

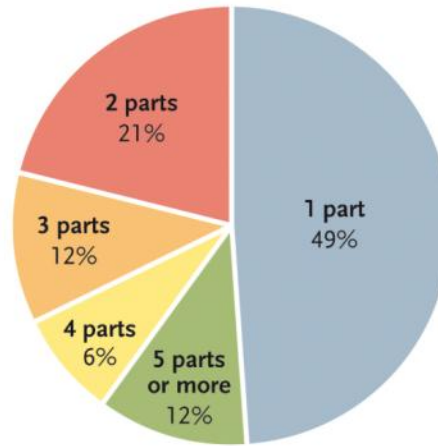
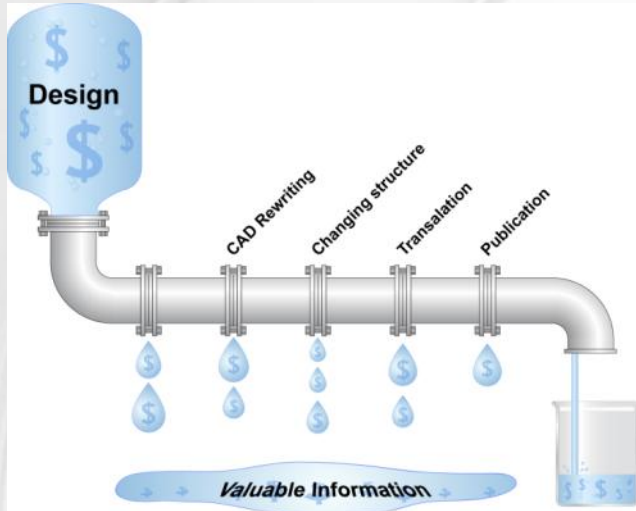
Automatic Production of Information

