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

A Study Using the Return Rate Measurement for the Wireless Product Family

Rapid expansion coupled with emerging technologies and globalization challenges the communications industry as it serves as 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, wireless, or satellite, 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).

The TL 9000 QMS, by dramatically expanding on ISO 9001, establishes a model that supports improving performance, better overall product quality, reduced cycle time, and improved customer satisfaction. The advantages of TL 9000 originate from the industry related supplemental requirements derived from practical experience and the standardized measurement reporting requirements for hardware, software, and service quality. Certified organizations also 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.

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.

The second in the series, released in September 2010, focused on the customer experience with Number of Problem Reports (NPR) and Fix Response Time (FRT) and again showed significant improvement in TL 9000 certified organizations. This paper, the third in the series, focuses on the return rates for the Wireless product family. Return rates are defined as the number of items returned after purchase for any reason whether it is for a defect or the customer's expectations were not met.

While TL 9000 has an ever growing listing of product categories, the team chose to study the Wireless product family since it is globally pervasive as well as growing and evolving at unprecedented rates due to smartphones and other emerging devices. The study also drills down into four product categories, listed below, that represent product family 3.3 Wireless Transmission.

- **3.3.1 Base Station Equipment** Equipment that provides the interface between wireless systems and the Public Switched Telephone Network (PSTN).

- **3.3.2.1 Basic (2G and Earlier) Base Transceiver System** Second generation and earlier equipment that provides the radio link to mobile subscribers.

- **3.3.2.2 Advanced Base Transceiver System** Post second generation (2.5G) or third generation (3G) equipment that provides the radio link to mobile subscribers.

- **3.3.4 WLAN Base Station Equipment** Equipment that provides the wireless data interface (such as IEEE 802.11 or IEEE 802.16) to wireless data network mobile subscribers. Examples include Wireless data access point and Worldwide Interoperability for Microwave Access (WiMAX).

This report utilizes the sustained performance data from TL 9000, including Best-In-Class (BIC) trends, Monthly Average (MA) trends, and Worst-In-Class (WIC) trends. The study covers a two year period from July 2008 to June 2010.

TL 9000 Certified Companies Reduce Return Rates

Return rates are measured in three distinct phases.

• The **Early Return Index (ERI)** is a measure of the returns of units during the first six months after initial shipment. ERI represents the rate of return for the product during installation, initialization, and testing.

• The **One-Year Return Rate (YRR)** is a measure of the return rate of units during the first year following the Early Return Index period. YRR counts the number units returned in the current month that were shipped between seven to eighteen months earlier. This period represents the rate of return for the product during the early life interval.

• The **Long-Term Return Rate (LTR)** is a measure of the return rate of units following the One-Year Return Rate period. LTR represents the rate of return for the mature period of the product.

Return rates are a good measure of product reliability. Product returns are expensive to both the supplier and the installing customer. Reducing the return rate has a major affect on lowering operational costs and expenses for all of the impacted parties. Such data is useful in helping understand and focus on not only product reliability, but also other improvement areas. For example, a high return rate coupled with a high no fault found rate may point to the need for improved troubleshooting, training, or fault isolation capabilities.

The nature of returns is one where customers often collect multiple Field Replaceable Units (FRU) and return the equipment in batches rather than returning each unit as soon as it fails. As a result, monthly averages often demonstrate variability month to month. That is why it is important to look at trends over extended periods to obtain a better handle on performance.

In this report on the Wireless product family, the WLAN Base Station Equipment product category had only partial Industry Average data during the two year period study. The Industry Average calculation is a rolling average based on data only from registrations that have submitted twelve or more consecutive months of data. Therefore, due to the limited data available for the Industry Average for the WLAN Base Station Equipment product category the overall Monthly Average performance was used instead.

