

# Process Performance Improvement in the Automotive - Why and How?

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## Abstract

The automotive industry is highly innovative. Technologies like software (x-by-wire) are driving innovation, yet directly impact on safety, margins and market share. In a globally competitive environment, it is essential to maintain the speed of innovation and manage process performance improvement efficiently and effectively.

## Automotive and process performance improvement needs

Automotive is a market where according to the manufacturers in Germany, 70-80% of the innovation derives from electronics, and 80-90% of that is realised in software. And still, software and electronics development is the major source for trouble and the area with significant improvements potential (see figure from "Der Spiegel", a major German news magazine, "Distribution of the cause of car problems in Germany", 2003).

Software and systems process improvements have been undertaken systematically, e.g. by global players like Bosch. Bosch is the world's largest tier 1 supplier to the automotive industry and as such strives to master the software challenge comprehensively. Software improvement success here affects the whole supply chain. Bosch's corporate Initiative for Software-determined Systems (BISS)<sup>2</sup> has shown great success with some significant

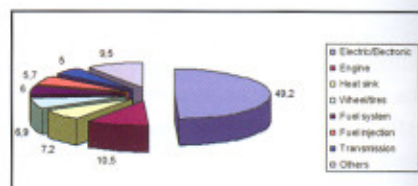
improvements in business units reported publicly.<sup>3</sup> Awareness creation through public events and specific mentoring of customer-supplier relations allowed to externalise such achievements and resulted in the development process to be recognised as a key driver for operational excellence.

The relevant industry association VDA<sup>4</sup> issued guidelines, and a software initiative (HIS) was formed by the OEMs<sup>5</sup>.

One key move is to use process assessments to evaluate the ability of suppliers to deliver as committed - including the commercial and technical perspective - and to drive industrial best practice adoption as part of development contracts. Process assessments are based on process reference procedure,

Change can be incremental or by "big bang" implementation of a grand master plan

models, and standards. CMMI<sup>®6</sup>, Automotive SPICE<sup>®7</sup> (ISO 15504-based), Six Sigma and various other models and methods are receiving increasing attention as means for achieving lasting performance improvements. However, practice shows that if the company's "standard" process does not return value to the business, it is bypassed,



Distribution of the cause of car problems in Germany (%)

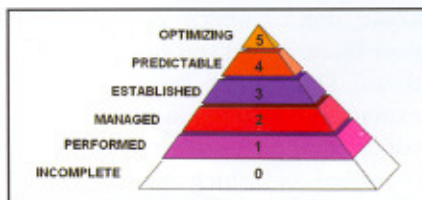
substituted by waivers and leads to taskforces.

## Different Improvement Models - a Birds Eye View

Improving an organisation means changing it. Change can be implemented by a series of small steps geared to reach an improved state incrementally, or it can be applied as a "big bang" implementation of a grand master plan, often involving radical changes.

**Business Process Reengineering (BPR)** in its original guise is an example of the latter approach, generally adopted when a business is in serious trouble or facing new challenges. As many variants of this method exist as there are consulting companies, but the basic procedure is the same: state the problem, define the desired state, and derive a master plan for reengineered processes which in turn drive the organisational fabric. BPR is often the last resort in difficult situations and involves considerable effort and cost and high risk of failure, but also the possibility of decisive rejuvenation for future success.

Incremental improvement approaches are less spectacular, but no less



The levels as used in CMMI® and SPICE

effective. The risk here is the establishment of a culture of continuous improvement that perseveres.

**Continuous Process Improvement (CPI)**, often equated with the Japanese “Kaizen”, uses a continuous series of small and smallest improvements to eliminate waste (“muda”), e.g. rework caused by development errors, unnecessarily high stocks of materials, superfluous delays in workflows etc. Kaizen can be used to improve something continuously, and therefore is a way of doing business. Kaizen and other supporting methods helped Toyota, for instance, to become worldwide the number 1 car maker in terms of profit, and number 2 in terms of turnover. Implementing Kaizen properly, however, requires a strong commitment from management and staff throughout the company, and in many cases it clashes with the prevalent organisational culture.

**Strong guidance is given by the CMMI®**, the most successful maturity model which replaced its predecessor CMM®. It comes in a product suite consisting of models, evaluation methods (“appraisals”) and training products. Models contain ‘Good Practices’ which have proven to be successful over many years. These practices are structured as steps (the “levels”), which indicate the degree to which the model has been implemented in an organisation and its change of behaviour. Moving up the levels by implementing practices means to improve the processes addressed step by step. Appraisals are used to evaluate what level an organisation has

reached, and to provide improvement guidance. Appraisals are also often used to evaluate suppliers. While the current application domain of CMMI® is software, hardware and systems development, there is also a draft version of CMMI® for Acquisition Organisations and a CMMI® for Services is announced for 2008.

**SPICE (ISO 15504)** is also a maturity model providing “level based guidance” and is similar in structure to CMMI®, although at a more detailed level the two models are not fully compatible. The main differences are

- CMMI® has a far better support organisation provided by the

In the automotive industry, Automotive SPICE® has become a ticket to trade

Software Engineering Institute (SEI)

- SPICE currently has a narrower focus on development (especially software).

