Quality Insight for the Automotive Industry

Applies to:

SAP Warranty. For more information, visit the Business Intelligence homepage.

Summary

Quality Insight, knowing the realities of product performance in operation, is essential to protect both customers and the Brand. Only by leveraging all of the available sources of data can a company obtain a complete and actionable view of product performance necessary to initiate action to protect customer, secure the Brand and to save costs.

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Author Bio

Mr. Larry Stolle is the Global Automotive Industry Solutions Marketing Director for SAP. In that role he has responsibility for marketing strategy and inbound marketing execution as well as contributing to the definition of global strategy for the automotive vertical at SAP. Prior to coming to SAP he held a similar position at Siebel Systems and was the Global Solutions Executive for the automotive industry at IBM. There he had global responsibility for strategy and solutions in the automotive retailing space focused on manufacturers, dealers and dealer group and the automotive aftermarket. He is a Certified Consultant and has thirty-five years experience in the Automotive Industry with deep knowledge and connection in global automotive markets. In addition to retail experience, Mr. Stolle has held positions as a manufacturer's representative in both sales and service and in various manufacturer staff level positions. During the most recent sixteen years in Information Technology, he has been responsible for the management of a national support, service and training organization supporting dealership management systems, electronic parts catalog and service information systems and business processes in the United States and Canada. In this role Mr. Stolle also provided support and process assistance to numerous corporate systems including sales, parts and warranty. He has in depth experience in providing automotive business consulting and strategy for Fixed Operations, Sales and Marketing, Financial Management, Warranty Parts and Sales Systems, Call Center/CRM and Factory Communications. Mr. Stolle has experience in process design and cultural change.

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Keeping customers – and your brand - safe

Quality Insight in the Automotive Industry

In its simplest dimensions the intensely competitive automotive industry has but two key elements; product and customers. Without product there are no customers and without customers there rightfully is no need for product.

It can also be argued that the customer is the most important of these elements. Customers vote with their dollars in two ways…first, they buy products with their dollars and second, in many cases, they invest their dollars into company stock. Customers will not buy products that do not demonstrate high quality and value and they will not risk funds on stocks representing a weak brand.

Companies have taken generations to build brand names only to have them destroyed in a few weeks due to bad publicity. Remember Audi and unintended acceleration from the mid 1980's, the Ford Explorer and Firestone from early in the previous decade and Toyota's unintended acceleration issues from today. Quality issues affecting customer well-being bring reputation breaking animosity.

Other automotive companies, some them relative newcomers to the industry, have confronted this challenge and have worked with a myopic focus on quality and the brand, resulting in quality levels previously only enjoyed by the elite of the industry.

Walking a fine line of quality safety, reliability and profitability is an even greater challenge during a soft economic period. In the automotive industry today staying balanced is difficult. It requires fundamental changes to how post – sale quality is monitored and responded to. There must be less reliance on warranty claim data and an ever increasing emphasis on building a comprehensive picture of product quality and customer experience. By acting on insights rather than reacting to issues, early detections and timely response to those issues can become a key part of the corporate culture.

Quality Data

Data relevant for quality insight falls into two distinct types.

Structured data is data that is maintained in a rigid structural format. Warranty claim data is an example of structured data. Warranty data always contains vehicle information such as VIN, delivery date and mileage. Other elements include, repair and diagnostic labor operation, parts, failure codes, part identifiers, part supplier, etc. Other types of structured data can come from OBDII DTC (Diagnostic Trouble Codes), MES (Manufacturing Execution Data) etc.

Unstructured data usually refers to text or freeform data that must be accurately interpreted to be of value. Examples include technician comments on claims, letters to customer assistance units, web blogs, etc. Unstructured data has the potential of being the "holy grail" or the "truth" in quality insight. Unstructured data in the proper context can open the windows of knowledge that structured data can only hint at.

Building Blocks of Quality Insight

Warranty

An original building block of quality insight is the oldest and most understood…warranty claim data. Warranty claim data is the old "safety net" and is the chief source of structured data for identifying recurring product problems. The analysis of structured warranty claim data has traditionally centered around three primary objectives:

- Cost containment in various forms, focused on product shortcomings or dealer actions
- Fulfillment of mandatory reporting requirements including NA TREAD and FASB FIN 45
- Identification of needed quality improvements, however this is a "long tail"

In its traditional form the warranty process is designed to serve and the manufacturer's quality assurance safety net. Warranties exist to correct defects that slip out of production, are introduced during distribution and delivery or arise during vehicle use. The objective of warranty is to raise product performance to the *minimum level* that meets customer and legal requirements. The focus is on repairing the product, not on improving customer relationships. And in many cases increased warranty periods have tended to create an illusion of increased product quality when that is indeed, not the case.