Johan Gunnarsson, CTO

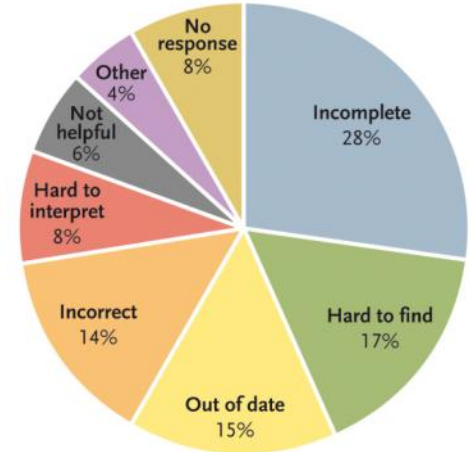


UpTime for Solving the Information Problem

The Problem



Source: Manufacturing Insights

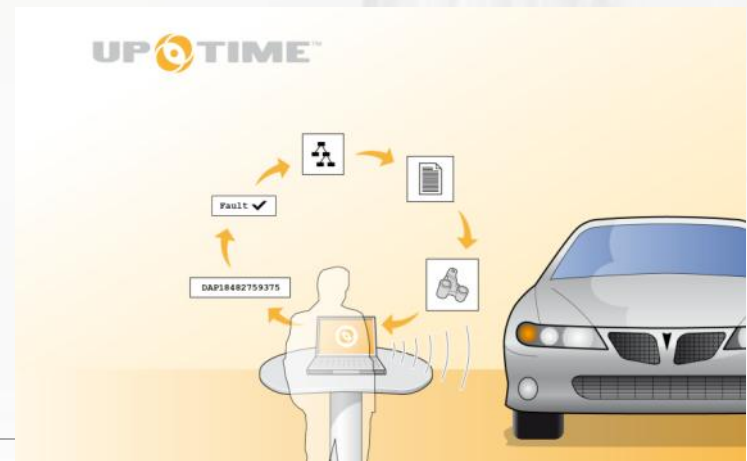


Source: Manufacturing Insights & SAE

The Solution



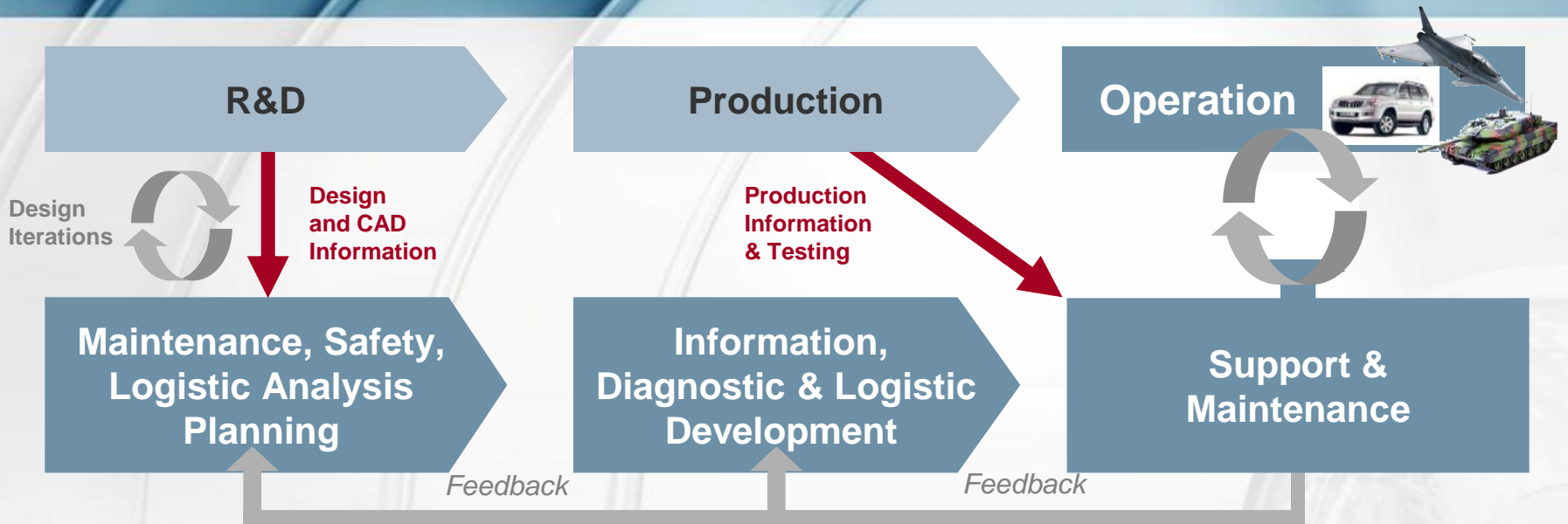
Development and Control of After-sales Information



