The High Price of Low Quality

Quantifying Quality and its Impact on TCO

Richard (Rich) W. Cheston
Chief Technical Architect, Distinguished Engineer & Master Inventor | Lenovo

Ever since the mid-90s when I helped Gartner develop the first of their widely influential TCO models, the idea of quantifiable quality has always been intriguing. **Ironically, then and now, the financial or cost impact of quality isn't built into most TCO models. So while TCO is supposed to capture total costs of technology ownership, it mostly ignores one of the few truly inevitable costs: hardware failure.**

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So why is quality so essential to comprehensive TCO?

Regardless of their technology profile, every customer and their organization is impacted by the quality of PCs they purchase. Understanding how PC quality affects the bottom line is easy enough: quality components and design reduce service and support and downtime costs and extend PC life.

The challenge, then, is capturing this impact in real numbers. And, more importantly, understanding the differences in quality between various suppliers and quantifying these differences financially. How much more does it cost me to support a failure rate of 8% annually versus another brand with a failure rate of 5%? What is the cost, in total dollars, of that gap?

In short: **significant differences in quality between suppliers should make quality a primary qualifier** in the purchasing process.

Big Theory, Huge Practical Impact

My interest in putting a dollar figure on the quality gap between PC brands came into focus again after a recent customer request. The company was preparing an RFP and wanted to figure out a way to credit Lenovo for our quality leadership. Their CTO had seen the difference first-hand, since recent acquisitions had brought a lot of non-Lenovo PCs into inventory and the gaps in quality were remarkable.

But were they quantifiable?

The Purpose of This Paper

This paper was designed to answer one question: what is quality worth?

- Most TCO models omit quality from their calculations.
- Hardware failures drive higher direct and indirect opex costs.
- Superior quality can put dollars back into the IT budget.

In short: significant differences in quality between suppliers should make quality a primary qualifier in the purchasing process.

In this paper I will attempt to quantify quality as it operates in an "average" environment–PCs mostly used by knowledge and data entry workers with the majority of those users clustered near enough to each other to limit the impact of travel time and other costs which may drive results outside the "average" customer range.

This average scenario, while conservative, is realistic. I can't imagine the pressure of trying to quantify the importance of quality in other instances I've come across over the years where a failure would be significantly more expensive or even catastrophic.

- Lenovo used to supply PCs for use on the the Space Shuttle. Even non-critical failures on the Space Shuttle can be very costly–particularly if you need a desk-side visit.

While most organizations take pride in providing outstanding support, **even the best Level 1 service is unable to resolve hardware failure.**

- Applications such as financial trading platforms must perform during a period of high volume activity, and even brief downtime can be devastating in cost and scope.
- Remote users drive up the cost of warranty and repair services dramatically–especially desk-side but even for depot support.
- VIP users such as C-level executives often incur a high cost of support and have much to lose with a hardware failure.

The Cost of Solving Hardware Failures in Enterprise

While a manufacturer's warranty covers a portion of a company's cost when a failure occurs, there's still a significant portion not covered. When non-warranted failures occur, the first line of defense is the IT help desk.

No matter what the function is called, most help or service desks consist of two to three tiers of internal support complemented with field support for remote workers and operations. When a user encounters a problem, they call the service desk and initiate a Level 1 repair action. They receive troubleshooting assistance and spend time waiting for the issue to be investigated.

The price of this process and, in the case of hardware failure, a resulting desk-side visit is costs that precede a warranty claim and are incurred by the customer. While most organizations take pride in providing outstanding support, even the best Level 1 service is unable to resolve hardware failure.

This is an important difference as not all failures are the same–most are application or OS failures. Hardware failure is different in that it cannot be resolved by a Level 1 support technician and, at a minimum, requires a Level 2 replacement of the failing component. This difference impacts several budget columns all at once: a Level 1 ticket becomes a Level 2 repair or Level 3 escalation, or for the remote user, a very expensive field support call.

TCO Nuts and Bolts

Most IT people have studied TCO and know it consists of two types of direct and indirect costs: capital expenses (capex) and operating expenses (opex). Since the very first Gartner TCO model for PCs either notebooks or desktops, typical models show capex at about 15%to 20% of TCO dollars with opex making up the majority of all costs.

