ADVANCED DIAGNOSTICS AND PREDICTIVE ANALYTICS OF VEHICLE DATA

DR. JOHANN PRENNINGER
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Service advisor

• Customer visit of service station for service or repair.
• Service advisor is picking up the car and the original statement (o-tone) of customer.

Data ReadOut

• Mechanic performs diagnosis, reads out onboard data, failure messages etc.
• Big picture of failure situation.

Diagnosis & Repair

• Repair is done as proposed and guided by diagnosis software.
• Diagnostic / technical data is created/logged at this time.

Data Transfer

• Data transfer of technical and business data to the headquarter.
• Storage in different data warehouses.

Analysis & Reporting

• Interpretation and analysis of the data.
• Check and Payment of Warranty Claim.
• Starting point for Data Mining.
The driver “produces” data about his driving experience.

He expresses himself online about product issues.

He is occasionally asked via surveys and studies (TÜV, IACS, JD-Powers, ...)

The customer expresses & shares his aftersales experience online.

He is asked individually about his service / repair experience.

He evaluates his satisfaction.
ONBOARD DIAGNOSIS DELIVERS AN INTENSIVE MIX OF DATA OF A COMPLEX FAILURE-SITUATION
~17 Mio. Vehicles in the field
~4.000 dealerships in 90 countries, ~50.000 service people
Up to 65 Electronic Control Units in a single BMW
1.000 individual, selectable Car Options
>1 GByte Functional Software, 15 GByte Data onboard
~2.000 Customer relevant Software Functions
~12.000 Diagnostic Trouble Codes implemented in Onboard Diagnosis
~3.000 Metric Values in all ECUs in average per car
~10.500 Testmodules for all BMW series
~34.000 Schematics documents

Up to 60.000 Diagnosis Sessions per day worldwide
total size of DataWareHouse >> 30TByte
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MATURITY LEVELS IN VEHICLE DATA ANALYTICS. EVEN SIMPLE QUANTIFICATIONS ARE VERY BENEFICIAL

Level 1: Count / Know

Level 2: Qualify / Compare

Level 3: Analyse / Understand

Level 4: Forecast / Predict

Level 5: Suggest / Advise

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PREDICTIVE ANALYTICS CHALLENGE: FEEDBACK DATA TO REALIZE COHERENCE AND CAUSALITY

- Vehicle Identification
- Diagnostic Trouble Codes
- Environmental Conditions
- Symptoms, Testplans
- ECU Metrics
- Testmodules, Diagnosis Codes
- Repair Advice
- Defect Codes
- Labour Codes
- Replacement Parts
- Vehicle Design
- Failure Avoidance
- Test Strategy
- Failure Appraisal
- Quality Function Deployment
- Production Optimisation
- Parts Quality + Dimensioning
- Customer Understanding
- Customer Sensitivity

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DATAMINING THE DIAGNOSIS PROCESS IN DETAIL. VISUALISATION OF THE OFFBOARD DIAGNOSIS
A-PRIORI ANALYTICS TO FIND ADVANCED CUSTOMERS USAGE AND FAILURE PATTERNS

Numerous “events” during a vehicle’s Lifecycle (production, diagnosis, warranty, etc)

Find the causal failure patterns in vehicles with specific critical defects using a Sequence Analysis. A-priori datamining methods with SystemML™ in a BigData environment compute results near realtime.

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THE FACTS PROCESS AT BMW. FIELDDATA ANALYSIS FOR CUSTOMER SATISFACTION

Internal Customer (Requirements)

Analytical Helpdesk (Tickets)

Support of professionals (OnePager / project description)

Software for internal R&D experts (actually more than 120 Apps available)

Analytic-Dashboards and Applications

Data assignment

Datasources and interfaces

Self-Service

Analytical Helpdesk

Satisfaction [%]?

What helps …?

Quality after Warranty?

Field penetration?

Problems in Repair?

Repeat Visit

Repeat Repair

Monitoring

TÜV-Targets

Service-history Monitoring

Analysis of Diagnosis & Flashupdates

Repeat Visit

Repeat Repair

Monitoring

TÜV-Targets

Service-history Monitoring

Analysis of Diagnosis & Flashupdates

Fielddata analytics

Experience in DataMining

Fielddata logistics

Making the data available group wide.
THE AGILE FACTS PROCESS.
CRISP DATA MINING AND SCRUM COMBINED

FACTS Process - CRISP & SCRUM:

1. Request / Question
2. Business Understanding
3. Data Preparation
4. Calculation / Modelling
5. Deployment

Typical FACTS Process Steps:

1. Question of Department X: Automatic Detection of an important vehicle annoyance in the field.
2. Balance of request: How can the question be answered with specific data available
3. Initial concept (FACTS) and realization of data load, modeling. Iterative („Scrum“) enhancements with enquirer.
4. Presentation of Results, evaluation of Business Case and definition of Deployment.
5. Deployment in FACTS App-Store as Webservice for self-service Realtime-Analysis (defined users with specific access rights).
PREDICTIVE ANALYTICS TOOLS
CLASSICAL DATAMINING TOOLS FOR EXPERTS ONLY.
THE TOOLCHAIN FOR DATA ANALYTICS. INTERACTIVE TOOLSET TO DISCOVER THE ISSUES
THE BMW FACTS ANALYTICAL APP STORE.
PREDICTIVE ANALYTICS AS SELF SERVICE PROCESS

Welcome to BMW FACTS Analytical APP Store

AccessPoint

Category: Diagnose (14)
Attribute: No Attributes Available

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Understanding the vehicle quality and realizing the customer impression in the field is a complex multidimensional task.

On- and off-board diagnosis play an essential role, but need interpretation by the engineers and developers.

FACTS delivers a process to answer many questions by combining the data available.

Predictive analytics is provided as a set of analytical apps, encapsulated and simplified to deliver results as an interactive self service process.

By enabling intensified usage of feedback from the field we understand and improve customer satisfaction.
THANK YOU VERY MUCH FOR YOUR ATTENTION! QUESTIONS?