Only Relevant, Correct and Applicable Information Easily Accessible



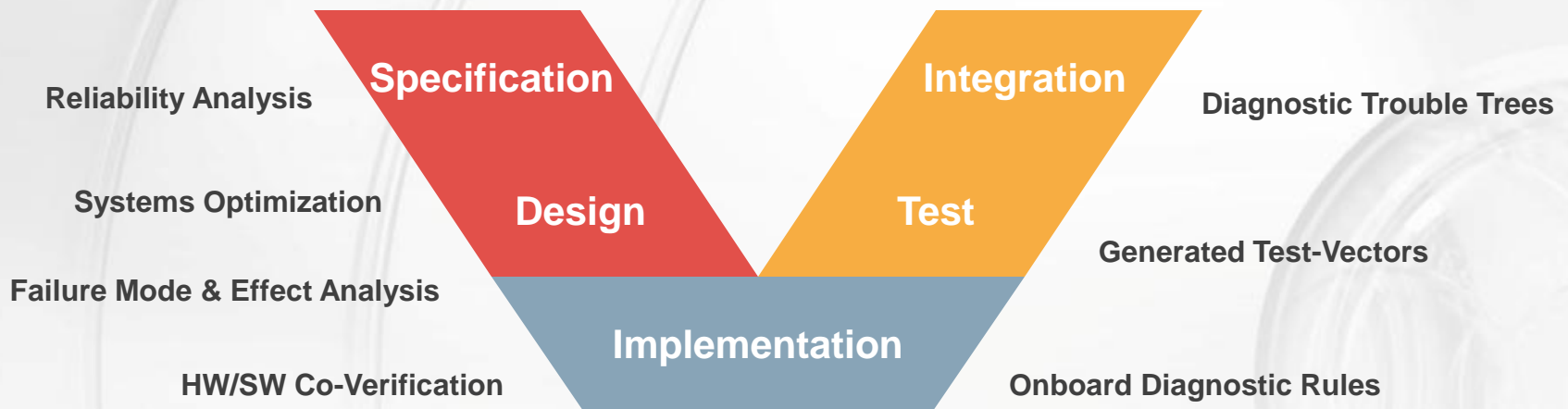
Product Lifecycle Support



has Increasing Demands for
Unified Information Systems
Vehicle Operation
Maintenance

Development Process

Value of Failure Mode Modeling for the Life Cycle



- * Adds value throughout the development cycle
- * Executable specification fosters collaboration between departments and organizations
- * Provides the missing link between development & service community

Current Problems Development Process

- * Time pressure

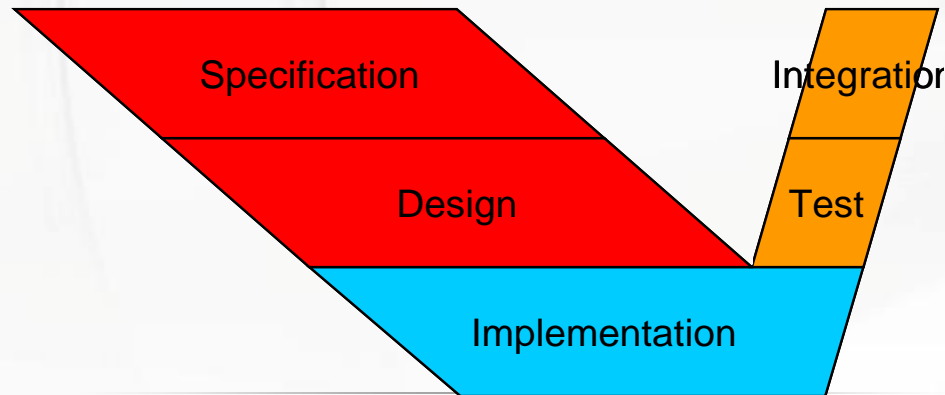
- Making the process more focused on the implementation phase, thus making the specification information incomplete

- * Late design iterations during implementation phase

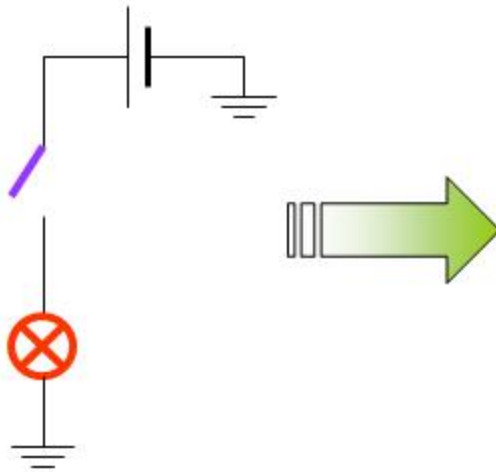
- Making the stable information based on what is actually implemented very late in the process

- * Lack of early failure analysis

- Makes the design of onboard diagnostics including DTC a result of design engineers ideas for fault detection rather than the complete support cycle aspect



Workshop Trouble Shooting



Workshop Tool

PROSIS UTQA - Publication: 2.0.0.70

Parts Service Training

Products

SN: Profile

Service Bulletins Repair Safety Specifications Diagrams Descriptions Time

Service information

Diagnostics Machine card Library Search Print

A40D (Volvo) [ART] L180F (Volvo) [WLO]

SAE Code

MID...