- SPICE is more flexible in allowing different application domains to build own maturity and improvement models (such as automotive, space, and medical industry).

SPICE has received increasing attention in the last few years

because the European car makers have initially been choosing SPICE and since beginning of 2007 Automotive SPICE® for supplier evaluations. This induced a large wave of process improvement activities in the automotive supplier industry worldwide.

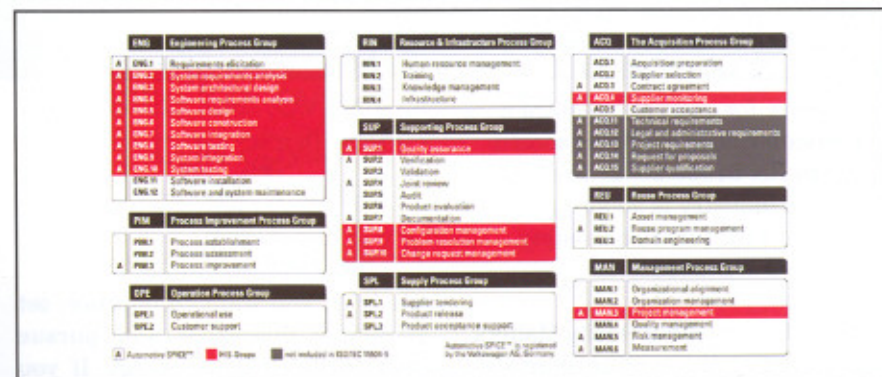
**Does it make Sense to Combine Different Improvement Models?**

Yes, it does. All incremental methods fit together very well. A sound base is provided by maturity models which offer a holistic and systematic improvement paradigm and infrastructure by defining operational requirements on project management, quality assurance etc., as well as addressing process management, process standardisation and organisational structures. Continuous improvements are covered by many model elements, especially on higher levels. E.g., Level 4 encompasses statistical control which can benefit a lot from Six Sigma.

**Are there Proven Business Benefits?**

Six Sigma, as outlined in various publications, has the potential to improve key performance indicators by 50-70%. The results of implementing CMMI® based programmes effectively are shown above:

Improvement approaches based on maturity models also facilitate dealing with:



Automotive SPICE®, the HIS-scope, and ISO15504 Process Model

Improvements	Median	# of data points	Low	High
Cost	20%	21	3%	87%
Schedule	37%	19	2%	90%
Productivity	62%	17	9%	255%
Quality	50%	20	7%	132%
Customer Satisfaction	14%	6	-4%	55%
Return on Investment	4.7 : 1	16	2 : 1	27.7 : 1

Table 1: Business benefits of CMMI (Source: Performance Results of CMMI-based process improvement, Technical report, CNU/SEI-2006-TR04, May 2006)

- pressure from customer: the market may require a particular minimum competence level. Automotive SPICE® levels required by the OEMs (up to level 3) are part

Implementing Kaizen properly requires a strong commitment from management and staff and may clash with the prevailing culture

- of the contract - thus, has become a ticket to trade.
- mastering complexity: large enterprises and large projects often have very complex work flows which simply require standardised and well-structured processes. The same is true for projects in an international context with several partners.
- legal requirements: safety critical systems, for example, require a particular maturity level according to EN 61508:2002. The automotive industry is adopting this standard for functional safety (see ISO WD 26262).

#### Conclusion, or: What Really Matters

In an early phase of an improvement project, the question which

model to use is often very dominant. In the automotive industry - Automotive SPICE® has become a ticket-to-trade. I.e., this question all too often obscures some of the more important factors to consider: improvement projects do require significant time, resources and true management attention and commitment. Here are some important success factors to pay attention to:

- Clear improvement objectives and motivation
- Strong management commitment
- Good consultants with relevant experience in similar settings
- Enough staff capacity to drive and support the project
- Good management of the improvement project
- Incentives for people to change
- Enough attention on internal marketing, communication, and change management

A final recommendation: Invest

If you want to improve, set attractive objectives and pursue them with all your energy

wisely! If you want to improve, set attractive objectives and pursue them with all your energy. If you can't guarantee the success factors

above, don't embark on it and save your money until you can guarantee them. There have been too many expensive improvement projects which did not deliver what they promised or which were stopped with no results at all. ■

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#### References

1. This article is based on (a) a publication in the British Computer Society 50 years' anniversary 2006 titled "CMMI®, SPICE, six sigma etc. Whats thier business Value?" by Klaus Hoermann and Hans-Juergen Kugler and (b) an article, "improving Industrial Practice", pages 113 - 117, by Hans-Juergen Kugler, published by Addison-Wesley in 2006 within SEI's new CMMI® book "CMMI® 2nd edition - Guidelines for process Intergration and product Improvement" Mary Beth Chrissis, Mike Konrad, Sandy Shrum.
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5. CMMI is registered in the U.S. Patent and Trademark Office.
6. Automotive SPICE is registered by the Volkswagen AG, Germany
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