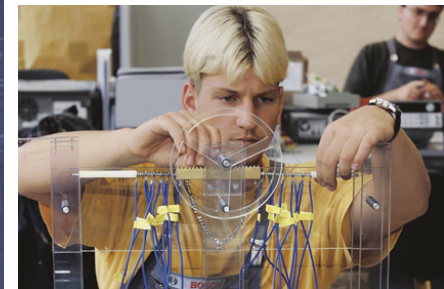
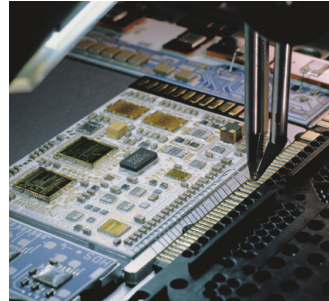




Upgrading to CMMI at Bosch

BOSCH

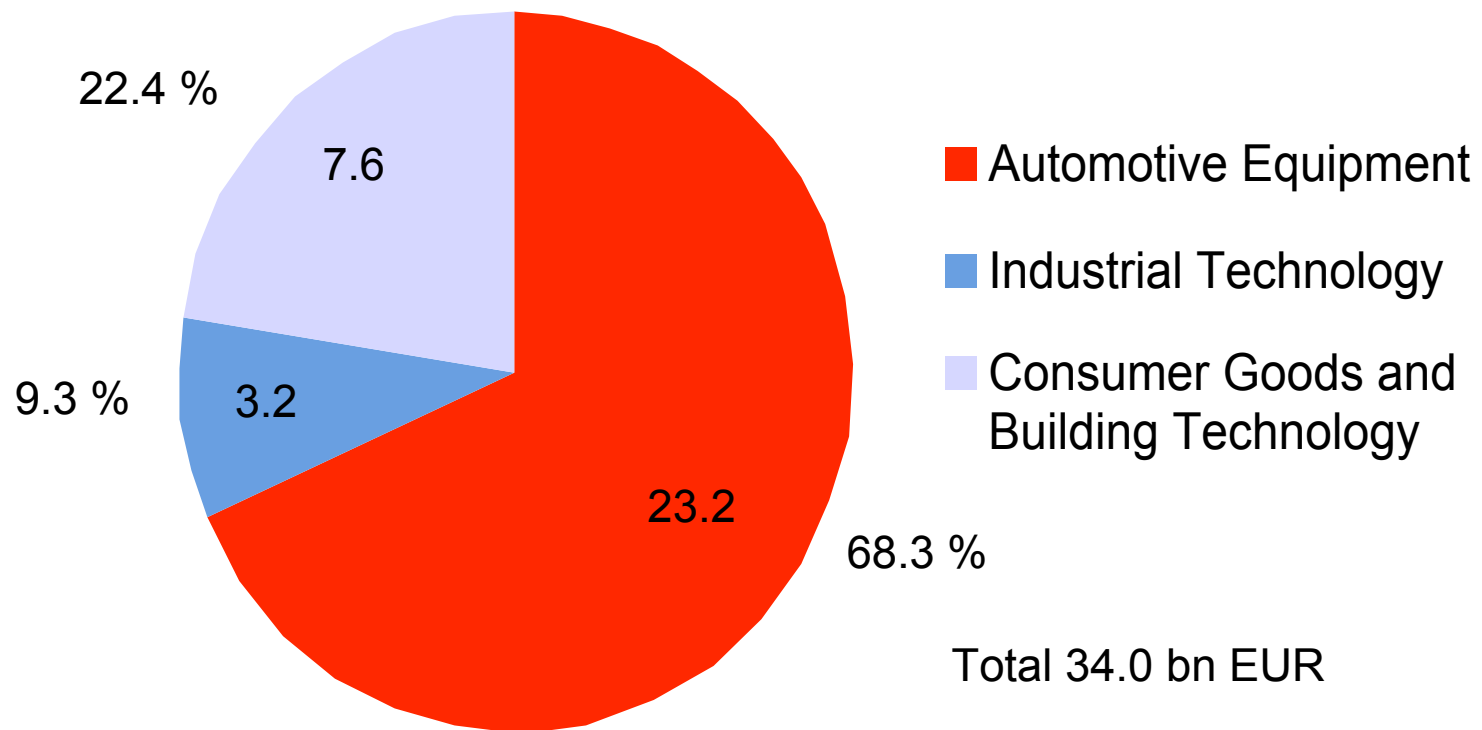


Thomas Wagner, Jan Unruh
Robert Bosch GmbH



Bosch - Distribution of Sales 2001

by Business Sectors





Agenda

- **Software in the Automotive Industry**
- Bosch Initiative for Software-Intensive Systems (BISS)
- Future SPI at Bosch