However, warranty claims offer a rich historical view of product performance, allow for forecasting future warranty costs with outstanding accuracy and are crucial in paying or settling claims made by dealers for repair of vehicle in operation.

So what are the challenges in achieving "insight" with warranty claim systems?

1. Latency – Warranty claims, by nature, have a high degree of latency, they are "lagging" indicators of product quality and performance. To have a warranty claim, the vehicle owner or operator must experience a problem. The severity of the problem then dictates how quickly the vehicle will be offered for repair. An appointment at the servicing dealer must be made and the repair must be completed. Further delays may occur if replacement parts must be ordered. Most dealer agreements require claims to be entered within a specific time period, although this time period is usually compressed as dealers attempt to improve cash flow. The claim must pass edits for validity and in some cases corrections or additional information added. Only when a claim is fully adjudicated can claim data be available for the analysis of the structured data contained therein.
2. Warranty claims contain highly structured data. That is that date must fit very specific formats. There are a finite number of labor operations, a finite number of "causal" part identifiers, a finite number of failure code (types of failure) and very rigid vehicle detail. Every part that potentially can be the cause of a product defect cannot possibly be listed for every single model of vehicle, generalities prevail. It is the same with repair action or repair codes. Specific "truths" are possible many times, while "truths" are not able to be specifically detailed just as many times.
3. Warranty systems are really more of a "payment" system. The primary purpose of a warranty system is to pay claims accurately and expediently to dealers for their repair of covered vehicles. Dealers make claims based on structured data pertinent to the vehicle repaired. If there is sufficient or relevant structured data available the dealer uses that data and a very accurate (to the actual defect) claim is submitted. In many case however, because a sufficient level of granularity is not preen tint he structured data, the dealer uses the closes thing he has available to explain the details of and support his claim. In other cases, he simply used the claim detail that got a similar claim paid the last time. This is hardly accurate.

   As an example consider this scenario. An exterior light does not work. And for the sake of this example we have as part identifiers to specify the exact point of failure and repair the following:

   1. Power source
   2. Wire
   3. Switch
   4. Light bulb
   5. Bulb holder

   The technician finds that the bulb holder is corroded due to moisture being present. The only logical defect must be attributed to the bulb holder. However, note that we do not have any type of weather or moisture seal listed. This is indeed the problem. However the technician codes the failure to the bulb holder…and the OEM, after getting enough of these claims goes off looking at the bulb holder for a defect, when in fact it was a defective seal around the light assemble that caused the problem. The result is more delay on identifying and correction of the root cause of failure. However the initial claim got paid promptly and accurately, as a warranty claim system is intended to do.
4. Critical mass of claims necessary to expose a problem takes time to develop.

On-Board Diagnostics, Telemetry and Data Storage

All vehicles produced in the United States after January 1, 1996, have on-board diagnostics built into them. Normally this function is contained in the OBD II module. This module provides almost complete engine control and emissions systems management and also monitors parts of the chassis, body and accessory devices, transmission and diagnostic network of the vehicle.

There are three distinct verities of OBD II: GM uses the SAE J1850 VPW {variable pulse width modulation}, Ford uses SAE J1850 PWM {pulse width modulation} and Chrysler, European and Asian Vehicles uses ISO 9141 circuitry. Function of all three modules may be considered to be similar and accomplish the same outcomes.

As the vehicle operates OBD II can monitor over 300 unique variables and record detected faults or deviations from normal operation as DTCs (Diagnostic Trouble Codes). These DTCs are stored in the OBD II memory for retrieval with special tools when diagnosing vehicle problems. These codes point to the specific area of the vehicle experiencing a problem and can indicate the nature or specific part that is failing.

OBD II is another important building block of quality insight. In this case it detects faults immediately or in some cases detects pending faults, meaning some faults must occur more than once to trigger a DTC. OBD II is an example of a "leading" indicator, and indictor that is detected almost immediately

OBD II is constantly monitoring engine and vehicle systems and in many cases actually stores data for a finite period of time. Things like brake pressure, throttle position, engine RPM, ambient data like temperature and altitude, etc can be stored to give a picture of what the vehicle was experience prior to a fault. Such information is very useful in troubleshooting a problem.