Indirect Opex: Hard to Measure, Critical to Control

Capex costs are direct: total price of hardware, software, and other accessories. Opex costs, on the other hand, can be both direct and indirect. Direct opex are the measurable IT expenses or actual organization IT budget dedicated to deploying, supporting, and retiring PCs and indirect

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opex is mostly the price of informal peer to peer support and the loss of productivity when workers attempt to double as IT trainers and technicians.

How does this work? The majority of indirect opex is the peer-to-peer support that takes place every day, in every office, around the world. A user asks their neighbor for help printing to the network or starting and using an application. In most cases, even though this is where most Level 1 support really occurs, unless user satisfaction becomes a priority, most organizations will not try to measure or address these costs.

Costly and Inevitable: Hardware Failure

There is not much that peer-to-peer support can do for hardware failure–users will need and demand help to avoid or at least minimize an unproductive outage. Once the user and/or IT recognize the failure, the process of replacing the failed component begins.

The high dollar impact of these hardware failures on an organization is real and can become very disruptive to operations; even to average, non-mission critical functions as outlined earlier in this paper. That's what makes quality so essential to any comprehensive view of TCO, and it should drive organizations to consider the significant differences in vendor PC quality when making sourcing and purchase decisions.

Measuring The Cost of Failure

One of the biggest challenges in measuring the impact of quality upon an organization is collecting reliable PC supplier data–no organization collects and shares this information on a regular basis. Nonetheless, occasionally various analyst studies demonstrate differences in PC suppliers' failure rates.

Unfortunately, if a PC company does not score well on quality, they will attempt to distort and minimize the results by claiming that essentially all PCs must be equal or nearly equal–after all, PC makers are buying the same or similar parts. While this seems to make sense, the reality is quite different.

Lenovo and TBR: Objective Quality Data

To help objective demonstrate our commitment to quality leadership, Lenovo has occasionally commissioned third-party analysts to perform studies to provide clarity in this area, with our most recent study performed by TBR (Technology Business Research). TBR has been one of the PC industry's top analysts for years, conducting studies on customer satisfaction and other IT policy drivers on a regular basis.

Lenovo selected TBR to do a survey on quality that measured actual failure rates between PC suppliers. The goal of the study was to determine failure rates by year, for both notebooks and desktops, for at least 3 years. This

SURVEY DETAILS

TBR conducted a survey of 300 IT professionals at large enterprises (more than 1,000 employees) in the US on warranty repair rates.

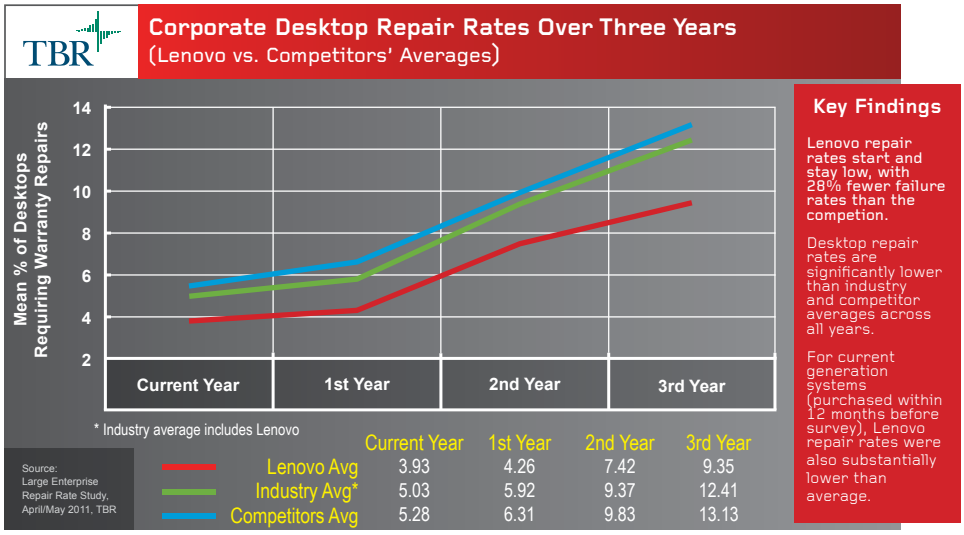
Repair rate observations were based on over 6.6 million installed systems.

information would empower real cross-supplier comparisons and enable Lenovo to measure itself against an industry average. The big question was: would the data backup Lenovo's claims of the industry's lowest repair rates? Could we objectively demonstrate the quality leadership that impressed our CTO friend?