Quality Management: 0-Defect Strategy

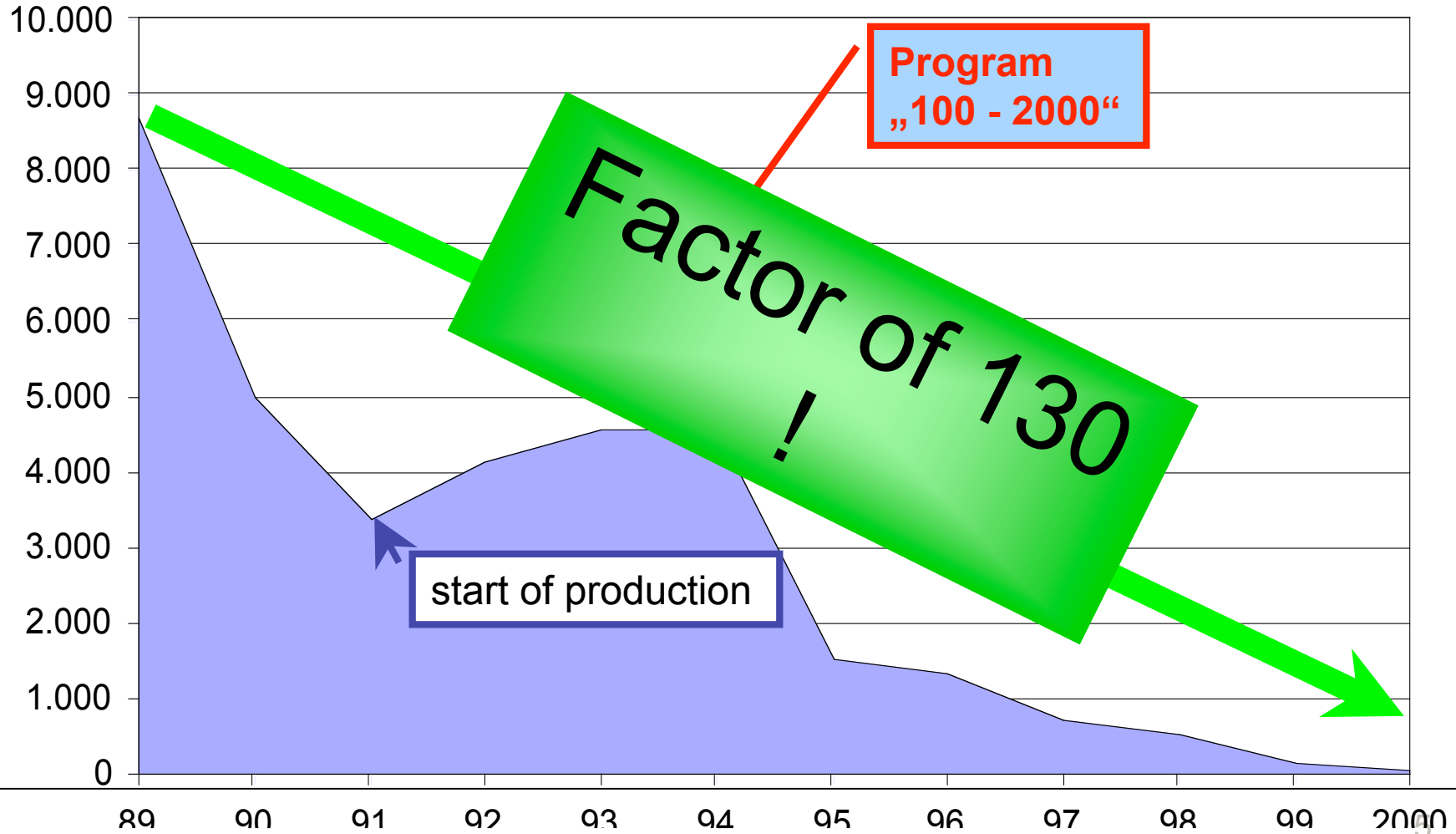
100 % Quality - wouldn't 99,9% do it also?

- One hour every month of dirty drinking water
- 500 faulty surgeries per week
- 32 000 skipped heart beat per person per year
- 20 000 wrong medical prescriptions per year
- 22 000 checks per hour debit the wrong bank accounts
- 1600 pieces of mail lost per hour
- One car per day with cracks in the steering-gear arm
- 20 loose lug nuts per day
- 80 faulty parts in every car produced
- A parachute doesn't open once per 1000 jumps

Hence: Zero Defect Strategy !



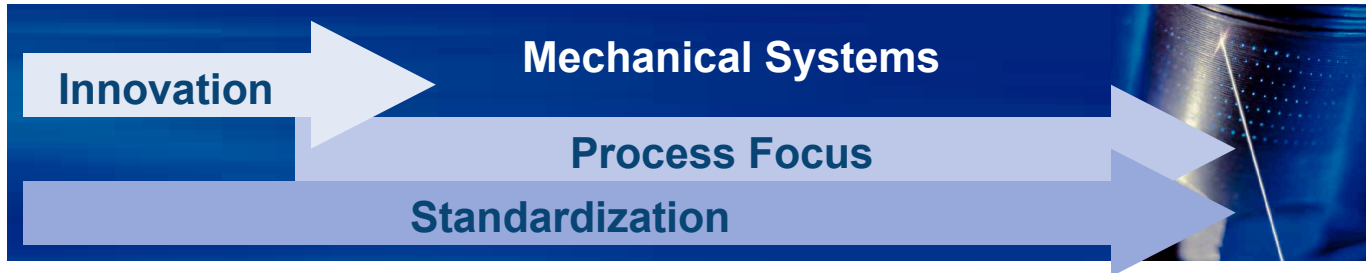
0-km Failure History of Mechanical Product