As more and more vehicles have the ability to transmit data, On-Star, Sync, etc., we could be begin to capture problems at the actual instant of failure. With this capability we can begin to build our knowledge immediately and would not have to wait for warranty claims to be processed in sufficient quantity to raise a flag. In addition we would know the actual operating conditions surrounding the failure, something warranty claims cannot do with sufficient regularity and accuracy.

So are there challenges with on board diagnostics and telemetry?

1. Not all vehicles currently have the ability to support telemetry; that is they cannot send data. More and more vehicles are gaining this capability every model year and there are indeed some aftermarket suppliers that provide "add-on" telemetry capability.
2. As more vehicles develop this capability we can easily face data overload. You can imagine with millions of vehicle in operation the volume of fault and surrounding data. These data streams are enormous and lead not only to storage challenges but also to processing challenges such as turning all this data into intelligence or in this case "insight".
3. We also face a challenge in obtaining detail from the repairing dealer; much data is available at the point of repair that is normally lost post repair.
4. And we still do not have complete resolution of real or perceived "privacy" issues.

But for all the challenges, the potential of OBD II telemetry is perhaps the most important "leading" or real time indicator of what is happening with an operating vehicle. We capture data, we are expanding the ability to extract the data and the ability to transmit in real time. We simply need to a) develop the processes to manage and interpret that data and b) to use it to improve vehicle quality and ultimately the customer experience.

Other Digital Data

We also cannot forget the vast amounts of digital data that exist in the automotive eco-systems… engineering detail, Supplier/Customer interactions, etc. And we also have data from the line controllers or PLCs that manager production…we can see things as critical as tolerance variation, which can be analyzed in search of defect root causes. We simply need to understand the implication of this data and how to glean intelligence from to resolve product issues.

Text – Unstructured Data

Information in text form is all around us. In fact, we are drowning in it.

Text is present in many forms such as:

1. Call Center transcripts
2. Customer Contact Center letters
3. Technical Hotline transcripts and reports
4. Field Technical reports
5. Warranty claims – technician comments (where systems have the ability to capture it)
6. E-commerce transactions
7. Oversight agency records
8. Insurance claim data
9. News and public Information
10. Social networking and Blogs

The power of text is immense, if you know how to harness it. For example, one major automaker found out it had a product problem from searching on-line blogs. In this particular case one model the OEM produced was experiencing engine fires. The OEM had no idea since the vehicles with fires were normally sent to insurance companies for settlement. There were no warranty claims. The insurance companies did not have enough claims to seek indemnification from the OEM. The OEM was blissfully unaware, but yet customers were unhappy and the brand was being seen unfavorably.

So how did the OEM find out…they were actively scanning public text data, blogs if you will and found an instance of a customer talking about a vehicle fire in this particular model. Then another blogger responded about having the same problem and so on…They finally got sufficient mass to recognize a problem…and the rest is history. But there were still no warranty claims…the power of text saved major problems for this OEM.

Does text pose any problems?

1. The sheer volume of it.
2. Where to look?
3. Context must be determined

Contextual Text Analysis

The ability to analyze unstructured or text data and derive explicit value or intelligence from it is highly dependent on the ability to analyze words in context.

For example…one might find the word "*dead*" in a report or letter. Ordinarily that implies the most dire situation. However…if the context was "the battery was "*dead"* we now have an entirely different and completely understandable (without emotion) circumstance.

Another example might be the word *"fire".* While not as bad as the previous example, it is still a serious situation. But if the context was *"the engine would not fire, or the spark plug did not fire",* we again have a very different circumstance. Not good but certainly rectifiable in a simple and expedient manner.

So we see that **"text"** is very valuable; in fact one might consider it to be the "holy grail" of quality insight. But being able to analyze and understand it ***"in context"*** creates real actionable intelligence that can quickly, with little interpretation lead to insight.

Accurate analysis of text, unstructured data, can lead to very accurate and very prompt analysis of what is actually happening in the field with vehicles. Blogs, calls to customer assistance center, etc., combined with the proper contextual analysis of text are accurate and prompt leading indicators, not only of product performance but also of customer perception of the brand.

Further text analysis provides the absolute ultimate in detail, defining in absolute clarity the specifics of product performance, product shortfalls and customer perception.

