Improving Profitability by End-to-End Analysis of the Warranty and Quality Chain

TERADATA. TIBCO™ Spotfire®

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Executive Summary

Product warranties are important agreements of trust between a customer and the company that guarantees a manufactured product's quality, if it's used within specified parameters. When warranties are fulfilled by the backing of exceptional product quality, they are a source of profitable sales, customer loyalty, and increased brand equity and image. However, when warranties are affected by less than exceptional product quality, the results are large and ever expanding warranty reserve budgets that directly impact the company's profitability. Sales also suffer from the loss of customer confidence and from the resulting damage to the firm's brand image and equity. When the product's use is linked to public safety, the situation may lead to increased government scrutiny resulting in product recalls, hefty fines, and in extreme cases, incarceration of executives. This white paper will review the emerging trends in warranty and quality management and examine the benefits of Warranty and Quality Analytics to companies that operate in this space.

Partner Snapshot

TERADATA. Teradata Corporation is the world's leading analytic data solutions company focused on integrated data warehousing, big data analytics, and business applications. Teradata's innovative products and services deliver integration and insight to empower organizations to achieve competitive advantage.

TIBCO Spotfire®. TIBCO Software Inc. is a provider of infrastructure software for companies to use on-premise or as part of cloud computing environments. Spotfire® is TIBCO's advanced analytics and data discovery software for next-generation business intelligence. By offering a visual, interactive experience, Spotfire helps professionals quickly discover new and actionable insights in information.

Introduction

How can companies detect and reduce product failures so that they can decrease the large warranty reserves they are carrying to meet their service warranty obligations? What other areas in their warranty and quality processes can they streamline and improve to further cut costs and increase their profitability? The largest obstacle that companies face in this endeavour is the ability to track, trace, and analyze—in detail—all the variables in their warranty and quality chain that affect product failure and the associated warranty costs. Fortunately, for the employees charged with the responsibility of managing and reducing warranty budgets, increasing product quality, managing product recalls, and assessing vendor quality and supplier financial recovery, there is help in the form of Warranty and Quality Analytics. This is the practice of including and making visible all of an organization's data from its entire warranty and quality chain in a single, integrated, detailed view.

Warranty and Quality Analytics allow companies to move from reactionary to a proactive and predictive method of operation. At its core is an early warning engine or system (EWS) that gives predictive alerts to emerging issues by analyzing all the data in the warranty and quality chain. The emerging issue reports, analyses, and alerts are presented in a detailed and comprehensive manner to the various corporate departments in a way that is relevant to their core functions.

Market Drivers Impacting the Warranty and Quality Chain

The area of warranty and quality management has been garnering increased attention lately, especially in the manufacturing sector, due to new and significant market changes. Advanced warranty and quality management has always been performed by all major manufacturers, however, the analysis and issue resolution were carried out at the departmental level. Recent business, legislative, and technological advances have forced companies to re-examine how they address the challenges in their warranty and quality chain. We will discuss some of the market drivers forcing the changes.

Changes in Financial Reporting Standards

New financial reporting requirements have added an additional standard to use when judging the profitability of companies that provide product warranties. The focus has been on the warranty reserve budgets that companies put aside to honour their warranty obligations.

GAAP requirements have been extended in most countries for the fuller disclosure of liabilities placed on the balance sheet for the effect of providing a reserve against future warranty claims. These reserves are required in order that revenue from a sale of goods can be recognised immediately.

The warranty reserves reporting requirement has led to the exposure of previously unseen details of how effectively companies are managing their reserves and the effect this has on profitability. Since warranty reserves are, by and large, driven by product reliability, pressure to actually improve product quality has increased significantly. In 2011, American manufacturers reported the smallest percentages of sales ever spent on warranty, suggesting that the attention they've given to their warranty process over the past decade has paid off.[1]

Typically, warranty reserves are reported as a percentage of revenues. Best-in-class companies usually set aside about 1-2% of their revenues to support product quality. In a study from Warranty Week Magazine of what companies are putting aside, we see that many companies are in excess of this goal. Many companies are in the 2-3.5% range with some going as high as 4.2%.[2]

When compared with companies that produce similar products, it is not difficult to discern how a company's product quality and reliability will affect its bottom line. Those firms with lower product quality and reliability have to set aside bigger warranty reserves relative to their competition for the same amount of sales. One can see how improvements in product quality and the processing, planning, and analysis of the warranty process can lead to big improvements in profitability. A reduction of 0.5 to 1% of the reserves in some of the larger manufacturing companies can amount to one billion dollars (U.S.) in cost savings.