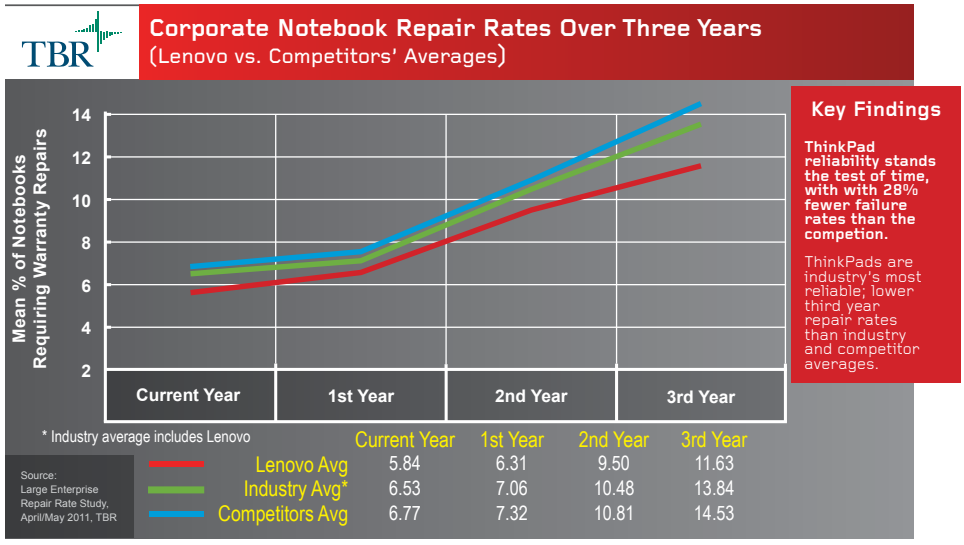
Superior Quality by the Numbers

The following charts represent the actual data from this survey.

CORPORATE DESKTOP RATES OVER THREE YEARS: LENOVO VS. COMPETITORS' AVERAGES



CORPORATE LAPTOP RATES OVER THREE YEARS: LENOVO VS. COMPETITORS' AVERAGES



Understanding Your Costs: Direct Costs

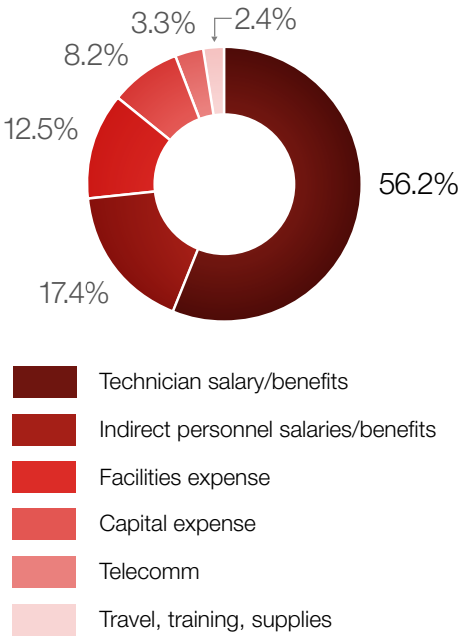
So now we know that there are differences in failure rates between suppliers and that the differences appear significant. How do these differences translate into dollars?

We'll look at direct costs first. According to a report in *SupportWorld,* direct service desk costs can be broken down into six categories.

- Salaries and benefits for desktop support technicians
- Salaries and benefits for indirect personnel (supervisors, trainers, managers, etc.)
- Capital expenses (computers, software licensing fees, etc.)
- Telecommunications expenses
- Facilities expenses
- Travel, training, and office supplies

Now let's look at these support costs by type of resolution: level 1, 2, 3, and/or field support. The following chart outlines the various levels of support and their costs. The data is from the MetricNet, an organization dedicated to developing and benchmarking Service Desk processes.

DIRECT SUPPORT COSTS BY CATEGORY



INCREMENTAL SUPPORT COSTS BY LEVEL

Support Level	INCREMENTAL	TOTAL
Level 1–Service Desk	$22	**$22**
Level 2–Desktop Support	$62	**$84**
Level 3– NOC, networking, system design flaws	$85	**$107–$169**
Field Support– Onsite diagnostics and repair	$196	**$118–$365**

According to MetricNet, this data captures North American averages and represents fully burdened costs per service level. Moreover, according to the data, as the issue is escalated, the costs quickly accumulate.

