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

A Study Using TL 9000 Measurements to Examine the Customer Experience

The communications technologies industry is expanding at a very rapid rate while also adapting to emerging technologies and globalizing to become the backbone of the technology revolution. With some of the world's largest and most innovative companies in direct competition to provide high-speed connections through telephone lines, cable connections, wireless, or satellite connections, the quality and reliability of these networks and the supply lines to build and support them is a strategic differentiator. Customers look to their service providers to fulfill the promises of new technologies, which in turn, challenges the supply chain to continually improve the performance of both the products supplied and the services rendered. QuEST Forum, an industry association comprised of collaborating service providers and suppliers, is addressing this challenge with their development, deployment, and continual improvement of the TL 9000 Quality Management System (QMS).

TL 9000, by dramatically expanding on ISO 9001, establishes a model that supports improving performance, better overall product quality, reduced cycle time, and improved customer satisfaction. One of TL 9000's major advantages over other quality management systems is the industry standardized measurement reporting requirements for hardware, software, and service quality. Certified organizations anonymously submit performance results monthly into a secure repository and summary reports are compiled by product category. The reporting organizations then use the resulting data as a benchmarking tool to track their performance and drive improvement.

Improved Quality and Performance

With the TL 9000 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.

This paper, the second in the series, focuses on the customer experience. The team chose two measurement groupings for the basis of this study - Number of Problem Reports (NPR) and Fix Response Time (FRT). For NPR, the study examines critical and major problem reports since they have the most impact on customers. 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-week.* 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.* FRT *measures the organization's overall responsiveness to reported problems. Specifically, it measures the supplier's performance in resolving problem reports within predetermined intervals.*

While TL 9000 has an ever growing listing of product categories, the team chose to study the Switching product family since it represents the core fabric in the interconnection of communication channels and its performance is a major factor in the customer's perception of quality and stability. The study also drills down into six product categories that represent both current and emerging technology products.

This report utilized the sustained performance data from TL 9000, including Best-In-Class (BIC) trends, Industry Average (IA) trends, and Worst-In-Class (WIC) trends. The study covered a two year period from 2008 to 2009.

NPR1 Switching Product Family and Product Category Industry Averages

The first measurement studied was NPR1. NPR1 is the Number of Critical Problem Reports per Network Element per Year. While there could be some exceptions, a Network Element is most often equated to a fully functioning system. Simply stated, NPR1 is the number of times an average system would expect to encounter a critical problem over the course of a year.

As shown in Figure 1 there were major improvements in the Industry Average of NPR1 for the Circuit Switch, Service and Network Controllers, and Core Router product categories. While the NPR1 industry average performance increased for Access Multi-Service and Application Servers, these two product categories started and finished with very strong performance. For example, Application Servers, the worst performer of the two, ended 2009 with the equivalent of one Critical Problem Report per System every 644 years.

Product Category	Initial NPR1 Industry Average Jan 2008	Final NPR1 Industry Average Dec 2009	Percent Change
Circuit Switch	0.0020	0.0009	-55%
Access Multi-Service	0.00037	0.00086	132.4%
Application Servers	0.000087	0.001551	1682.7%
Service and Network Controllers	0.0200	0.0126	-37%
Core Routers	0.000411	0.000157	-61.5%
Edge Routers	0.000294	0.000268	-8.8%

Figure 1 – Switching Product Categories Percent Change for NPR1 Industry Average

To determine the overall Industry Average performance of the Switching Product Family, the team computed the arithmetic mean across all individual product category industry averages. As shown in Figure 2, there was significant improvement across the product family in reducing the number of critical problems over the two year period. While the monthly means exhibited variability over the period, a linear depiction of those results shows more than a 33% improvement, or a reduction from .006 to .004.