1 Warranty Week November 12, 2012 http://www.warrantyweek.com

2 Warranty Week http://www.warrantyweek.com/archive/ww20110318.html

The warranty reserve requirement has applied such significant pressure to companies that it has led some of them to falsify the amount of funds that they are setting aside. There have been recent reports in the media of senior company officials being charged in court with falsifying the warranty reserve requirements to make their companies appear much more profitable than they really are.

"The difference between a best-in-class and an average performing company with $1 billion in revenue is $15-20 million in cost difference."

Warranty Policy as a Competitive Advantage

Many companies are beginning to view their basic product warranty as a marketing advantage in the highly competitive markets in which they operate. Basic warranties that have significantly longer coverage periods or cover more types of failure or usage are seen as a communication of first-rate product quality. The rationale behind the lengthy warranties is the manufacturer's belief that their products will outlast the warranty period, thus increasing market share and customer loyalty without significant additional cost. Extended warranties that go beyond the basic coverage, which customers buy for a premium, are also a source of significant revenue. Again, the rationale is that companies can sell warranties that they may never have to service, thus the increased revenue.

Safety and Emission Compliance Requirements

Public safety and regulatory bodies worldwide have over the last 20 years introduced wider and stricter regulations that have at their basis warranty claims data. The European Union, the United States Environmental Protection Agency and many national governments have dramatically increased the possibility and frequency of embarrassing and potentially image-damaging product recalls, as well as fixed minimum terms for certain classes of goods. Failure to meet, or deception in, compliance reporting can carry the possibility of significant fines and jail time for those involved.

Warranty claims records measured against sales and production volume numbers form the basis of many of these safety and emissions compliance requirements. There is significant pressure to reduce the number of warranty claims relative to sales that companies report. The goal can be achieved by quality improvements coupled with greater and much more detailed analysis of the base reporting data.

Some of the data reported are now in the public space, and there are current court cases in process that may make more of these data public. The public and brand image of a company can suffer significantly when external groups, such as consumer advocacy groups, draw unfavourable conclusions from the data.

Challenges to Profitability by the Warranty and Quality Chain

Challenges of Warranty Cost Drivers and Their Estimation

One of the most difficult tasks that warranty budget planners face is determining accurately the right amount of funds to set aside to service the firm's warranty obligations.

The lack of completeness of information about every step in the warranty and quality chain and the associated cost are the principle barriers to the budgeting process. Data are not available in a manner that is chronologically interrelated and that uniquely identifies the cost factors in a detailed manner that matters. The factors that affect warranty costs go beyond the actual repair cost and extend into other cost areas, such as distribution, logistics, RMA, rework and performance incentive costs.

Ideally, companies would like to have the capability of predicting their future costs. This is a large challenge considering many don't have the capability of knowing what is happening right now in the field. The statistical algorithms that are required to accurately predict future warranty costs require data attributes of all the cost drivers.

The sensitivity to cost of each attribute, as well as its interaction with the other attributes, can be studied to help predict what future warranty reserves should be set aside. The inability to get to the granular detail level of planning forces companies to either over- or under-estimate the correct funds to set aside in warranty reserves. Valuable and significant amounts of capital are tied up or lost by the inability to determine where the costs are coming from and what effect those costs have.

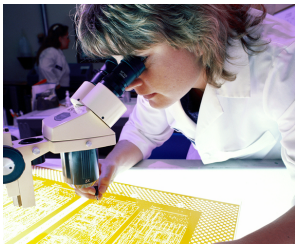
" A 1% reduction in warranty reserves for typical $1 billion Revenue Company relates to $10 million direct cost savings."