The Price of Escalation

All support issues start out as Level 1 calls, and a significant amount of these calls can be resolved at the Level 1 service desk, since the majority of support calls are related to application or OS issue or password reset.

A hardware failure is much different. It starts out as a Level 1 call, but since it's a hardware failure it's not possible to resolve the issue without escalation to Level 2 desktop support at a minimum. By definition, hardware failures will require a desk-side visit to replace the failing component.

The escalation process drives up the cost of hardware failures, even if the component is covered under warranty. More critically, PC failures during initial deployment (e.g.; Dead on Arrival failures) can have a much greater impact upon operations. As research from the Robert Francis Group shows, these early failures can delay key new programs from rolling out on time and have other devastating financial consequences. In other words, not only do these failures cost the corporation real dollars, they can further impact revenue by increasing the cost of new projects and programs or delaying their introduction.

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Understanding Your Costs: Indirect Costs

While direct costs are easy to understand, indirect costs are harder to identify and quantify–and most IT organizations know this. Since these costs never show up on IT–or anybody else's–budget, organizations often choose to ignore them, thus forfeiting the opportunity to measure real, comprehensive TCO.

About the closest example of budgeted indirect costs I can think of is the planning that occurs around scheduled downtime for servers and other critical applications. However, assuming users stay generally satisfied, most indirect costs are ignored. Generally, only persistent, systematic downtime or Level 1 service so poor users are forced to largely support each other will cause indirect costs and issues to be analyzed and addressed.

Understanding Your Costs: Indirect Costs of Hardware Failure

Hardware failures also generate their own indirect costs. As we've already discussed, hardware failures are different than most support issues or requests for assistance. The issues that generate most of your indirect support costs are feature or function related, users needing help with an application or OS. Even if these issues are left unresolved, the user can still operate their computer and probably complete their task.

Hardware failures are a much harder stop, and downtime can get expensive very quickly. Unless the device is a server-based computing client that permits a quick switch to another working device, the user remains offline and unproductive until the failure is resolved with a component replacement. In the worst case scenario, where the failed component is the hard disk drive (HDD), additional time and money must be spent to recover and restore critical data.

Clearly, as a ticket is escalated, and resolution moves further away from the Level 1 service desk, the cost of resolution increases. Furthermore, these costs are cumulative. **If a ticket is logged at Level 1 and then escalated to Level 2 for resolution, the average cost of resolution is not just $62, but $62 plus $22, for a total of $84.**

Calculating The Cost of Downtime

While the cost of repairs are direct, the cost of lost productivity is harder to calculate.

COST OF DOWNTIME PER PC

Cost Center	COST
Average employee hourly wage	$21
Hourly benefits + Overhead (35%)	$28.35
Total hourly cost per employee	$49.35
Number of downtime hours	8
Lost productivity per PC	$394.80
Lost productivity + Lost data per PC	$494.80

This model assumes the user is down 8 hours. A PC might go down at noon on a Tuesday and a new part is not received, installed, and tested until 8 work hours (1 business day) later, or Wednesday at noon.

If reliability reduces downtime, it improves productivity and puts IT dollars back in your budget at the same time.

The Big Picture: Lenovo vs. the Competition

Since quality so significantly impacts TCO through lower downtime and support costs, why doesn't it rise to the top of requirement lists put together during the purchasing process? I believe most companies know they should consider quality–if they only had objective data that would neatly fit into their comparative spec matrix along with processor speed and RAM.

Lenovo ThinkPad® Laptops vs. the Competition

According to the latest survey data, the average industry laptop will experience 5.4 more hardware failures per 100 notebooks compared to ThinkPad laptops.

ACCORDING TO THE LATEST SURVEY DATA:

The average industry laptop will experience

5.4 more hardware failures per 100 notebooks

compared to ThinkPad® laptops.

The average industry desktop will experience

7.7 more failures per 100 desktops

compared to ThinkCentre® desktops.