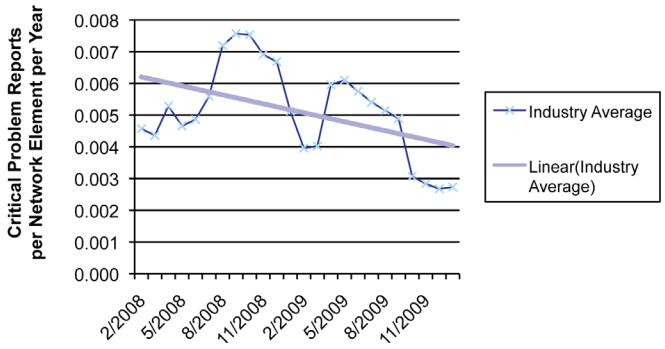

Figure 2 – NPR1 Switching Family Industry Average Trend

Best-In-Class Trend for Number of Critical Problem Reports

The team also looked at NPR1 BIC performance across the Switching product family. As shown in Figure 3, the arithmetic mean across all individual product category BIC results shows that the top performer continued to improve. The results are even more impressive for the individual product categories. Three of the six reporting product categories displayed perfect BIC every month during the two year period with perfect BIC equaling zero Critical Problem Reports per Network Element per Year. When plotted as a linear line, BIC for the entire Switching product family improved from 0.0006 to 0.0001.

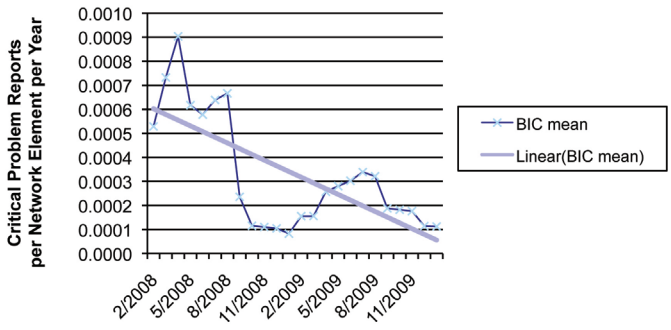

Figure 3 – NPR1 Switching Family Best-In-Class Trend

NPR2 Switching Product Family and Product Category Industry Averages

The second measurement studied was NPR2. NPR2 is the Number of Major Problem Reports per Network Element per Year. Simply stated, 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. As shown in Figure 4, the Industry Average for NPR2 improved in three of the six product categories. The most significant improvement was in the Circuit Switch product category, with a 45% decrease in the Number of Major Problem Reports.

While Application Servers and Edge Routers had a significant increase in NPR2, they both began the study with the best performance within the Switching family and although they were unable to maintain that level of performance, they still finished with excellent performance. For example, NPR2 Industry Average for Application Servers ended the study with the equivalent of one Major Problem Report per System every 250 years.

Product Category	Initial NPR2 Industry Average Jan 2008	Final NPR2 Industry Average Dec 2009	Percent Change
Circuit Switch	0.20	0.011	-45%
Access Multi-Service	0.003602	0.003608	0.2%
Application Servers	0.0019	0.0040	110.5%
Service and Network Controllers	0.2630	0.2255	-14.3%
Core Routers	0.0039	0.0028	-28.2%
Edge Routers	0.0000088	0.0002358	2579.5%

Figure 4 – Switching Product Categories Percent Change for NPR2 Industry Average

As with NPR1, in order to assess the NPR2 performance trend for the Switching product family, the team computed the arithmetic mean across all individual product category NPR2 Industry Averages. As shown in Figure 5, the monthly data together with a linear trend demonstrates that over the two year reporting period there was almost a 33% improvement across the product family in reducing the number of major problems.

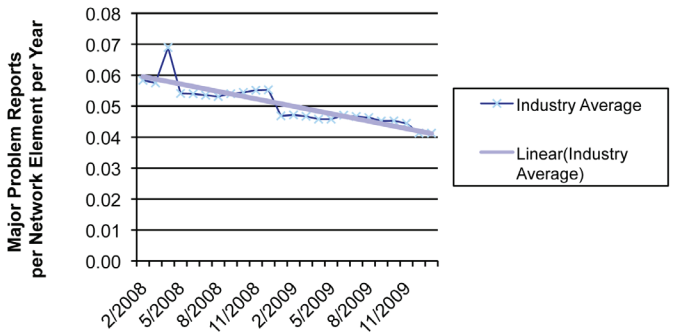

Figure 5 – NPR2 Switching Family Industry Average Trend

Best-In-Class for Number of Major Problem Reports

The NPR2 BIC range across the product categories was very strong with all six categories reporting perfect or near perfect BIC with perfect BIC equaling zero Major Problem Reports per Network Element per Year.