Challenges of Supplier/Vendor Recovery

Warranty providers of manufactured products in discreet manufacturing (OEM) incorporate other companies' parts and systems into their own products when they assemble and resell their finished product. Supplier or Vendor Recovery is the process by which the

SUPPLY CHAIN

- As Design and Manufacture +
- Switch and qualify new supplier
- New supply lead times
- Goods in transit



DESIGN AND MANUFACTURE

- Lead time for new design
- Take action, dispose or rework goods in stock
- Same for goods WIP
- Identify, quarantine defective goods
- Lead time for replacement
- Disruption to capacity, scheduling, inventory
- Identify and re-set out of control processes

SALES OUTLET

- Tarnished brand
- Customer recall
- Complaint handling
- Processing return of defective goods
- Fulfilling new orders
- Loss of customer
- Seek new customers
- Reassure public
- Double marketing efforts

CUSTOMER

- Wants it fixed ASAP
- Feels dissatisfied
- Is worried
- Might switch brand
- Will spread the word
- Might seek compensation
- Take liability action

Figure 1.

OEMs recover funds from the supplier for costs they incurred servicing products covered by their warranty when the failure can be attributed to the supplier.

In general, the OEMs have a significantly higher warranty spend rate as a percentage of revenues, around 2.5%, while the suppliers average the 0.7% range. OEMs have awakened to this inequity given that most of them no longer manufacture most of the parts and assemblies they incorporate in their final products. Many OEMs have made it their priority to bring their rates closer to the supplier rates with suppliers taking on a significant share of the cost.

Being unable to chronologically interrelate, uniquely identify, and track a failed part or assembly to a supplier in an unambiguous and irrefutable manner is what prevents the OEMs from reaching their goals. OEMs have a difficult time establishing supplier responsibility in an accurate, detailed manner. The task is especially difficult with parts that are complex assemblies or cheap generic parts. The OEM needs to be able to track the bill of materials for each product to the factory lot number from which the failed part came.

The ability to use computer systems to track each warranty claim against the contract terms that determine the level of reimbursement is very difficult. The contract is usually in text form and not in the codes and their descriptions with which traditional computer systems work. Each contract is unique, with multiple rules and caveats, forcing the OEMs to deal with high-level reimbursement. The inability to enforce the reimbursement contract in its entirety means that millions of dollars go uncollected. Additional resources are used when debating and negotiating the reimbursement amounts due to the lack of clear evidence.

Challenges of Crafting the Right Warranty Policy

Companies face a significant challenge in deciding what type of warranty policies to offer for both the basic and extended warranties. The warranty policy challenge is one of being able to create cost-effective policies that balance customer satisfaction and image with profitability. A poorly structured warranty policy can result in financial losses or portray an undesired image of product quality. The inability to convert detailed and integrated data to readily available information stops the warranty policy designers from being able to determine the appropriate answers to the major questions listed here.

- What is the true cost and effect of products that carry multiple or combined warranties over the entire product's lifecycle?
- What cost limiting strategies can be employed in product repairs and should the repair or maintenance activity perform a replace or repair of the failed component?
- What are the most cost-efficient service guidelines for how much time, what parts, and labour operations should be carried out for a product service or repair?
- What is the true cost for free replacement (goodwill) and partial use warranties, not just from a budget perspective, but also from a customer retention and satisfaction perspective?

The Challenge of Reducing Fraud in the Warranty Chain

According to the Association of Certified Fraud Examiners, it is estimated that "the typical U.S. organization loses 6% of its annual revenues to fraud". Estimates have suggested that for some consumer goods up to 15% of all warranty claims are "suspect".

Stopping fraud in the claim processing and returns systems—where most of the fraud originates in the warranty and quality chain—should be the ultimate goal in curbing this menace. The most effective and difficult type of fraud to trace and eliminate is the type that is small on a transaction basis and flies just below the acceptable thresholds and alerts set in the claims and returns processes. These types of events have to be viewed in a historical context for the patterns and details to emerge. The challenge is compounded by the fact that fraud may not occur in the actual claim or returns system, but in a secondary system. The siloed approach of analyzing events in a single system or process ensures that this type of fraud will be easy to detect. The events viewed individually in their source systems are valid, but only when viewed together does the fraud become apparent.

" The typical U.S. organization loses 6%-8% of its annual revenues to fraud."

Early Warning Systems and Reducing the Detection to Correction Time

The detection to correction time (DTC) is a measurement, usually represented in days, of the time it takes a warranty provider to detect a quality issue and correct it. Gartner Research estimates that it costs automotive companies approximately $1 million per day for delaying a major quality recall issue. Warranty budgets are ballooning out of control for numerous reasons, but the major one is the inability to stop product quality issues in their infancy. For each day the problem goes undetected or corrected, more of the product with the defect continues to be produced and get into the field for sale.