Paradigms for Automotive Innovation

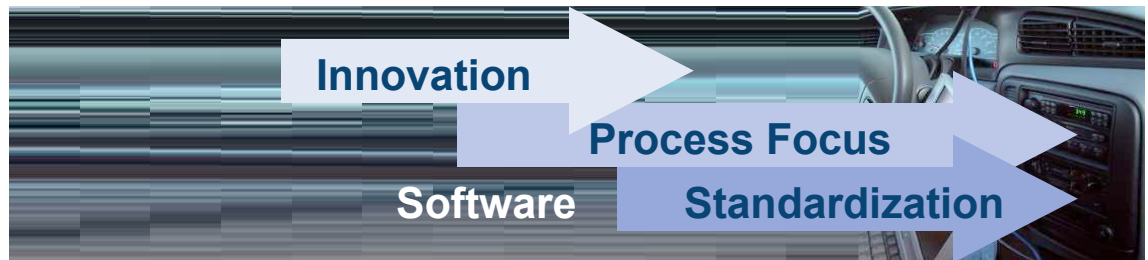
1880
-
1960



1960
-
1990

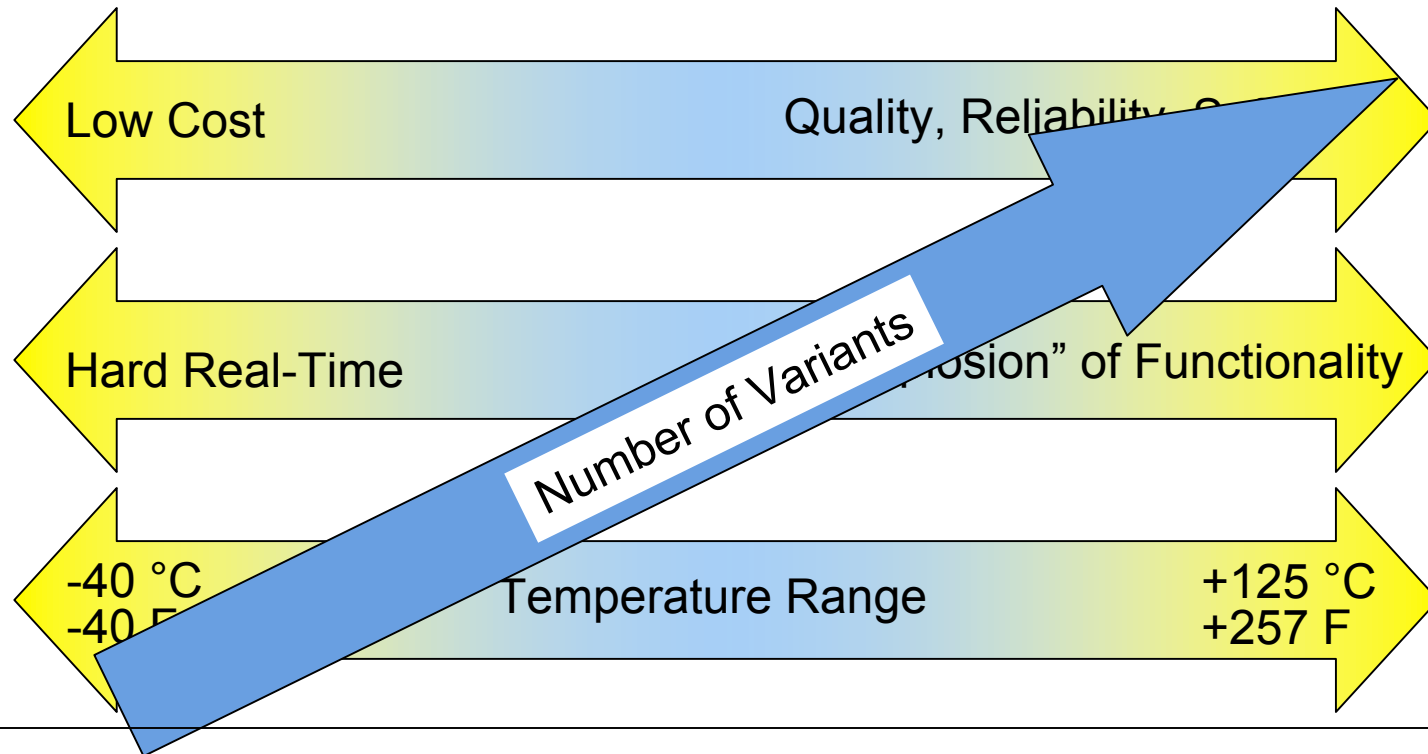


since
1980





