



# Quality Improvement Trends in Companies Using the TL 9000 Quality Management System

A Study Using the Edge Router Product Category

With the TL 9000 Quality Management System (QMS) now in its second decade, the overriding question is: Are TL 9000 certified companies demonstrating improved quality and performance? In order to objectively assess the performance of companies certified to the TL 9000 QMS, the QuEST Forum Performance Data Reports (PDR) Team is producing a series of industry papers analyzing the TL 9000 third party audited data. The first paper, released in October 2009, detailed the dramatic improvements shown in the On-Time Delivery (OTD) of products and services by companies certified to TL 9000 during a two year period from 2007 to 2008. The second paper showed improvement for Number of Problem Reports (NPR) and Fix Response Time (FRT) across the Switching Product family. The third paper demonstrated improvement in Wireless Product Category Return Rates. This paper, the fourth in the series, focuses on Edge Router Product Category 1.2.9.2 trends over a five year period. While TL 9000 has an evolving list of product categories, the team chose to study the Edge Router family since it represents a significant part of today's and future networks.

The measurements examined include:

1. Number of Problem Reports - Critical, Major and Minor (NPR1, NPR2 and NPR3)
2. Problem Report Fix Response Time - Major and Minor (FRT2 and FRT3)
3. Software Fix Quality (SFQ)
4. On-Time Item Delivery (OTI) which is a subset of On-Time Delivery

In the first three industry papers, Problems Reports, Fix Response Time and On-Time Delivery for Edge Routers were discussed. This paper reviews sustained performance data from TL 9000 Industry Average and Monthly Average trends for a five year period from 2006 through 2011. For the first time Software Fix Quality, introduced to TL 9000 in 2007, was also examined.

## Number of Problem Reports (NPR)

The Number of Problem Reports (NPR) is used to evaluate the number of customer originated problem reports that are indicative of the quality of the product delivered during its General Availability and Retirement Phases. Problem Reports may have a negative impact on the organization due to rework as well as the customer since multiple site visits may be needed and problems could jeopardize or affect the customer's business operations. Problem Reports contribute to a loss of end-user loyalty and reduced customer satisfaction. This measurement is intended to stimulate ongoing improvements resulting in a reduction of the number of problem reports, associated costs and potential revenue losses.

NPR1, NPR2 and NPR3 were examined in this five-year study.

### NPR1

NPR1 is the number of Critical Problem Reports per Edge Router per Year. Simply stated, NPR1 is the number of times an average system would expect to encounter a critical problem over the course of a year.

A Critical Problem Report is where conditions severely affect the primary functionality of the product and because of the business impact to the customer requires non-stop immediate corrective action, regardless of the time of day or the day of the week.

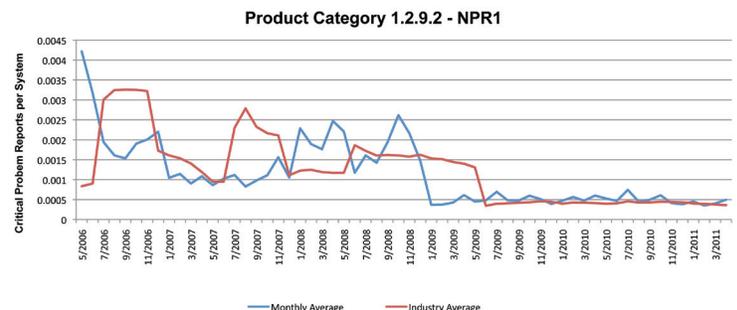


Figure 1 – Critical Problem Reports Monthly & Industry Averages

## Why are there spikes in the industry and monthly averages?

One aspect you will notice in the Edge Router charts are spikes in both the industry and monthly averages.