Worst-In-Class for the Number of Major Problem Reports

NPR2 WIC trends improved for all six product categories. Figure 6 shows the linear depiction of these improvements. Observing trends in WIC is insightful since this measurement holds the opportunity for the most improvement. When there are large improvements in WIC, it has a corresponding benefit to Industry Average performance since it raises the overall performance level.

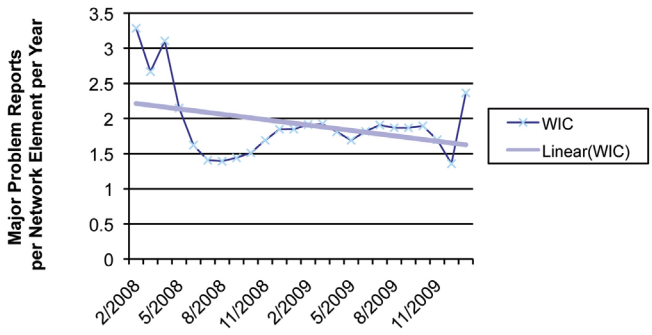

Figure 6 – NPR2 Switching Family Worst-In-Class Trend

The data, as shown in the preceding charts and graphs, supports the premise that, as measured by NPR1 and NPR2, the quality of products delivered by TL 9000 certified companies improved during the study period. TL 9000 certified organizations are required to use the TL 9000 benchmarking data to continually improve their performance which in turn improves the overall performance of the industry. It is logical to conclude that the availability of third party audited TL 9000 performance data has accelerated the improvement for TL 9000 certified organizations. TL 9000 Certified Companies show Sustained Improvement in Reducing Fix Response Time for Problem Reports.

While the Fix Response Time measurement grouping has two different measurements for the Switching product family, the team focused this study on Major Problem Report Fix Response Time (FRT2) since Major Problem Reports have the greatest impact on service. It should be noted that 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 cannot survive in today's competitive environment. Simply stated, the FRT2 measure is the percentage of major problem reports satisfactorily resolved on time, with on time meaning on or before a predetermined due date. FRT2 is a complementary measurement to NPR2, which measures the number of problems experienced. Improvements in FRT2 performance would clearly improve the customer experience.

FRT2 Switching Product Family and Product Category Industry Averages

The FRT2 Industry Average improved for all six product categories reviewed. As shown in Figure 7, Application Servers, Service and Network Controllers, and Routers experienced the largest improvement. Although Circuit Switch performance showed the smallest gain with 1.7%, it demonstrated the strongest FRT2 Industry Average throughout the two year period. Also interesting is the performance of newer technologies versus mature technologies. With respective FRT2 Industry Average performances of 88% and 86%, the newer technologies of Core Routers and Edge Routers made tremendous gains on the mature Circuit Switch product category.

Product Category	Initial FRT2 Industry Average Jan 2008	Final FRT2 Industry Average Dec 2009	Percent Change
Circuit Switch	91.0	92.6	1.7%
Access Multi-Service	80.3	82.9	3.3%
Application Servers	63.3	76.6	21.2%
Service and Network Controllers	66.2	75.4	13.9%
Core Routers	81.3	87.7	7.9%
Edge Routers	79.1	86.1	8.9%

Figure 7 – Switching Product Categories Percent Change for FRT2 Industry Average

The FRT2 Industry Average trends for each of the Switching product categories showed overall improvement. As shown in Figure 8, Application Servers and Service and Network Controllers saw the sharpest increases in responsiveness. As with NPR1 and NPR2, in order to identify FRT2 Industry Average performance of the Switching Product Family, the team computed the arithmetic mean across all individual product category industry averages. As shown in Figure 9, a linear assessment of this performance illustrates improvement from 80% to approximately 85%.