Many detection methods require that certain thresholds be reached before alerts to potential quality problems are sent out. The number and combination of variables that can go wrong and result in a part failure is very large. The data required to effectively deal with reducing the DTC will come from multiple systems across multiple disciplines from the entire enterprise. The difficulty of integrating, storing, and easily analyzing the massive amounts of data forces companies to rely on very selective, attributed, high threshold values. They must also use aggregated data as opposed to the detailed data in their emerging issue identification to be able to reduce the DTC time. The aggregated selected data usage fails to consider those alerts and patterns that have not been previously encountered. These can fly under the radar for a long time only to blow up when the problem becomes very large.

Extended DTC windows are exacerbated by the challenge of getting the right supporting information of an identified emerging issue. To address the emerging issue, a detailed and relevant analysis of the issue needs to be communicated rapidly to the appropriate parties. Analysts need the relevant data in order to validate the emerging issue and the right course of action; unfortunately they spend a vast majority of the critical time gathering data as opposed to analyzing and reacting to it.

"Delaying a major recall can cost as much as $1 million per day."

– Gartner Research

The Challenge of Root Cause Analysis of Complex Systems

Today's manufactured products are increasingly complex in their design and composition. This complexity leads to intricate failures that make it increasingly difficult to diagnose the root cause of the failure. Root cause analysis (RCA) of the failures is necessitated because there could be multiple failure points of the part assemblies and subassemblies that use parts sourced from multiple suppliers.

Even if the companies have adequate early warning to a potential quality issue, the data required to perform the RCA are often not reliable and sufficient because the issues are not coded and recorded correctly. It is very difficult to create codes for all the failures that a system can experience with all the associated conditions and sequence of events of the failure. These are the data that are required to accurately identify the RCA of a failure. Previous attempts to establish these codes have created lengthy and complex processes that have the opposite effect of what they were intended to do. The staff recording the issues usually picks the first available options to avoid the lengthy process of accurately defining the issues. The failure is not captured effectively, and when RCA is attempted, there isn't sufficient information to complete it. The richest source of data available is often in the form of unstructured text in the records used for RCA.

"50% of auto suppliers reportedly found no fault with the replaced part sent to them by OEMs for inspection to determine the root cause of the parts failure."

Unstructured text is the information stored in comment fields, emails, and so on, where the problem is described in text form as opposed to using a failure code, complaint code, or diagnosis code to describe the issue. Reading the text comments contained in thousands of warranty records, customer complaints, and technician's reports for RCA is not cost effective or efficient. Different analysts might interpret the text content differently. The large volume of data records forces companies to read very few of the records, and in the process, they often overlook the critical ones.

Historical Perspective of Warranty and Quality Analytics

For many companies, the analysis and knowledge of all the functions and departments in the warranty and quality chain that interact with each other to affect the profitability and company brand image is carried out at a departmental level. This siloed approach to analysis forces the aggregation of data and information to a very high level. This limits the ability to get at the detailed data that are required to address the quality and cost challenges.

Warranty claims, along with installed base of data, form the primary source of data used in the early warning and emerging issues systems. While moderately effective, the use of warranty claim data constitutes a reactive approach to the problems. Warranty claims result from problems with products that have, for the most part, already been sold and are in use out in the field. Even when issues are identified earlier in the product's lifecycle, more products are being introduced with the potential to encounter the same problem. Historically, the use of all the data, especially those that are higher up in the warranty chain, must be incorporated in early warning systems that span an entire enterprise.

Data mining and use of predictive analysis (to help predict future costs and potential quality issues that may affect a company's profitability and overall customer satisfaction) have also been used at a siloed departmental scale—not in an enterprise-wide way. This siloed approach may have addressed the department's needs in the short term, but since the quality issue may involve multiple departments and functions, it took a very long time to address the issues.

What to Look for in a Warranty and Quality Analytic Solution

Data as the Central Strategy

The cornerstone of any company's attempts at seriously tackling the challenges in its warranty and quality chain is having a complete and single version of the data visible at the center of its efforts. All the data in the warranty and quality chain must be utilized—not just warranty claims. The repository should be developed in an interactive process that integrates all the data in the warranty chain from product design to the end of the product lifecycle. The data should be added in an iterative manner to include: warranty claims, installed base, bill of material, product life cycle management, call centers, field service, part sales and orders, service technician help systems, product life cycle, and internal and external sources of customer complaints, to name just a few.