Industry Average spikes can be caused by its calculation rules. The Industry Average data point is intended to provide an indication of sustained performance. Industry Average performance calculations for measurements in this study are derived from data over a period of six consecutive months, which is referred to as smoothing. In addition to the smoothing, eligibility or inclusion rules are applied to each company's data that may or may not allow it to be included in the Industry Average. The most notable eligibility rule is that the data must represent at least two percent of the population of data in order to be

included. As a result, the Industry Averages for these data sets have sample sizes ranging from three to fourteen companies over the study period. The variation of the number of companies included in the Industry Average can cause spikes in the trends.

The Monthly Average data point in a particular month is the composite average data for the measurement for that month only. Spikes in this data set are normal due to the dynamic nature of monthly performance.

For a detailed explanation of the calculations, see "Performance Data Reports Calculations" under Related Resources on the PDRs tab on the TL 9000 website, [www.tl9000.org](http://www.tl9000.org).

As shown in Figure 1, there were major improvements in the Industry Average during 2006 through 2008. The six month Industry Average was relatively stable from May 2009 at about 0.004 Critical Problem Reports per Edge Router per year or four Critical Problem Reports per thousand Edge Routers per year. The unsmoothed monthly average shows the improvement a few months earlier. The Critical Problem Reports improved from an Industry Average of around 0.0017 from 2006 to 2009 to an Industry Average of 0.0004 from 2009 to 2011 representing a 76% improvement.

### NPR2

NPR2 is the Number of Major Problem Reports per Network Element per Year. As with NPR1, NPR2 is the number of times an average system would expect to encounter a major problem over the course of a year.

A Major Problem Report is where the product is usable, but a condition exists that seriously degrades the product operation, maintenance or administration, etc. and requires attention during pre-defined standard hours to resolve the situation.

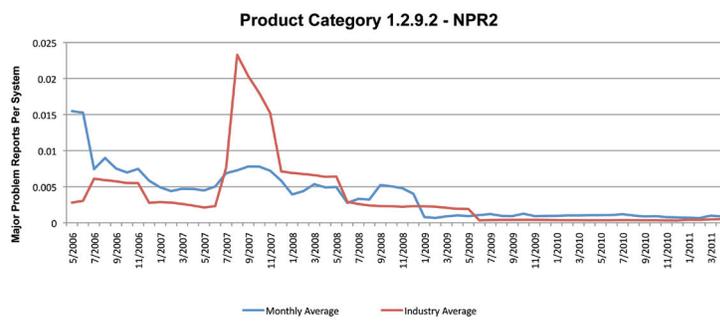


Figure 2 – Major Problem Reports Monthly & Industry Averages

Figure 2 shows that Major Problem Reports values were consistent after the first half of 2009 and reached their lowest point during the five-year period. With the exception of a large spike in the Industry Average in late 2007 (see sidebar regarding "spikes" in averages), both lines showed a continued improvement over time. The Major Problem Reports improved from an Industry Average of around 0.0055 from 2006 to 2009 to an Industry Average of 0.00037 from 2009 to 2011 representing a 90% improvement.

### NPR3

NPR3 is the Number of Minor Problem Reports per Network Element per Year. As with NPR1 and NPR2, NPR3 is the number of times an average system would expect to encounter a minor problem over the course of a year.

Minor problems are defined as other problems of a lesser severity than “critical” or “major” such as conditions that have little or no impairment on the function of the system.

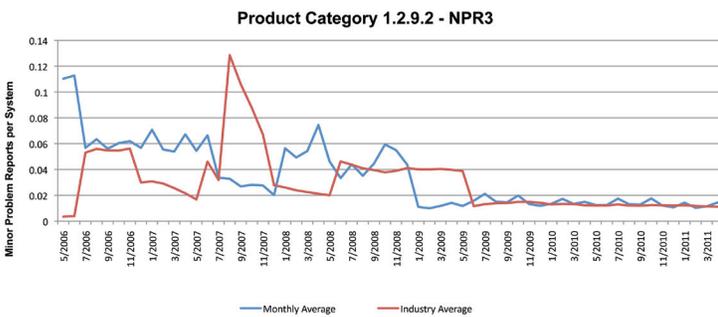


Figure 3 – Minor Problem Reports Monthly & Industry Averages

Figure 3 shows that Minor Problem Reports were stable since July 2009. As with NPR2, there was a large spike in the Industry Average in late 2007, which may have been caused by companies moving in and out of the data. The Minor Problem Reports improved from an Industry Average of around 0.0410 from 2006 to 2009 to an Industry Average of 0.01400 from 2009 to 2011 representing a 66% improvement.