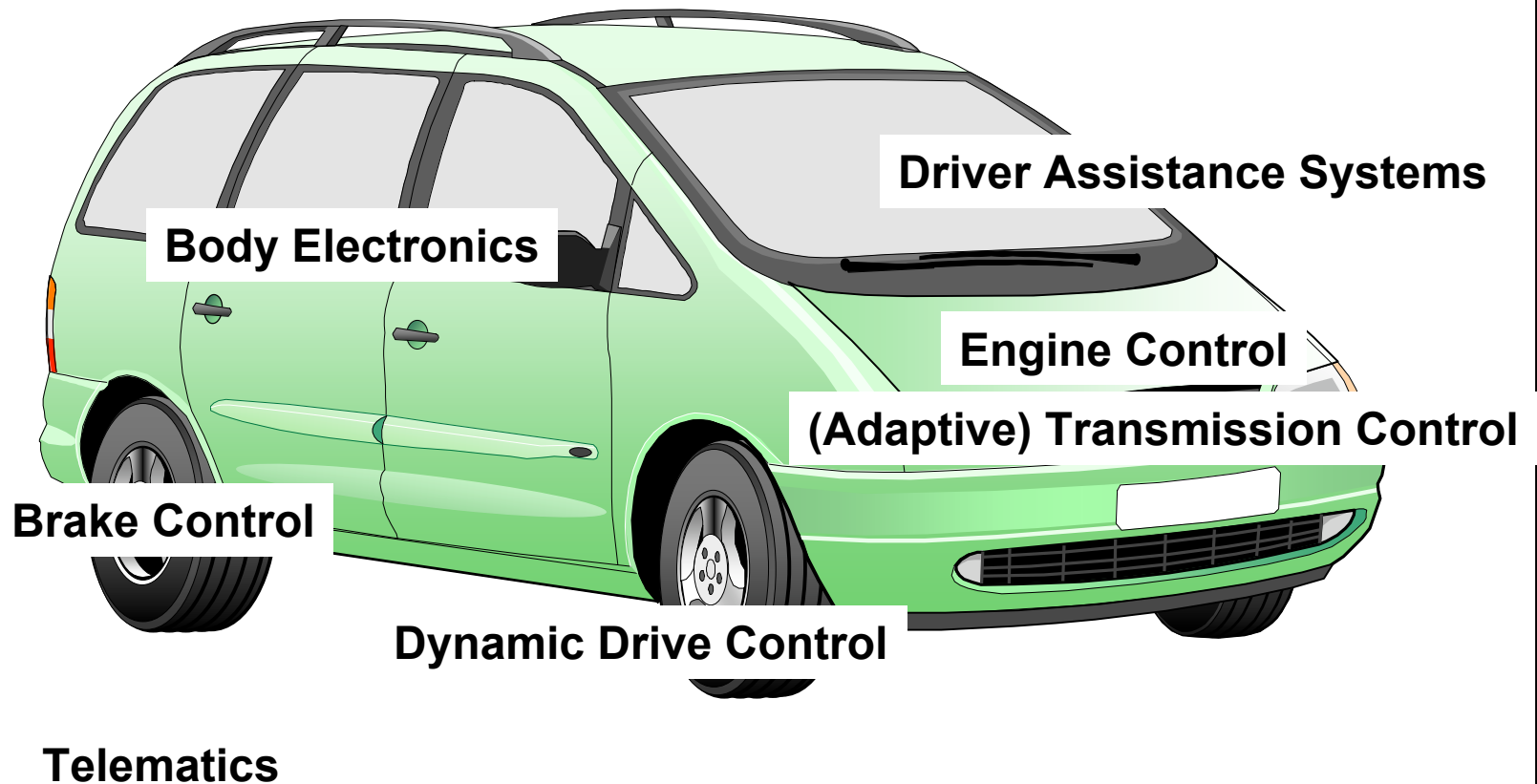
Characteristics of Automotive Electronics



80% of all innovations in automobiles are realized with software
(German car manufacturers, September 2001)