A Data Strategy Roadmap

Companies need a comprehensive, flexible blueprint or roadmap that defines how different types of data will relate and interact with each other in the data repository. This will help guide companies in their endeavours to place information as the central strategy in tackling the warranty and quality problem. The roadmap should help the firm with a structured model of how warranty and quality chain data can be turned into actionable information and the associated business value when choosing what area in the warranty and quality chain to tackle.

The roadmap should show how each iteration of a new data source enhances the existing reporting and analysis capabilities that exist within the enterprise.

Early Warning System

The analytic solution must have an early warning system (EWS) that makes use of predictive analytics. Broadly speaking, predictive statistical data allied with historical data so that future events can be predicted—in this case failures. The EWS system would identify all the emerging issues, and then classify them in order of their importance, based on defined business objectives.

The higher up the warranty chain that predictive analysis is carried out, the lower the potential damage to customer satisfaction.

Traditionally, efforts are focused on Infield early warning, which is trying to predict failures of products in the field. The Infield early warning approach uses data from products in the field. While crucial and definitely required, the analytic solution should help companies move farther up the warranty chain by performing predictive analytics to the product testing stage where, based on what test data show, predictions can be made about how products will behave in the field: enabling issues to be stopped at this early stage before the products go into the field.

The next stage should be the ability to move the company to product design predictive analysis. This is where proposed design change data can be studied in relation to similar design changes and what effect they had on the performance of products in the field.

Effective Communication Framework

When issues are identified and classified by the early warning engine of the analytic solution, the appropriate supporting data and analysis should be communicated rapidly in a function-specific manner to the various departments of the enterprise that work together to address the issue. The idea is to focus the limited, expensive, and seriously time-constrained resources on resolving the issue as soon as possible. Traditionally, scarce resources are wasted perusing the many likely, but fruitless leads to the cause and scope of the issue. Too much time is spent in gathering and analyzing the additional supporting data for the numerous possible leads, reducing the time available to solve the issue. The result is missed opportunities in significant cost avoidance.

Unstructured Text Analysis Capabilities

Text analytics software performs linguistic-based analysis of the comment text in the records, not just statistical and proximity analysis. The text has to be analyzed to identify all of the attributes (who, what, when, where, and why) in the text and their related behaviors. These attributes and behaviors are then combined to form meaningful and unambiguous structured facts derived from the information. These extracted facts can then be fused and stored with the original structured data in a traditional relational database. The hybrid information is then available to be accessed by analytic applications.

Highly Scalable and Accessible Hardware Platform

Having established that the major challenge to the warranty and quality chain is primarily access to the right data at the right time, we must give serious thought to how the massive amounts of data should be stored and retrieved. The analytical solution has to run on a combination of a database and hardware platform that allows for complex query retrieval and concurrent data loading capabilities. The expectation should be that the analysis will get progressively broader and more detailed as additional data sources come on board. The database and hardware should scale in a linear and predictable manner to meet the new demands.

Service-oriented Capabilities

The solution should have a component development and deployment tool to enable you to quickly build robust applications that leverage valuable information resulting from analyzing the warranty and quality analysis. This would drive valuable information into a company's operations and to hundreds of front-line decision makers. And it would enable smarter, more competitive decisions, cost cutting, and time saving actions—actions that are enabled by near-real-time information access and analysis of the warranty and quality operations.

Qualified Professional Staff

The supplier should provide data warehousing architecture, implementation, and optimization consulting services, and enterprise analytics consulting. They must offer technical and business solution qualified Professional Services references.

Benefits of Warranty and Quality Analytics

The significant benefits that emerge when a company adopts an analytic approach to the area of warranty and quality analytics are numerous. However, we have highlighted the significant ones in their respective functions in the enterprise.

Improvements in Warranty Cost Analysis

- Improved profitability resulting from reduced warranty reserves and warranty payments.
- Improved accuracy in forecasting overall product warranty budgets.
- Detailed and precise knowledge of all the important factors that cause warranty reserves to expand or shrink.

Faster Early Warning and More Accurate Root Cause Analysis

- Reduce the DTC times for product quality issues. Have the ability to stop potential quality problems in their infancy when the affected population is still relatively small. Inform assembly and manufacturing plants in a timely manner of quality issues for prompt corrective action.
- Design more reliable products by studying previous similar products for failure patterns especially those caused by design problems and avoiding similar mistakes.
- Set better priorities regarding opportunities for quality improvement.