With regards to NPR, the trend where it starts out high, decreases and then reaches a steady state is seen across all three measures and is typical for a maturing technology. This is good news for today’s networks with the explosion of data and the importance of Edge Routers. It is important to note that this trend information would not be available without TL 9000 and is only available for companies that are certified. As new technologies are injected into networks, TL 9000 certification must play a similar role in accelerating maturity.

### Problem Report Fix Response Time (FRT)

Problem Report Fix Response Time measures the organization’s overall responsiveness to reported problems. Specifically, it measures the supplier’s

performance in resolving problem reports within predetermined intervals. FRT applies to the delivery of the official fix in response to customer problem reports.

This study focused on Major Problem Report Fix Response Time (FRT2) and Minor Problem Report Fix Response Time (FRT3). There is no TL 9000 measurement for Critical Problem Report Fix Response Time since an immediate response to critical problems is a basic requirement for the industry. Organizations that do not adequately provide resolution to critical problems will not survive in today’s competitive environment. Improvements in FRT2 and FRT3 performance would clearly improve the customer experience.

### FRT2

FRT2 is a complimentary measurement to NPR2 that measures the number of major problems experienced. FRT2 measures the percentage of Major Problem Reports satisfactorily resolved on-time, with on-time meaning on or before a predetermined due date.

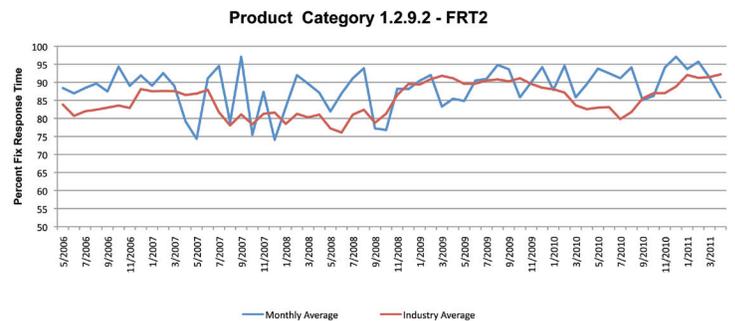


Figure 4 – Major Fix Response Time Monthly & Industry Averages

Figure 4 shows that Major Fix Response Time was consistently between 75% and 95% for all five years with the Industry Average for the first quarter of 2011 above 90%. This chart is a good example of how the Industry Average smooths out the peaks and valleys of the Monthly Average over time.

### FRT3

FRT3 is a complimentary measurement to NPR3 that measures the number of minor problems experienced. The FRT3 measure is the percentage of minor problem reports satisfactorily resolved on time, with on time meaning on or before a predetermined due date.

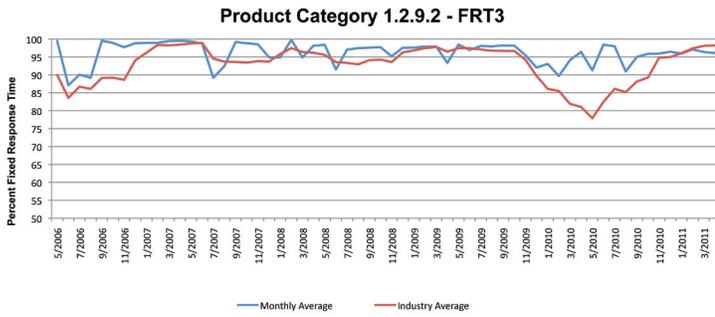


Figure 5 – Minor Fix Response Time Monthly & Industry Averages

Figure 5 shows that the Industry Average for Minor Fix Response Time dipped in early 2010 but then recovered. For the first quarter of 2011, the Industry Average was above 95%.