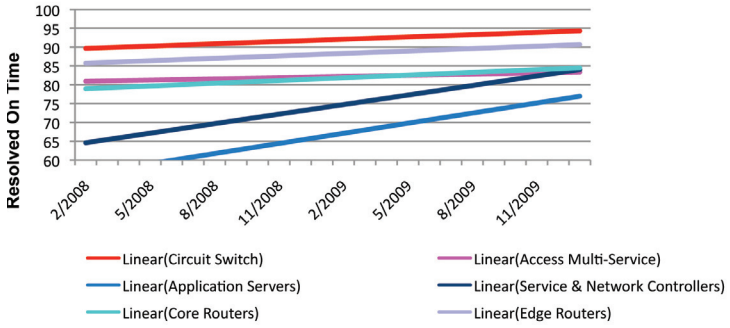

Figure 8 – Linear Trends for Switching Product Categories FRT2 Industry Average

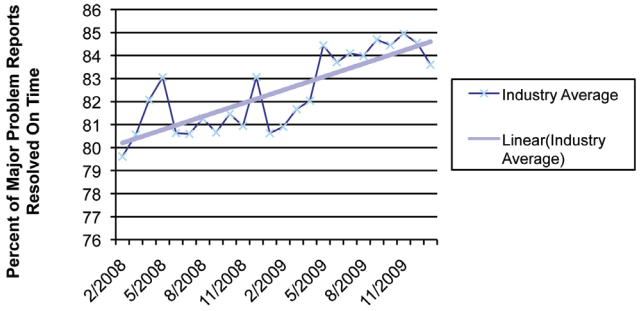

Figure 9 – Industry Average Trend for Switching Product Family and FRT2

Best-In-Class for Major Problem Reports Fix Response Time

FRT2 BIC for four of the six product categories was perfect with perfect BIC meaning that all problems were fixed within the designated response time. The other two product categories, Applications Servers and Service and Network Controllers, showed major improvement in BIC. Figure 10 shows the linear depictions of FRT2 BIC performance.

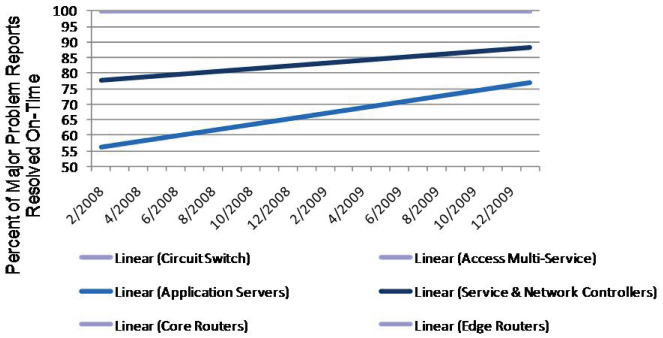

Figure 10 – Linear Trends for Switching Product Categories
FRT2 Best-In-Class

Worst-In-Class for Major Problem Reports Fix Response Time

As illustrated in Figure 11, five of the six product categories saw improvement in the FRT2 WIC. The Circuit Switch and Core Routers categories improved their FRT2 WIC over 10%. Circuit Switch started with the best WIC and the maturity of this product category is the likely reason. The Application Server FRT2 WIC degraded over the report period. As previously noted, this product category's Industry Average improved, meaning that the companies with WIC performance are becoming more conspicuous. They need to quickly improve their performance or it will likely impact their business.

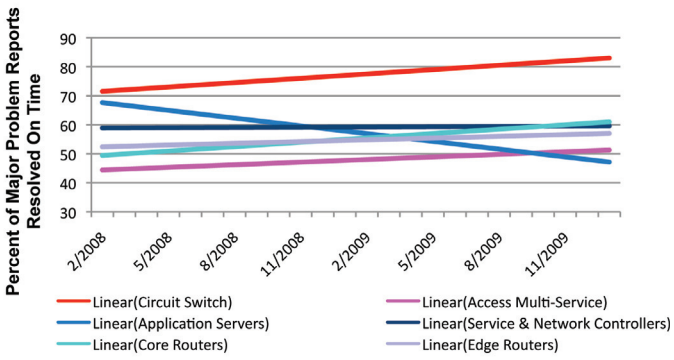

Figure 11 – Linear Trends for Switching Product Categories
Worst-In-Class

The data compiled and presented on the preceding charts and graphs shows the percentage of major problem reports fixed on time has broadly improved across the Switching product family. As with NPR, it is logical to conclude that certified companies' use of the TL 9000 benchmarking data has accelerated the industry's improvement.

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 a consumer, the availability of objective TL 9000 performance data provides critical information to use in the management of 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 quality improvement during a period where suppliers were forced to aggressively reduce their costs 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. 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.

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
Drive the adoption of TL 9000 through global collaboration, evolving the Requirements, Measurements, and 3rd party registration process while sharing 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 or call +1-972-423-7360.

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