Increased Supplier/Vendor Financial Recovery

- Increase funds from supplier/vendor recovery by counting all funds available for recovery in a faster, more accurate, and timely manner.
- Provide better, more accurate communication and data among the suppliers and the warranty providers. Provide detailed analysis and reports that accurately and unambiguously show the expected funds to be recovered.
- Review supplier recovery policies and agreements, and update them in a timely manner.

Smaller and Surgically Precise Product Recalls

- Focus product recalls on only those items affected: avoid wide-casting recalls caused by the inability to accurately pin point the affected population.
- Perform recall simulations to determine the most efficient and cost-effective manner to carry out the recall.
- Analyze and predict, in a detailed manner, the actual cost of a potential product recall.

Appropriate Product Warranty Policies

- Offer product warranties that increase customer satisfaction, product brand loyalty, and product brand image.
- Use extended warranty as a potential source of income.
- Adjust product warranty policy to maximize profitability, but still maintain high customer satisfaction and enhance product brand image.
- Craft the most cost-effective repair and service guidelines for repair technicians to balance the need to cut costs and maintain high customer satisfaction.

Reduced Warranty Fraud

- Identify and stop fraudulent warranty claims in both labor operations and parts replacement by identifying fraud patterns and developing the appropriate polices and controls.
- Proactively stop fraud at its source in the warranty claim entry systems by using fraud alert services. The services leverage the new insights to the ever-changing fraud patterns gained through the study of all data in the repository and the use of data mining and predictive analysis.
- Identify and stop the abuse of goodwill maintenance and service at detailed levels from the service center down to the individual service person.

The Teradata/Spotfire Advantage

The power of Warranty and Quality Analysis delivers:

- **Complete Visibility**: A single view of all data that affect product quality and the warranty costs required to support the products throughout the product life cycle.
- **Predictive Intelligence**: Advanced analytics that predict the failures and costs that affect profitability and customer satisfaction.
- **Alerts and Event Management**: Automated and continuous exception monitoring that provides actionable information to decision makers in time to take preventative measures in the entire warranty and quality chain.
- **True Collaboration**: Alignment of disparate functions within the business to common priorities, enabling them to work as a team to achieve overall business goals in the warranty and quality arenas.

Teradata Corporation and TIBCO Spotfire have combined all the features that are required for a world-class, enterprise-wide warranty and quality analysis solution. This solution is modular with each module addressing a specific function of the warranty and quality chain. It can be implemented in a way that addresses the most pressing needs of your company first. A general overview of the features of the solution is provided in this section of this paper.

The partnership between Teradata and Spotfire can be summarized in terms of the following differentiators.

- **Single View of Your Business**: Make the best decisions possible with increased efficiency and lower costs by arming those who can take immediate action with a consolidated source of consistent, accurate, and timely information.
- **Fastest to Actionable Insight**: Increase productivity by enabling anyone in the organization to anticipate, ask, answer, and act on relevant questions with unmatched agility and flexibility.
- **Visibility into the Unknown**: Uncover trends, patterns, and unexpected insights hidden in large, complex data sets with intuitive visualizations to instantaneously identify strategic business opportunities or threats in real time.
- **Self Service Data Discovery**: Anyone can freely explore their data, asking and answering detailed questions on demand without in-depth data modeling, radically accelerating decision making, while dramatically reducing dependence on IT.
- **Encapsulated Expertise**: Deliver deep, repeatable analytic solutions and processes to complex business challenges that encapsulate the knowledge of your DBAs, data scientists and decision makers in conjunction with Teradata and Spotfire's deep industry expertise.
- **Universal Adaptability**: Leverage a single enterprise analytics data engine and data discovery platform to address analytics use cases required by any business or technical user, from strategic, back-office analysis to the front lines of your business.

Teradata, Spotfire and Unstructured Data

Through our alliance partners we are able to incorporate text analysis technology directly into our warranty and quality offerings. This technology automatically extracts valuable data from free-form text records found in varied systems, such as warranty claim systems, test systems, engineering design systems, and customer and technician call centers to name a few. The extracted free-form text record is then combined with structured data to quickly generate accurate, analysis-ready data sets that unlock the unique value contained within the text.