**Software Fix Quality (SFQ)**

The Software Fix Quality Measurement is used to assess the effectiveness of an organization’s software fix processes and was first introduced in 2007. SFQ is the percentage of software fixes that are determined to be defective and is used to evaluate the defective fix percentage with a goal of minimizing customer risk of failure when introducing fixes to an in-service generic software release.

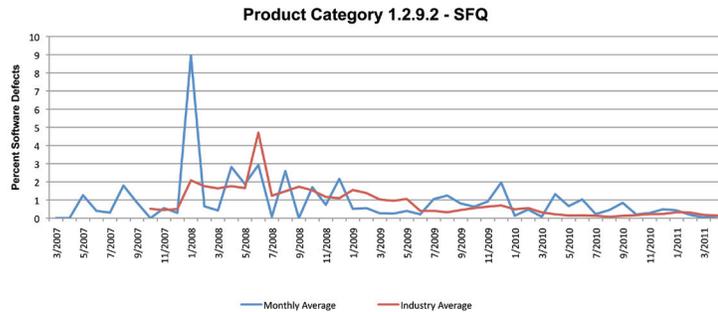


Figure 6 – Software Fix Quality Monthly & Industry Averages

Figure 6 shows the results for Software Fix Quality for the five year time period. The Industry Average begins six months later than the Monthly Average due to the six month smoothing algorithm. Since it was introduced, the Industry Average percentage of software defects, after spiking in the middle of 2008, had a downward trend and ended the time period at its lowest levels. Currently, the SFQ Industry Average is

running at less than 0.2 percent of software fixes that are determined to be defective.

**On-time Delivery (OTI)**

On-Time Delivery measures timeliness of delivery of products to customers. It is used to evaluate the organization’s on-time delivery performance to meet the customer’s need for timely product delivery and to meet end-customer expectations. OTI represents the percentage of line items delivered on time to the Customer Request Date.

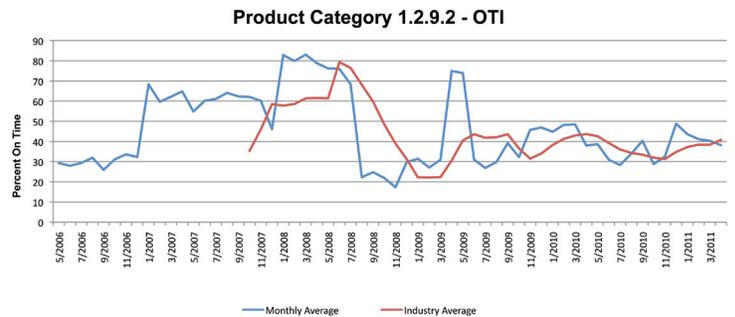


Figure 7 – On-Time Item Delivery Monthly & Industry Averages

Figure 7 shows the five year results for On-Time Item Delivery. At the beginning of 2007, the Industry Average did not have enough eligible companies to participate in the smoothing algorithm. Of all the data examined in this study, this measure showed a marked decline in performance. In the first half of 2008, OTI was around 60% or above while during the first quarter of 2011 it hovered around 40%.

**Summary**

As stated in previous papers, a major premise behind QuEST Forum’s inception was that as organizations use TL 9000 data to drive improvement, the net effect over time would be an overall improvement in the quality of the telecom industry. While there are many factors that could be responsible for shifts in measurements, it is apparent from this study covering five years of data, that the founding intent of QuEST Forum and TL 9000 to improve telecom quality is being realized.

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Furthermore, this study vividly illustrates the importance of the TL 9000 measurements and the valuable insight they can provide. Without a common measurement system designed for benchmark data, this study would not have been possible. The TL 9000 measurements provide for the secure collection of anonymous data both derived using accepted definitions and reported in a common format. While many certified organizations that faithfully use TL 9000 attest to the improvements in quality derived from utilizing TL 9000, this study confirms these statements. The benchmark data derived from the TL 9000 measurement data can be confidently used to drive meaningful improvement

targets for certified organizations and the industry as a whole.