Add

Machine Display Text

Code...

Add

Symptoms

2: ENGINE WITH MOUNTING AND EQUIPMENT

Abnormal smoke

Blue Smoke

Add

Search Result

Abnormal smoke

ENGINE WITH MOUNTING AND EQUIPMENT

Blue Smoke

View Remove

User: XU32665 English

Valve springs, check

Valve cover, removal

For further instructions, see [Valves adjusting](#)

Check if the valve springs are cracked or broken.

check also the valve yokes

Are any of the valve springs or valve yokes damaged?

Yes No Back

VOLVO

Model Based Diagnostics with RODON

Sörman RODON Symposium, Linköping 2010-10-28

Volvo Group



Volvo Trucks



Renault Trucks



Mack Trucks



UD Trucks



Buses



Construction Equipment



Volvo Penta



Volvo Aero



Financial Services

Volvo 3P

Volvo Powertrain

Volvo Parts

Volvo Logistics

Volvo Technology

Volvo Information Technology

Volvo Group Real Estate – Volvo Business Services

Volvo 3P Global Presence

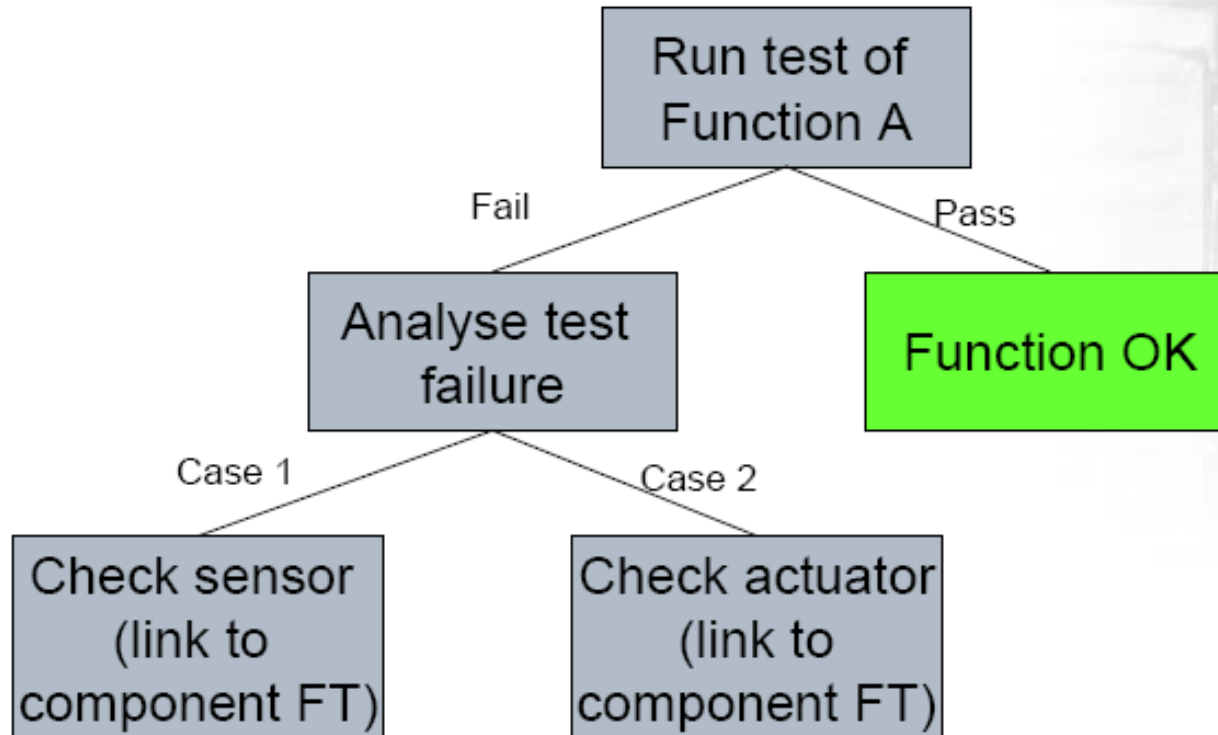


Guided Diagnostics

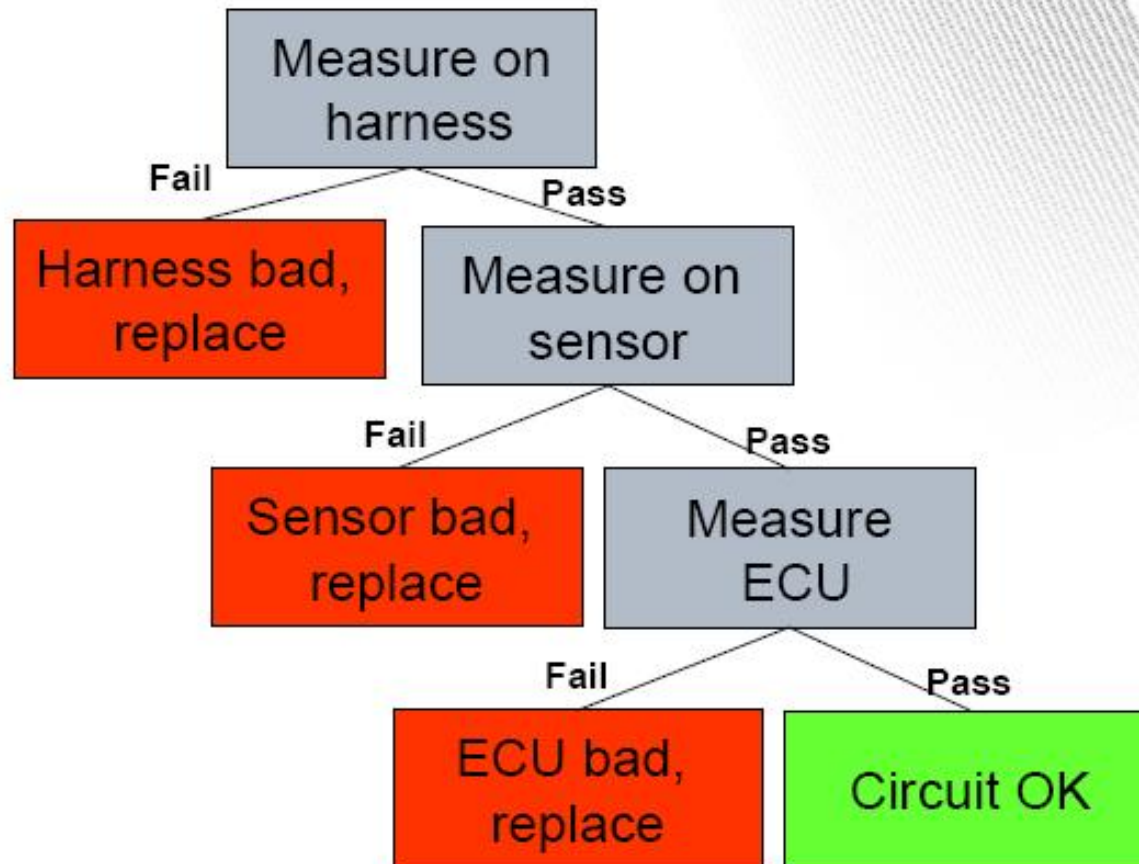


“The trees will guide us “

Function Fault Tracing



Component (Circuit) Fault Tracing



GD summary

- Supply guided diagnostics for the AM workshop technicians:
 - Analysis of symptoms and possible root causes
 - Execution of step by step fault tracing
 - Verification of repair
- GD content
 - Function based fault tracing driven by driver complaints (symptoms), component fault tracing for finding root cause
 - Application-like information (no documents)
- Tool
 - GD Authoring tool for fault tracing instructions in workshop tool