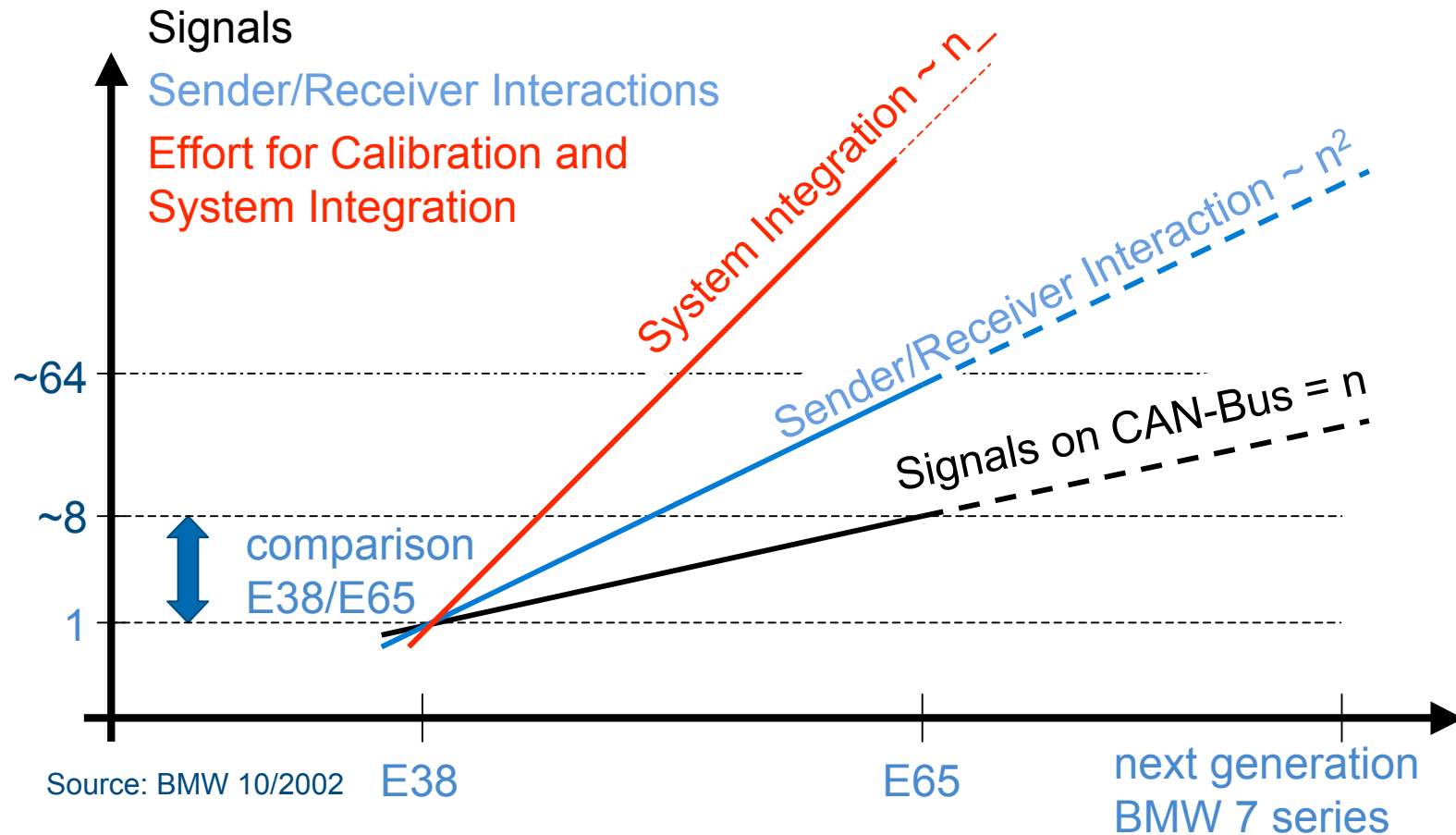


Automotive Electronic Systems





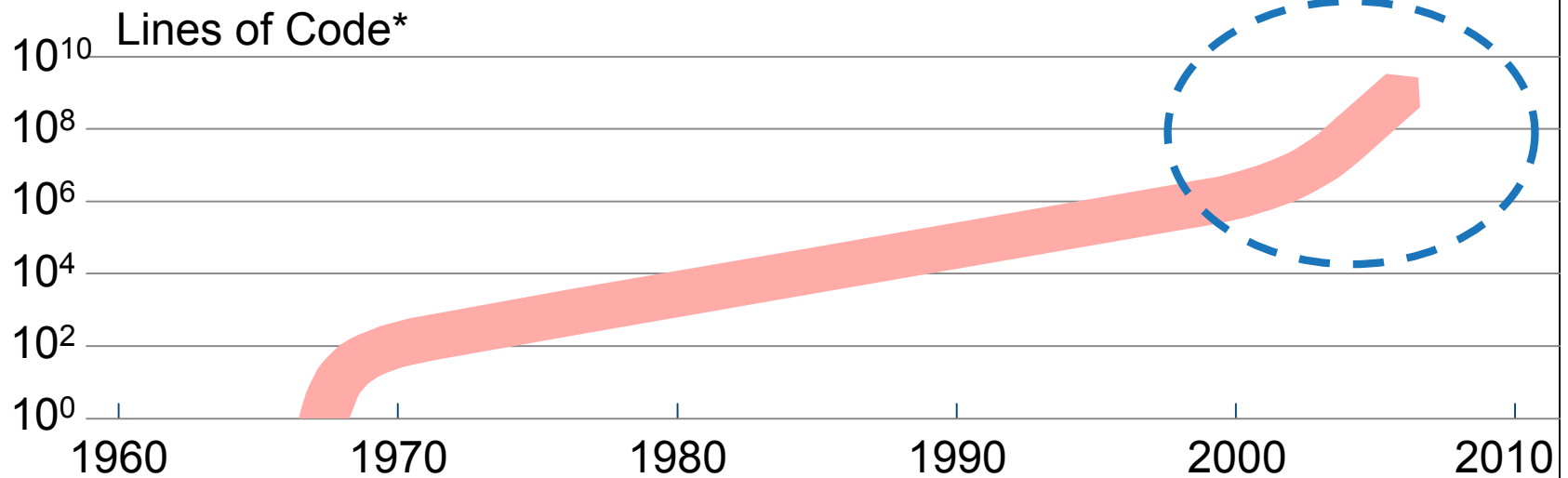
Complexity of Electronic Systems in Vehicles