Enterprise Quality Insight

An enterprise wide quality insight "system" is essential! The path forward must:

1. *Work from a much broader perspective*…growing product complexity makes root cause analysis based on currently captured data exceedingly difficult. To establish a more forward looking perspective, automotive manufacturers must look beyond warranty claims to more timely sources of information.
2. *Capitalize on Integration…*Businesses should look at a variety of sources and take advantages of unique insights that come from integrating disparate data sources.
3. *Make analysis more affordable…*Automate data collection, manipulation and analysis.
4. *Look beyond the surface…*Advanced techniques for analysis can unlock deeper and more sophisticated insights that have been hiding in unstructured-free form text.
5. *Maintain focus…*on discovering the highest priority issues and solve them for the lifecycle of the vehicle.
6. *Encourage responsibility…*to respond rapidly and effectively to new issues and opportunities someone must be accountable for managing changes that touch numerous parts of the organization and its extended eco-system.
7. *Become "business and usual"…*certain the responsibility for quality extends throughout the organization.
8. *Tune the system and quality process…*over time…let it evolve.

Consider the possibilities for Quality Insight

Combining all of the above techniques will yield a rich view of product quality performance…and can do that in near real time with excellent detail. However, consider that all of this detail can be combined, history applied and considered. Algorithmic logic can be developed to take a look at the data and make predictions about product quality, product quality costs and customer perceptions. With that true view of quality insight and the associated quality intelligence companies can make correct decision on sorting the time to repair of defects, improving product quality, avoiding costs and securing a positive customer perceptions of the brand and the product.

Examples of Potential Sources of Data to Achieve Quality Insight

Potential sources	Advantages	Challenges
Warranty claim data	• Always present and structured • Significant granularity of detail • Includes key data such as mileage and vehicle information • Includes actual costs of repair	• Latent, Lagging indicator • Payment system is primary focus • Open to abuse or improper use • Structured data format cannot cover in detail all possible aspects of failure or repair
Consumer call center data and transcripts	• High volume of insights • Based on actual dialog between customer and customer service representative	• Lagging Indicator • Difficult to analyze unstructured text data • Terse summaries with spelling errors and shorthand abbreviations
Technical "hotline" data and transcripts	• Rich technical information • Often contain the discussions that lead to eventual repair of unknown or complex problem	• Leading Indicator • Difficult to analyze unstructured text data • Terse summaries with spelling errors, shorthand abbreviations and technical jargon
Field Engineering reports	• Highly descriptive • Well organized	• Lagging Indicator • Filled with engineering and technical terminology
e-commerce interactions	• Direct feedback from diverse set of customers • Provides input on quality • Offers suggestions and clues that can lead to future product or service improvements	• Varied level of value • Customer comments can at times be offensive or inappropriate
Oversight agency records	• Particularly useful because customers often choose to contact agencies rather than the manufacturers about safety or quality concerns	• Though descriptive, the agency's terminology may differ from the companies normal nomenclature • Lagging Indicator
Insurance claims information	• Early, reliable indicator of safety related incidents	• Perceived liability risk of receiving such data • Lagging Indicator
News and public information available via the Web	• Can provide early indication of safety and quality issues as well as general customer satisfaction and preference	• Extremely difficult to categorize • Vast number of sources: where to look? • Leading Indicator
Data exchanges with partners – both up	• Supplier often provides same component to several manufacturers and can observe	• Building open, collaborative business relationship where exchanging data about

and down stream	potential problems in a variety of settings and products • Dealer have valuable data too: they often notice problems first, based on service requests	potential design flaws is perceived as an advantage and not a risk • Debate over data ownership of transactional data in dealer systems
Date from in-vehicle devices	• Provides alert at the first instance of failure of fault indication • Quality trend can start immediately	• Real time leading indicator • Requires vehicle platform to include transmit or extended store capability • Scaling solution to handle data volume (storage and grid computing) • Must include dealer in process to avoid disintermediation
Manufacturing data from PLCs (line and device controllers)	• Readily available data for in/out or near threshold tolerances • Can be applied to all models	• Must find methods to relate build data to produced vehicles • Amount of possible data available to be managed

Conclusion

We all clearly understand that Product and Customers are the entire spectrum of the automotive industry. We must also understand that the bridge between products and customer includes three distinct concepts, “Innovation, Quality and Service”. Quality insight supports innovation, achieves and assures quality along with reduced cost and is the foundation of quality service!

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