3P approach

- From manual to systematic analysis
- From rewriting documents to modelling data
- From complex to simpler problems to solve
(How can this symptom arise? vs How can this component break?)
- From AM responsibility to PD responsibility for the methodology

- - **MBD is the chosen methodology**

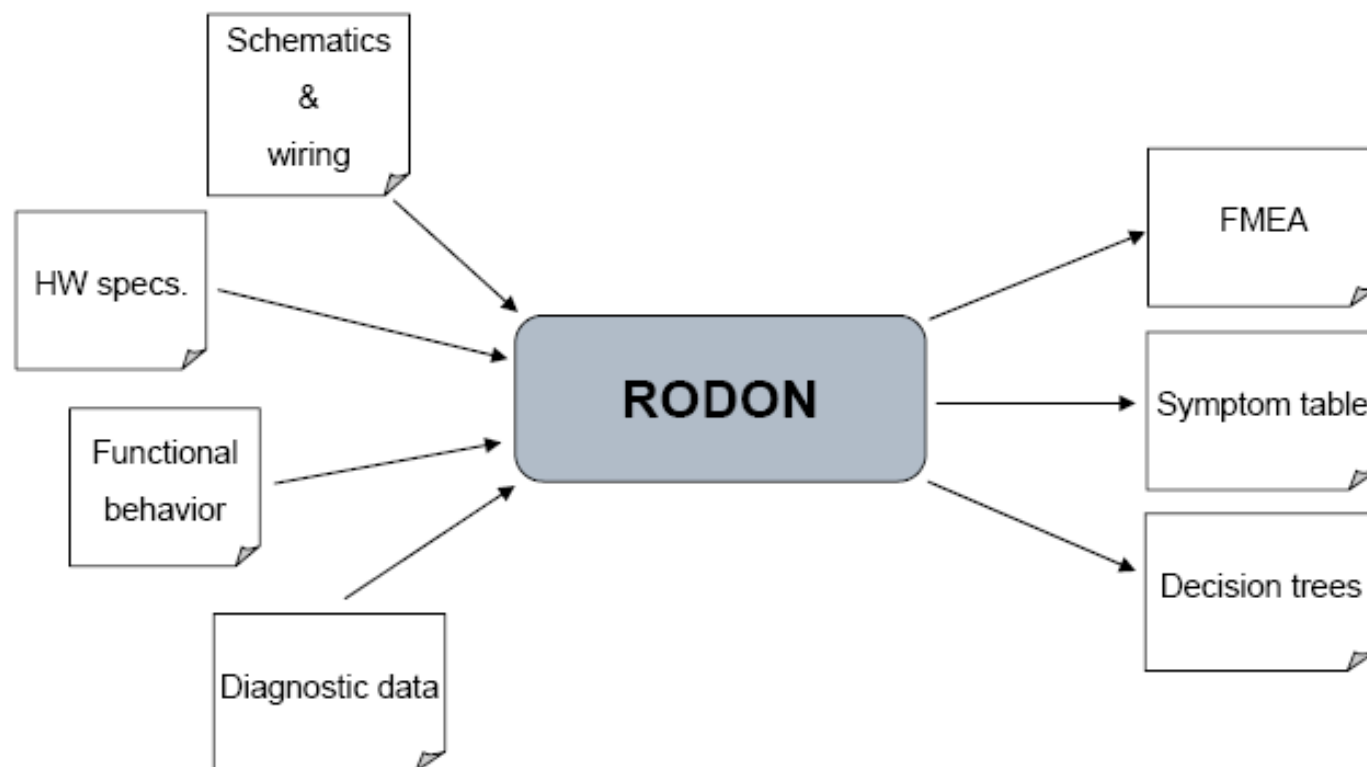
What is MBD



- In short:
 - Create a virtual model of the system
 - Calculate system behaviour and states based on real and physical values for currents, flows, pressures, signals, ...
- Models
 - Component-oriented, describe topology and properties
 - System/function model is built by component models (library)
 - Both nominal and faulty behaviour is modelled
- Output
 - Fault tracing methods (trees) and symptom analysis
 - System FMEA and fault code coverage
 - *Reliability and diagnosability analysis*