“Explosion” of Functionality

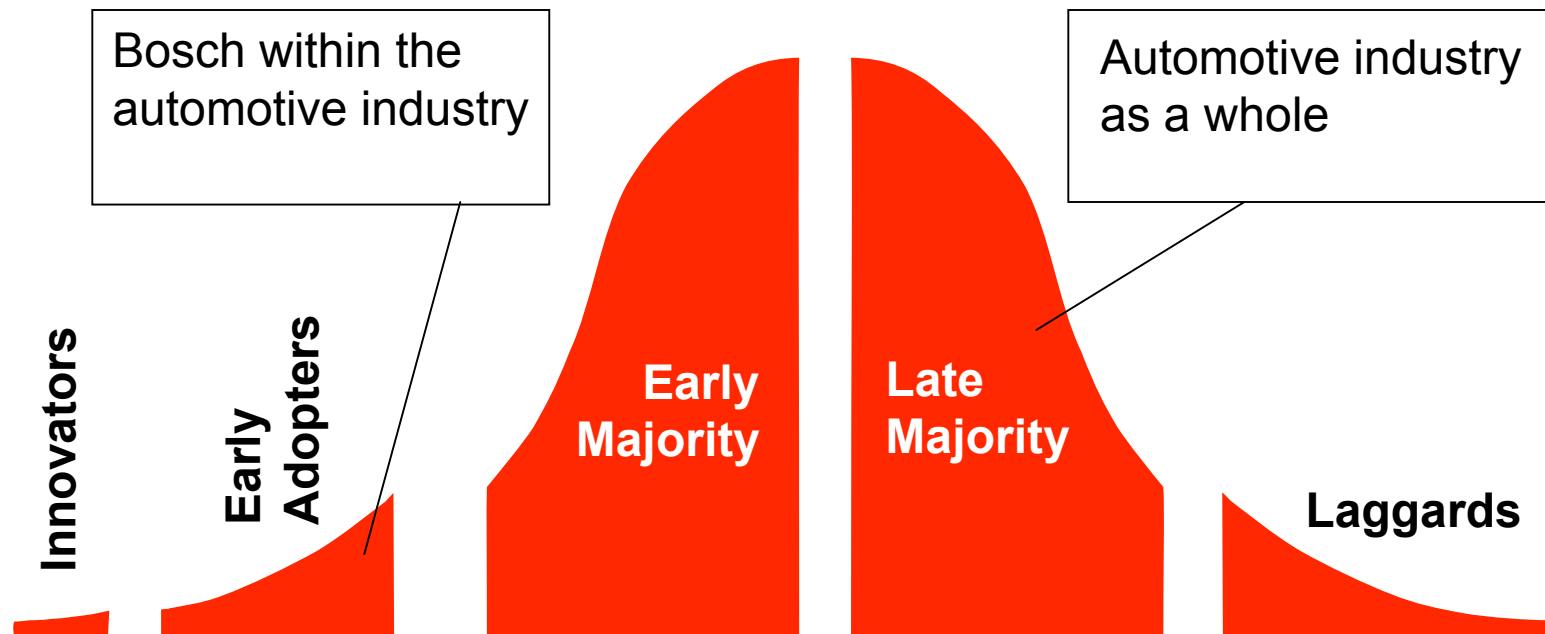
Stand-alone systems (interactions by dedicated wires)	In-Vehicle networking	Vehicle linked to environment
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*All systems in a car (Source: DaimlerChrysler 2002)