This will result in an average support desk allocation by level:

SUPPORT DESK ALLOCATION BY LEVEL

Support Level	% RESOLUTION	INCIDENT COST
Level 1–Service Desk	0%	$0
Level 2–Desktop Support	60%	$84
Level 3– NOC, networking, system design flaws	30%	$169
Field Support– Onsite diagnostics and repair	10%	$218

In addition, we calculate user down time per the above matrix:

- $394.80 for a failure not involving a HDD
- $494.80 for a failure involving a HDD

In the end, the total cost of a hardware warranty failure over a 3 year life cycle:

- $2,251 per failure across 100 systems or **$22.51 per laptop**
- $2,791 per HDD failure across 100 systems or **$27.91 per laptop**

Lenovo ThinkCentre® Desktops vs. the Competition

According to the latest survey data, the average desktop will experience 7.7 more failures per 100 desktops compared to ThinkCentre desktops.

In addition, we calculate user down time per the above matrix:

- $394.80 for a failure not involving a HDD
- $494.80 for a failure involving a HDD

In the end, the total cost of a hardware warranty failure over a 3 year life cycle:

- $3,107 per 100 system failures or **$31.07 per desktop**
- $3,876 per 100 HDD failures or **$38.76 per desktop**

A Better Choice: Demonstrated Quality Leadership

Every company will be impacted by the quality of the supplier they choose–it's inevitable. Unfortunately, understanding the differences in failure rates between suppliers, by year or as the PC ages, has always

been difficult given the lack of consistent analyst or industry reporting that gives us the objective data we need to make informed decisions.

However, we do have a lot of anecdotal evidence from a reliable range of sources. Customers who are either dual-sourced through procurement or acquisition, feedback from business partners who provide warranty services, and the occasional industry survey consistently show Lenovo ThinkPad and ThinkCentre PCs have far fewer failures than other commercial PC brands.

For Stronger Productivity and a Better Bottom Line

One point explored in this paper is that hardware failures represent a unique challenge in terms of scope, cost, and priority. Nothing brings a productive organization to a quick, screeching halt like a hardware failure, and almost nothing is more detrimental to the ability to accomplish the very mission-critical tasks for which the PC was purchased. This makes failure even more devastating, especially when it involves a high-priority task or user.

Quantifying the impact of these failures on a typical IT environment is monumental enough. As we discussed at the start, there are lots of use cases that could generate far more dramatic (and costly) consequences than we've addressed here.

A mission-critical application needs to perform. Whether it's a financial trading system, a PC deployed into outer space or remote locales like the South Pole, or a prison system where the PC is located behind multiple locked doors that open according to a strict schedule, **quality matters.**

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From small businesses thriving in remote villages far from repair personnel to a PC running an MRI or CAT scan in a state-of-the-art hospital, quality is everything. High quality is what ensures the reliable productivity businesses need to survive and succeed, especially when organizations rely on technology to generate revenue and strengthen the possibilities of future innovation and growth.

A Commitment to Continued Quality Leadership

Lenovo has always been relentlessly focused on product quality and the pursuit of continual improvement. Even as the quality benchmark we set in the 2011 TBR report comes the industry norm, Lenovo continues to lead. Our reliability rates are 50% better this year than in 2011.

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We know it's important to our customers – it's a reason they choose Lenovo – over and over again. Lenovo quality helps them lower costs and build the solutions they rely on to drive daily productivity as well as power transformative innovation. At Lenovo, our commitment to quality does more than just lower costs internally and for our customers, it allows us to design and build products that we know will help shape the future of the PC now and into the future.

Sources

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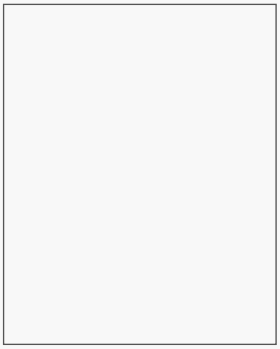

ABOUT THE AUTHOR:

Richard (Rich) W. Cheston

Chief Technical Architect, Distinguished Engineer & Master Inventor, Lenovo

Rich Cheston is Lenovo Chief Technical Architect for Software & Peripherals. Past innovations include the creation of the now universal Wake on LAN standard and groundbreaking work on Gartner's original Total Cost of Ownership (TCO) model. Rich is now responsible for Lenovo's Cloud strategy, guiding technical development and working with our corporate customers all over the world to develop transformational cloud solutions.