QuEST Forum would like to thank the PDR Evaluation Sub team of the IGQ Work Group for graciously giving their time to create this report. The IGQ Workgroup consists of volunteers from QuEST Forum member companies.

For additional information on QuEST Forum or TL 9000 please visit [www.questforum.org](http://www.questforum.org) or call +1-972-423-7360.

## The Future is Bright for TL 9000 Certified Companies

One of the fundamental drivers for the formation of QuEST Forum and creation of TL 9000 was the telecommunication industry's need to objectively measure quality performance. When a competitive marketplace has reliable benchmark data for comparable products, the participants need to differentiate themselves resulting in an accelerated improvement loop. The TL 9000 QMS has provided this environment and as shown by the data presented in this study, certified companies that have adopted and are using the TL 9000 Measurements and Performance Data Reports have demonstrated improvement. For a supplier, TL 9000 data provides the company with a report card on its improvement progress. It also provides them with objective industry performance results not easily obtained by their non-TL 9000 competition. For the purchaser of telecommunications equipment, the availability of objective TL 9000 performance data provides critical information to use in order to better manage their supply chain.

This report was compiled using the data from certified TL 9000 companies. While the team surmises that the overall industry has improved, the data only substantiates that the companies using the TL 9000 QMS improved. Regardless,

being able to provide objective evidence of substantive improvement during an extremely difficult economic downturn underscores the value of TL 9000.

As customers become more aware of the improvements driven by TL 9000, it is expected that they will seek to purchase products and services only from TL 9000 certified organizations.

Furthermore, this study vividly illustrates the importance of the TL 9000 measurements and the valuable insight they can provide. Without a common measurement system and the requirement for certified companies to submit their results, a study reviewing third party audited objective data would not be possible.

Many certified organizations that faithfully use TL 9000 attest to the improvements in quality derived from utilizing TL 9000 and this study confirms these statements.

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## QuEST Forum

QuEST Forum is the communication technologies industry's leading force in the pursuit of global product and service quality and performance excellence.

### Vision

Be the global force for improving quality of products and services delivered to customers of communication technologies.

### Mission

Foster a collaborative global industry Forum which drives the evolution of communications quality through the adoption of TL 9000 and sharing of best practices.

Comprised of a unique partnership of industry service providers and suppliers dedicated to continually improving products and services in our industry, QuEST Forum's strength comes from its member companies' Subject Matter Experts (SMEs) who operate in a collaborative environment allowing suppliers and service providers, that are often competitors, to come together to develop innovative solutions to practical business problems. QuEST Forum is in its second decade and its growth globally over this period has made it the leading global force in the pursuit of continuing to improve quality and performance. QuEST Forum has influenced industry-wide quality and performance by:

- Harmonizing global quality requirements and supporting their consistent application
- Promoting a collaborative global forum of industry leaders
- Identifying and sharing best practices across the communication technologies supply chain
- Maintaining a searchable repository of industry trends, performance and comparative data

## TL 9000



QuEST Forum's creation and continuing improvement of the TL 9000 quality management system has provided an industry specific platform of guidelines and processes that have improved supply chain management effectiveness and efficiency. Building on ISO 9001, TL 9000 provides the communication technologies industry with a consistent set of quality expectations that parallel rapid technology changes and customer expectations, resulting in a unique and robust quality management system that drives continual improvement and business excellence. By employing the TL 9000 quality management system companies have been able to improve efficiency, implement process improvements, and reduce defects; adding millions to the bottom line over the past decade. TL 9000 is truly unique in that it requires all certified companies to provide auditable data into a central data base repository. This data allows QuEST Forum to provide benchmarkable information which allows companies to continually strive to be best in class.

For additional information on QuEST Forum or TL 9000 please visit [www.questforum.org](http://www.questforum.org) or call +1-972-423-7360.



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