SPI Adoption





Quality Software

**Software viewed as
Business Opportunity
Improving competitiveness**

**Software viewed as
Cost Factor
Managing risks
Avoiding bugs**

Software as a
differentiator

Software as a
vital component

Software as a
necessity

Target:
Zero failure

Software Quality

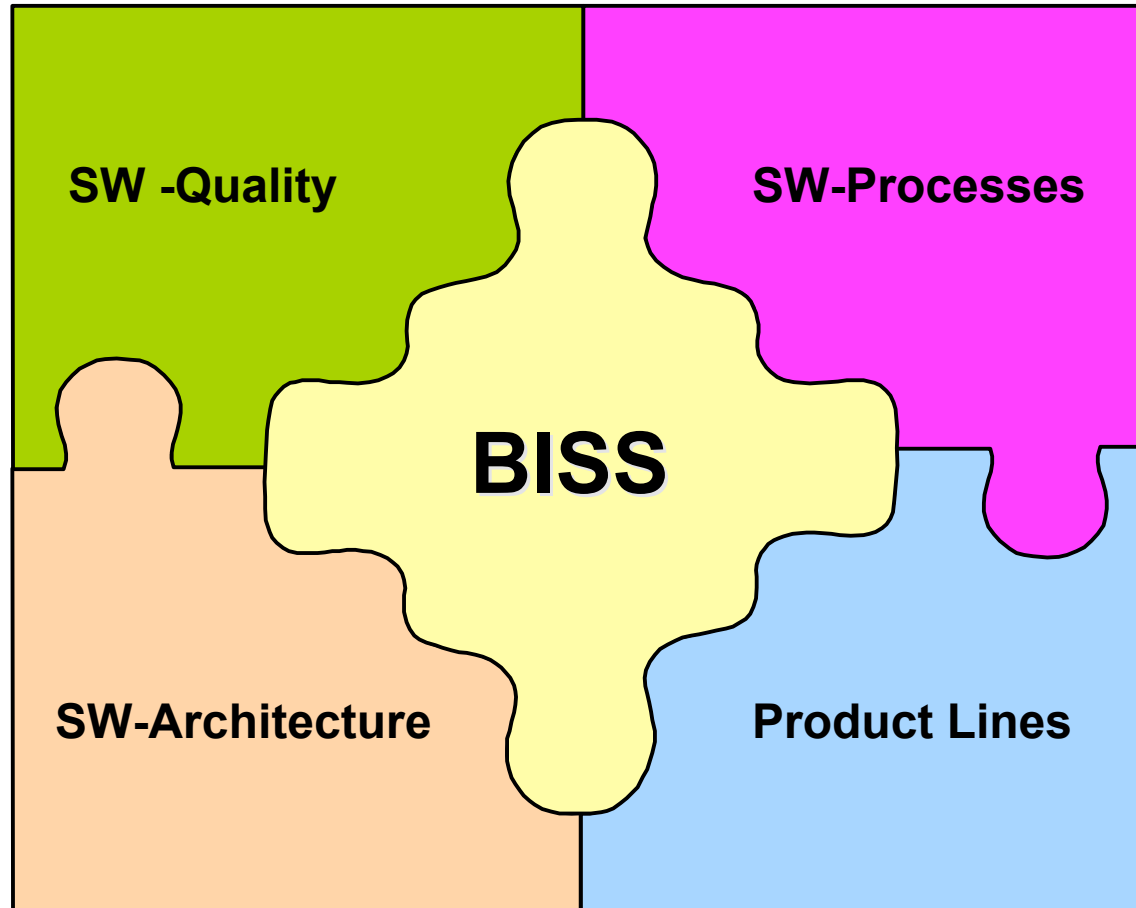


Agenda

- Software in the Automotive Industry
- **Bosch Initiative for Software-Intensive Systems (BISS)**
- Future SPI at Bosch