Volvo 3P – RODON usage

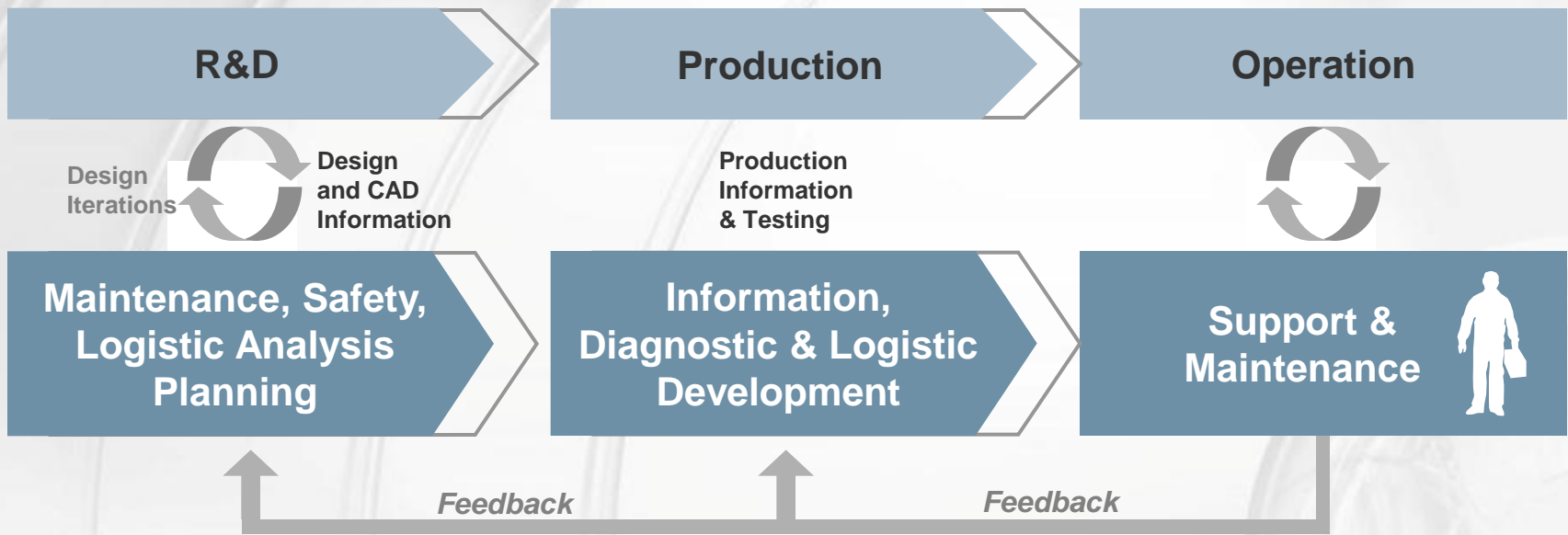
Fault tracing information to aftermarket



Summary

- MBD is another way of collecting and organizing PD data to create base material for AM diagnostics
 - Structured and reusable models
 - Analysis responsibility shifted towards PD
- MBD does not change implementation in GD authoring tool
- MBD opens for
 - Improved support and systematic analysis of in-vehicle diagnostics
 - More automated content production in GD authoring tool

Product Lifecycle Support



Industrialization of information process by

- * by making information future safe via standards, or
- * by generating information directly from the source data?

Thank you for listening

Johan Gunnarsson

CTO

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