The combined data is then integrated with all the other data in the warranty and quality data repository to be explored by Spotfire to gain a greater understanding of the information that was previously hidden. The hybrid data significantly reduces the early warning signal identification timescale. The greatest gains are in the area of determining the root cause of a failure since the free-form text part of the record usually contains the most insightful information to the conditions and sequence of events of complex failures and multiple points of failure.

Teradata Manufacturing Logical Data Model

The Teradata® Manufacturing industry Logical Data Model (MLDM) is a comprehensive and flexible blueprint for building a warranty and quality data repository that is the basis for all the analysis and reporting required to address the challenges of the warranty and quality chain.

The Teradata MLDM provides track-and-trace capability for almost all functions in which a manufacturer would be engaged. The MLDM provides the structure to integrate data, and details how to combine

data between the warranty providers' internal systems and external data systems, such as suppliers'. The systems include, but are not limited to:

- Warranty claims
- Sales and distribution
- Manufacturing data (Plant floor)
- Financial management (Both ERP and home-grown)
- Customer management
- Product launch and test systems
- Product life cycle
- Legal contracts

Advantages of the Teradata MLDM

Reduced implementation time

The Teradata MLDM accelerates the time required to get a data warehouse up and running, saving considerable human and financial resources in the process. This means faster time to market, and faster ROI.

- **Added investment protection**: The Teradata MLDM also protects your investment by using proven modelling methodologies and an experienced Professional Services team to avoid the common—and expensive—pitfalls inherent in building a data warehouse.
- **Increased flexibility**: The Teradata MLDM is flexible. It can be easily adapted and extended as your warranty and quality operations grow and change or as new subject areas, entities, or sets of attributes arise. The model makes it easy to add enhancements and new applications without re-architecting your current IT expenditure.

Teradata Integrated Analytics and Spotfire

Teradata Integrated Analytics allows you to perform complex early warning analysis without having to move data to a separate analytic tool. You always have access to all the data and can quickly and efficiently analyze massive volumes of data. Spotfire is then used to visualise the analysis so that your people can work smarter and gain and share high value insight immediately.

- Spotfire enables users to interactively visualize data without requiring predefined dimensions or measures.
- Teradata's analytic data engine is fast and flexible enough to dynamically aggregate, filter and drill down to micro-level details.
- Together we maintain high performance and linear scalability as data volume and complexity grows.
- Teradata provides users with immediate access to consistent data from a single data repository, freeing up user's time as they no longer need to worry about finding data stored in multiple places before asking interesting questions.
- Spotfire empowers users to quickly and dynamically combine data from Teradata and unconsolidated data sources into a single visual analysis without scripting or IT support.

Together we uncover insights previously masked by unrelated data silos, sampling or high level data aggregations.

- Spotfire enables users to anticipate opportunities and risks by seamlessly integrating predictions into ad hoc sessions and pre-authored analytic applications.
- Together we interactively enrich your data in-database to move beyond the limitations of historical data analysis.

Make the Right Connection

Spotfire has a direct connection to all the capabilities of the Teradata Warehouse as well as the ability to use data virtualization software for a unified view of all your data. That means your users have automatic use of all of Teradata's massively parallel features, including multi-level partitioning, join indexes, and complex views that provide fast access to huge amounts of data. Spotfire's power comes from its agility in allowing both analysts and business users to ask and answer their own questions as fast as they can think of them. And its speed brings you built-in benefits in three distinct areas:

Continuous Feedback

Every interaction the end user makes with Spotfire visualizations (navigation, marking, filtering, switching parameters, etc.) responds immediately with a new view. And because it responds so rapidly it creates a unique, virtuous cycle where business users who understand the business domain, but not advanced analytic tools, can explore deeper and with greater insights… and can ask even more questions.

The Teradata Difference

No IT Latency

None of these new views require going back to IT or a database administrator (DBA) to get a new SQL view or report created. Creation of a new optimized SQL views in a traditional RDBMS can typically take two weeks or longer… by which time the answer may not be relevant.

Instant Authoring

Ad hoc users and application developers can get started analyzing and building with almost no data or metadata modeling. Spotfire is unique in that it does not distinguish between dimensions and measures or require any other type of tagging or predefined aggregation.