Early Return Index for the Wireless Product Family

Monthly Average for the Early Return Index

Figure 1 is a plot of the average across all the product categories monthly averages. In order to better show trending, we have also included a linear trend line. The trend demonstrates significant improvements over the two year period. The linear average improved over 21%, a reduction from 1.4 to 1.1. While the monthly average varied throughout the period, the four product categories showed more than a 45% improvement or a reduction in returns from 2.0 to 1.1 during the two year period.
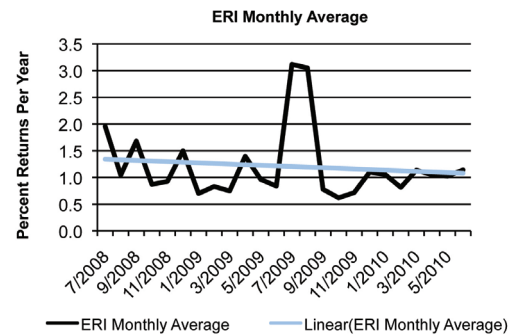

Figure 1 – ERI Monthly Average Trend for the Wireless Product Family

Best-In-Class Trend for Early Return Index

The team also looked at ERI BIC performance across the Wireless product family. The BIC results for ERI were very dynamic during the two year period. However, when a linear trend line is created from this data it shows an improvement from 0.21 to 0.09 as shown in Figure 2.
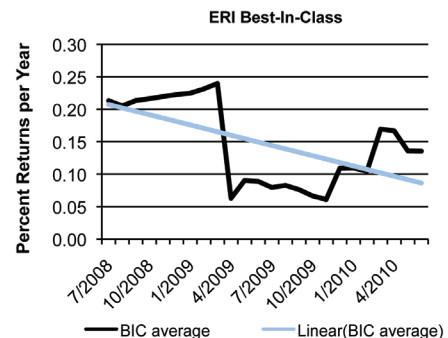

Figure 2 –ERI Best-In-Class Trend For the Wireless Product Family

One-Year Return Rate for the Wireless Product Family

Monthly Averages for One-Year Return Rate

As shown in Figure 3, the Monthly Average for YRR dramatically improved in two of the four product categories. The most significant improvement was in the Basic (2G and Earlier) Base Transceiver System product category with a 75% decrease in returns, a reduction of 4.2 to 1.2, and WLAN Base Station Equipment product category with a 71% decrease in the number of returns, a reduction of 4.5 to 1.3. The Base Station Equipment product category consistently delivered excellent YRR field performance throughout the two year period.
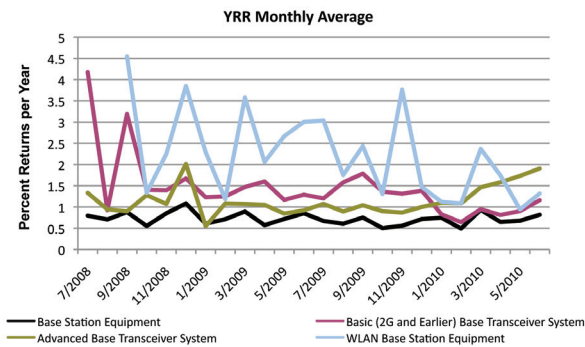

Figure 3 – YRR Monthly Average Trend for the Wireless Product Categories

Figure 4 is a linear depiction of Figure 3 that shows the performance trends. Consistent with Figure 3, the linear monthly average for YRR showed extensive improvement in two of the four product categories. The most significant improvement was in the Basic (2G and Earlier) Base Transceiver System product category with a 40% decrease in returns from 3.2 to 1.9. Product category WLAN Base Station Equipment had a 19% decrease in the number of returns from 2.1 to 1.7. Again, the Base Station Equipment product category had consistent results and the best YRR linear monthly average field performance of the four categories.
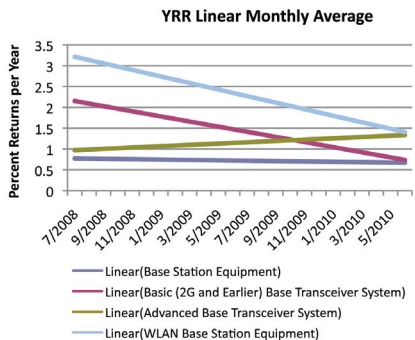

