitly confirms these studies.

Notes

[1] "Desktop Service & Reliability Survey 2009", in PC Magazine, Sept 15, 2009 issue. Available at: <http://www.pcmag.com/article2/0,2817,2352796,00.asp> ; and "The Best (and Worst) Tech Support in America: Desktops", in PC Magazine, July 29 2008 issue. Available at: <http://www.pcmag.com/article2/0,2817,2326602,00.asp>

[2] "How to Reduce Your PC TCO 30% in 2011", by Federica Troni, Brian Gammage, and Michael A. Silver. Research ID Number: G00166195. Gartner: March 20, 2009. Accessed at: http://www.fourthirds.com/documents/how_to_reduce_your_pc_tco.pdf.

[3] "Toolkit: Age Matters When Considering PC TCO" by Michael A. Silver, Mark A. Margevicius, Federica Troni, and Leslie Fiering. Gartner for IT Leaders ID Number G00154726. Gartner: March 25, 2009.

[4] "Keeping Notebooks Past Their Prime: A Study of Failures and Costs". J. Gold Associates: April 2009. Link to purchase the report/model: http://www.jgoldassociates.com/Keeping_Notebooks_Past_Their_Prime_Announcement.html ; Press Release/Summary at: http://www.jgoldassociates.com/Press_Releases/Keeping_Notebooks_Past_Their_Prime_Press_Release.pdf ; Discussion (without model) at: <http://download.intel.com/business/resources/reports/keepingnotebookspastprime.pdf>

[5] "Using TCO to Determine PC Upgrade Cycles" by John Mahvi (IT PC Fleet Manager for Intel IT) and Avi Zarfaty (finance strategic analyst for Intel IT). Intel: May 2009. Available at: http://download.intel.com/it/pdf/Using_TCO_To_Determine_PC_Upgrade_Cycles_ANIMATED_PDF.pdf .

[6] See "About Equivalent Annual Cost" at the Toolbox for IT website: http://it.toolbox.com/wiki/index.php/Equivalent_Annual_Cost for a description of EAC and its relation to NPV.

[7] "Using Total Cost of Ownership to Determine Optimal PC Refresh Lifecycles" by Timothy Morey and Roopa Nambiar of Wipro Consulting Service Product Strategy and Architecture Practice. Wipro: May of 2009. Sponsored by Intel Corporation. Available at: http://www.wipro.com/resource-center/wipro-council-for-industry-research/pdf/using_total_cost_of_ownership_to_determine_optimal_pc%20refresh_lifecycles.pdf

[8] The SquareTrade Laptop Reliability Study by Austin Sands and Vince Tseng. SquareTrade: November 16, 2009. Available at: <http://www.squaretrade.com/pages/laptop-reliability-1109/>; Lenovo raised some objections about the applicability of their conclusions at: http://localtechwire.com/business/local_tech_wire/opinion/blogpost/6477229/; SquareTrade responded at: <http://blog.squaretrade.com/2009/11/a-rebuttal-to-some-comments-about-our-laptop-failure-study.html>.

[9] "PC Leasing Trumps Purchasing" by Cal Braunstein. Executive Technology Strategies document number ETS 10-03-11. Experture/Robert Frances Group: March 2010. Available by subscription at <http://www.experture.com>.

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