Teradata Warehouse

The Teradata Warehouse is a powerful, complete solution that combines parallel database technology and scalable hardware. Teradata's leading technology is supported by the world's most experienced data integration, reporting, and analysis consultants who use the best tools and applications available in the industry today. Teradata solutions are the only offerings that allow for multiple and complex use of data that are resident in today's fast-paced, ever-changing, competitive warranty and quality environment.

The very large enterprise-wide data sets used in reporting and analysis must be supported by higher performance, availability, and guaranteed response times. The guarantees must be matched by the scalability to accommodate the new and ever changing requirements of the warranty and quality space. The Teradata Data Warehouse Appliance meets and exceeds these needs to become the most dependable, highest performing, massively parallel processing (MPP) server ever to be released in a Teradata solution and the market as a whole.

Teradata has been leading the technological evolution of data warehousing and decision support for more than 25 years. Teradata has a long, successful track record of helping organizations—in industries as diverse as retail, transportation, financial services, telecommunications, travel, government, manufacturing, and healthcare to build better solutions that help solve an organization's problems.

Teradata has a built-in base of industry knowledge, global support services, and world-leading hardware technology—a combination of strengths unmatched in the industry.

To help guide your model development, Teradata Professional Services consultants will help you plan and select the applications that support your unique business needs. Then we'll work with you to prioritize and implement an effective warranty and quality analysis strategy, a strategy that delivers the strongest return on your investment and implements a world-class business solution.

TIBCO Spotfire for Warranty and Quality Analysis

Teradata has partnered with TIBCO Software to develop a framework solution in the warranty and quality space. TIBCO's Spotfire technology serves as the visualization layer for the early warning engine, as well as providing contextual collaboration.

With TIBCO Spotfire companies can leverage the data and analysis in the warranty and quality data repository to answer the critical questions and share insight they can trust across the entire organization.

- What are the acceptable levels of Repair Orders over time?
- What abnormalities in product and parts performance can be identified in order to calculate exposure/ risk?
- What will future failure rates look like, and what will be their impact?

Spotfire helps businesses analyze warranty data from numerous perspectives in order to make better decisions regarding future cost and risk mitigation and serves as a single business platform to communicate all the information needs and actions enterprise wide for the entire warranty and quality chain.

- Gain visibility and perspective on all areas of warranty claims allowing the organization to derive context.
- Proactively drive context across the worlds of unstructured, semi-structured and structured content sources.

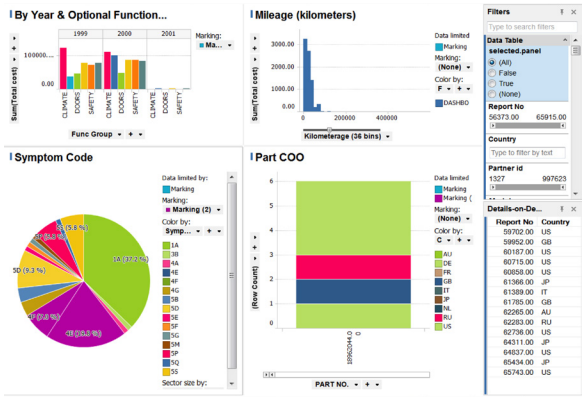


Figure 2.

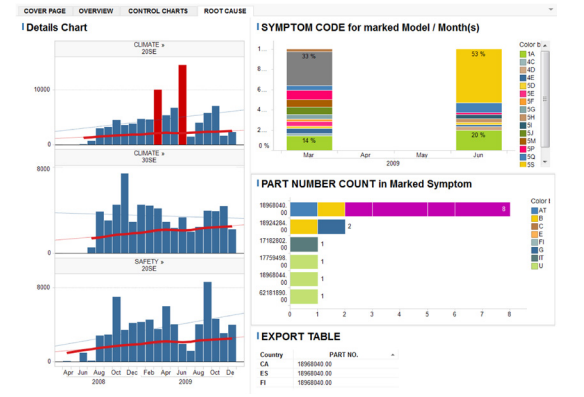


Figure 3.

Conclusion

This white paper reviewed the emerging trends in warranty and quality management and examined the benefits of Warranty and Quality Analysis to companies that operate in this space. From this review, you should have discovered how Teradata and Spotfire can determine and provide you with the solution to ensure your company moves from reactive warranty and quality to a proactive and predictive method of operation.

TERADATA. TIBCO Spotfire®