Figure 4 – YRR Linear Monthly Average Trend for the Wireless Product Categories

As with ERI, in order to assess the YRR performance trend for the Wireless product family, the team computed the arithmetic average across all individual product category YRR monthly averages. As shown in Figure 5, the linear average trend demonstrates that over the two year reporting period there was a 35% reduction from 1.7 to 1.1 across the product family in the number of returns.
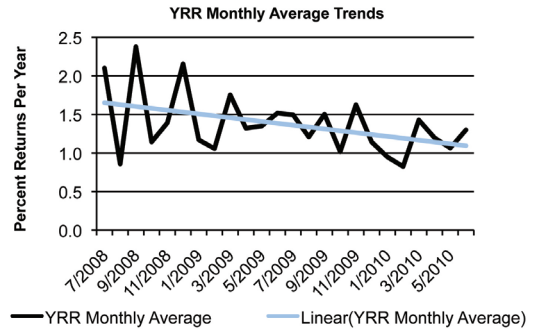

Figure 5 – YRR Monthly Average Trend for the Wireless Product Family

Best-In-Class for One-Year Return Rate

Figure 6 shows the YRR BIC improved for both Base Station Equipment and WLAN Base Station Equipment. The Base Station Equipment product category had the best performance improvement as it went from 0.23 to .09 for a 60% reduction in returns. While the WLAN Base Station Equipment had only seven months worth of data, it also showed a significant reduction in returns from 0.96 to 0.52 or a 45% improvement.
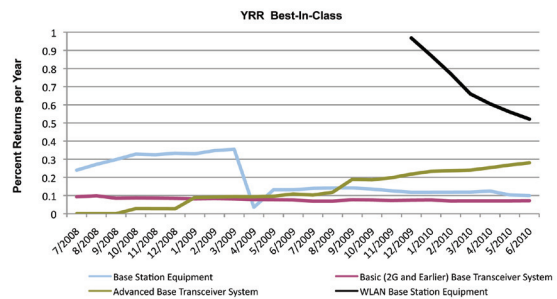

Figure 6 – YRR Best-In-Class Trend for the Wireless Product Categories

Worst-In-Class for One-Year Return Rate

Observing WIC trends is insightful since this measurement holds the opportunity for the most improvement. When there are large improvements in WIC, it also has a corresponding benefit to Monthly Average performance since it raises the overall performance level. In Figure 7, which depicts the YRR

WIC for the Wireless product family, the Basic (2G and Earlier) Base Transceiver System product category showed the most improvement. In September 2009, the Basic (2G and Earlier) Base Transceiver System performance improved dramatically due to one reporting organization choosing to drop out of the product category. In the following nine months, the performance continued to improve over 20%.
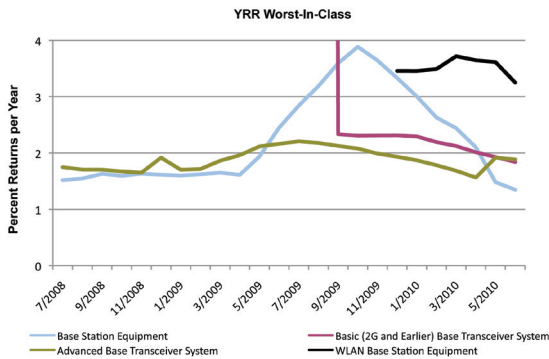

Figure 7 – YRR Worst-In-Class Trend for the Wireless Product Categories

Long-Term Return Rate for the Wireless Product Family

Monthly Averages for Long-Term Return Rate

Figure 8 shows that the LTR monthly average improved for three of the four product categories reviewed. The Base Station Equipment product category demonstated excellent LTR monthly average performance throughout the two year period, as did Basic (2G and Earlier) Base Transceivers and the Advanced Transceivers for the trailing twenty months. As also shown in Figure 8, the WLAN Base Station Equipment product category experienced the largest consistent improvement.
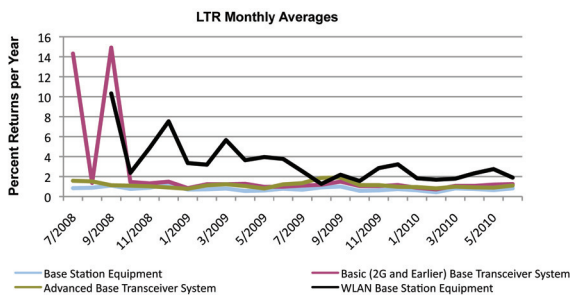

Figure 8 – LTR Monthly Averages Trend for the Wireless Product Categories

The LTR monthly average linear trend in Figure 9 shows an overall improvement for the Wireless family. As with ERI and YRR, in order to identify LTR monthly average performance of the Wireless product family, the team computed the arithmetic average across all individual product category industry averages. As shown in Figure 9, a linear assessment of this performance shows the LTR linear average demonstrating an 80% improvement, from 3.1 to 0.6.
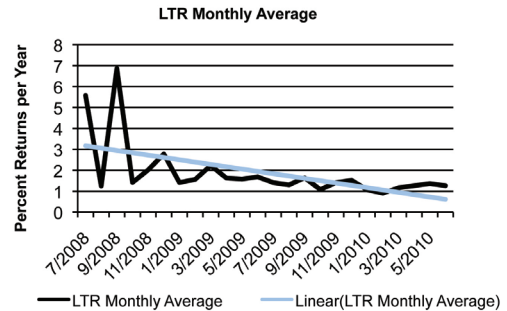

Figure 9 – LTR Monthly Average Trend for the Wireless Product Family

Best-In-Class for Long-Term Return Rate

Figure 10 shows the LTR BIC performance for the Wireless product categories. While the LTR BIC showed very good performance for each of the product categories, two of the four product categories improved significantly during the period. The Base Station Equipment product category improved from 0.40 to 0.05 for an 87% improvement. The WLAN Base Station Equipment product category, while it only had a partial data set, also showed improvement during that period from 1.3 to 0.9 or 30%.
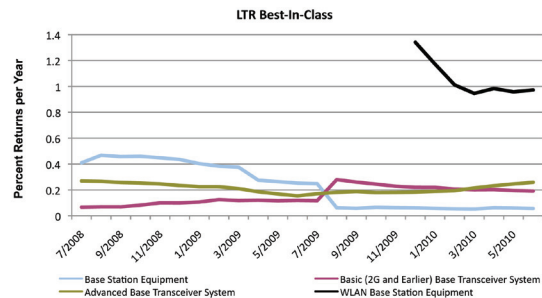

Figure 10 – LTR Best-In-Class Trend for the Wireless Product Categories

Worst-In-Class for Long-Term Return Rate

As illustrated in Figure 11, three of the four product categories saw improvement in the LTR WIC. After reporting a high of 347% in September 2009, one

reporting organization chose to drop out of the Basic (2G and Earlier) Base Transceiver System product category, bringing the WIC in range with the WIC for the other wireless product categories. As previously noted, this product category's monthly average correspondingly improved, meaning that the companies with WIC performance are becoming more conspicuous.
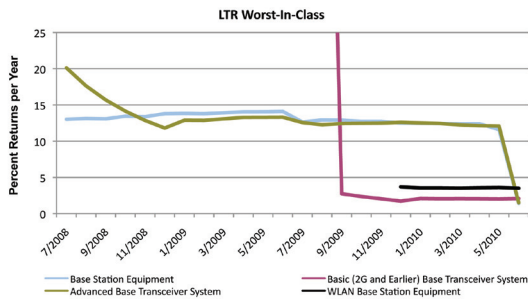

LTR Worst-In-Class

Figure 11 – LTR Worst-In-Class Trend for the Wireless Product Categories

Summary

The data presented on the preceding charts and graphs shows that return rates have broadly decreased or improved across the Wireless product family and that the linear average has improved for each of the measurements examined.

- For the Wireless product family, there was a 21% decrease in returns for the Early Return Index measurement.

- For the Year-One Return Rate measurement, there was a 35% improvement in returns. Also, for YRR, the studied Wireless product categories had a BIC of about 0.5% or less, the Monthly Average was in the 1 to 2% range, and the WIC was in the 1 to 4% range.

- There was also an 80% improvement or decrease in the Long-Term Rate measurement for the Wireless product family.

Based on this data, the TL 9000 certified suppliers of the Wireless product family have achieved the goal of reducing the costs associated with quality and warranty upkeep. The Wireless product family customers who purchase from TL 9000 certified suppliers have also realized their need for near term product improvement. Lastly, it is logical to conclude that certified companies' use of the TL 9000 benchmarking data has also accelerated the industry's improvement as a whole.

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.

For additional information on QuEST Forum or TL 9000 please visit www.questforum.org or call +1-972-423-7360.

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.

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