Ingredients

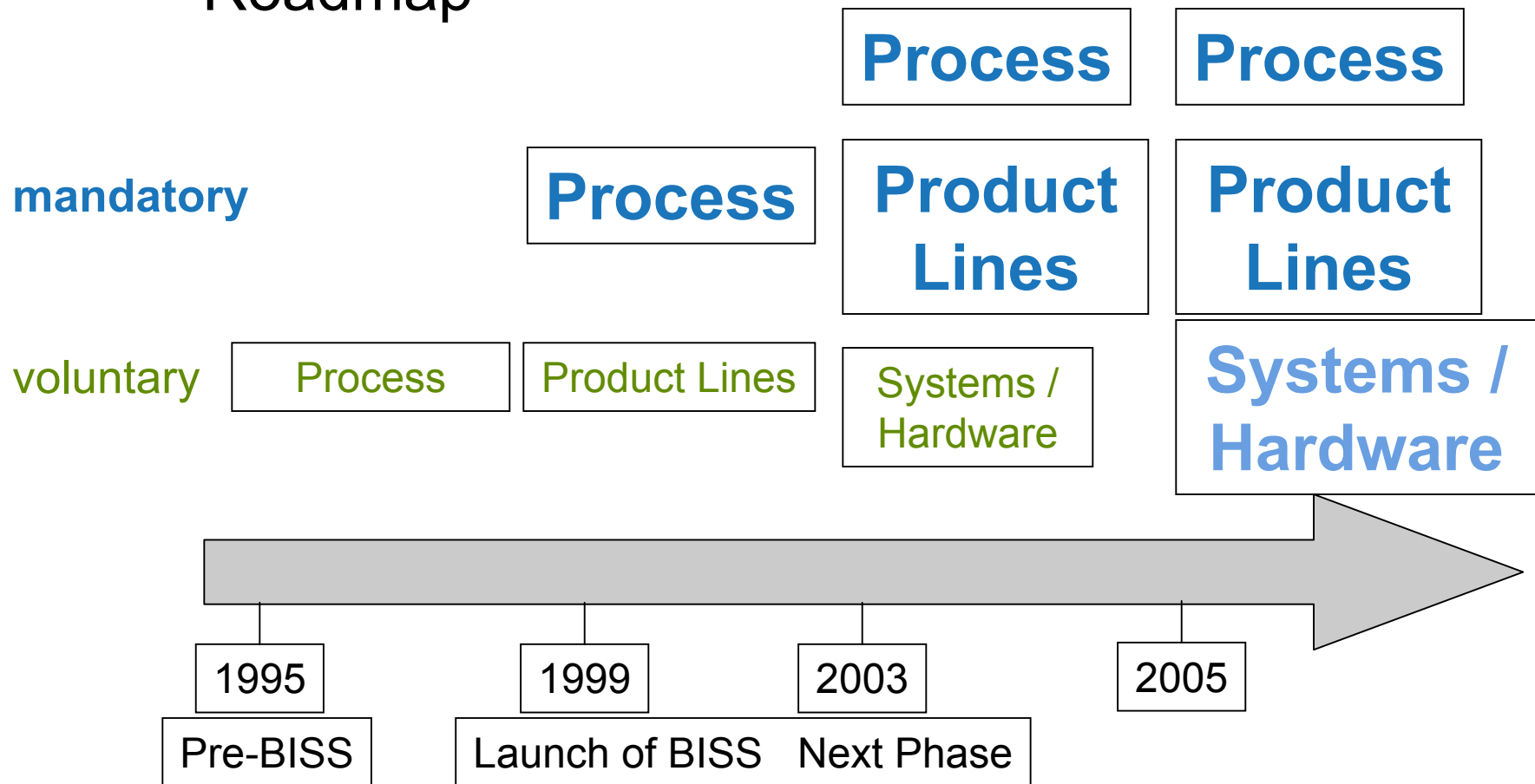




BISS

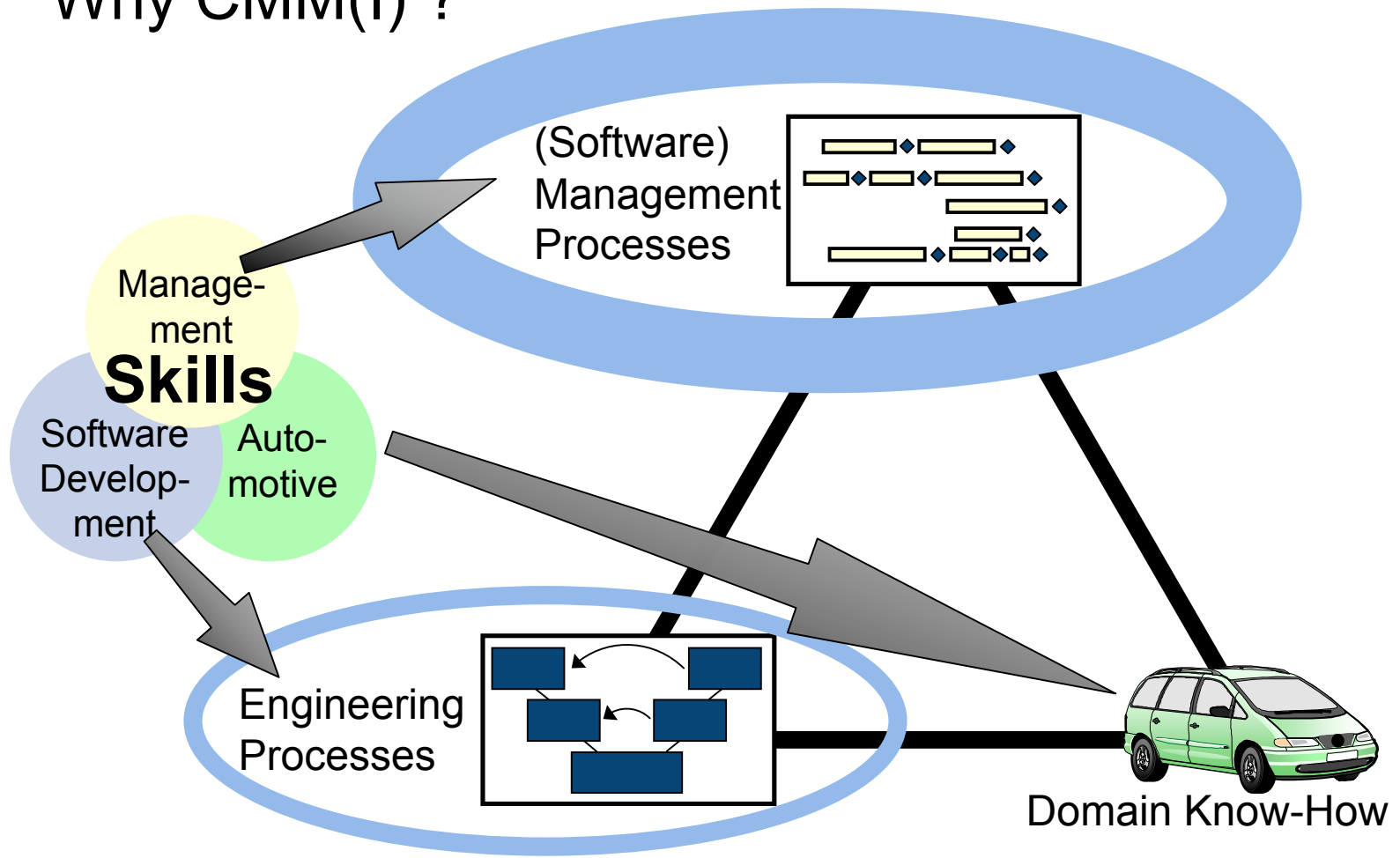
BOSCH

Roadmap





Why CMM(I) ?





Why “Product Lines” at Bosch ?

- Automotive electronic systems are Product Lines
 - Platform concepts
 - Medium to large number of variants

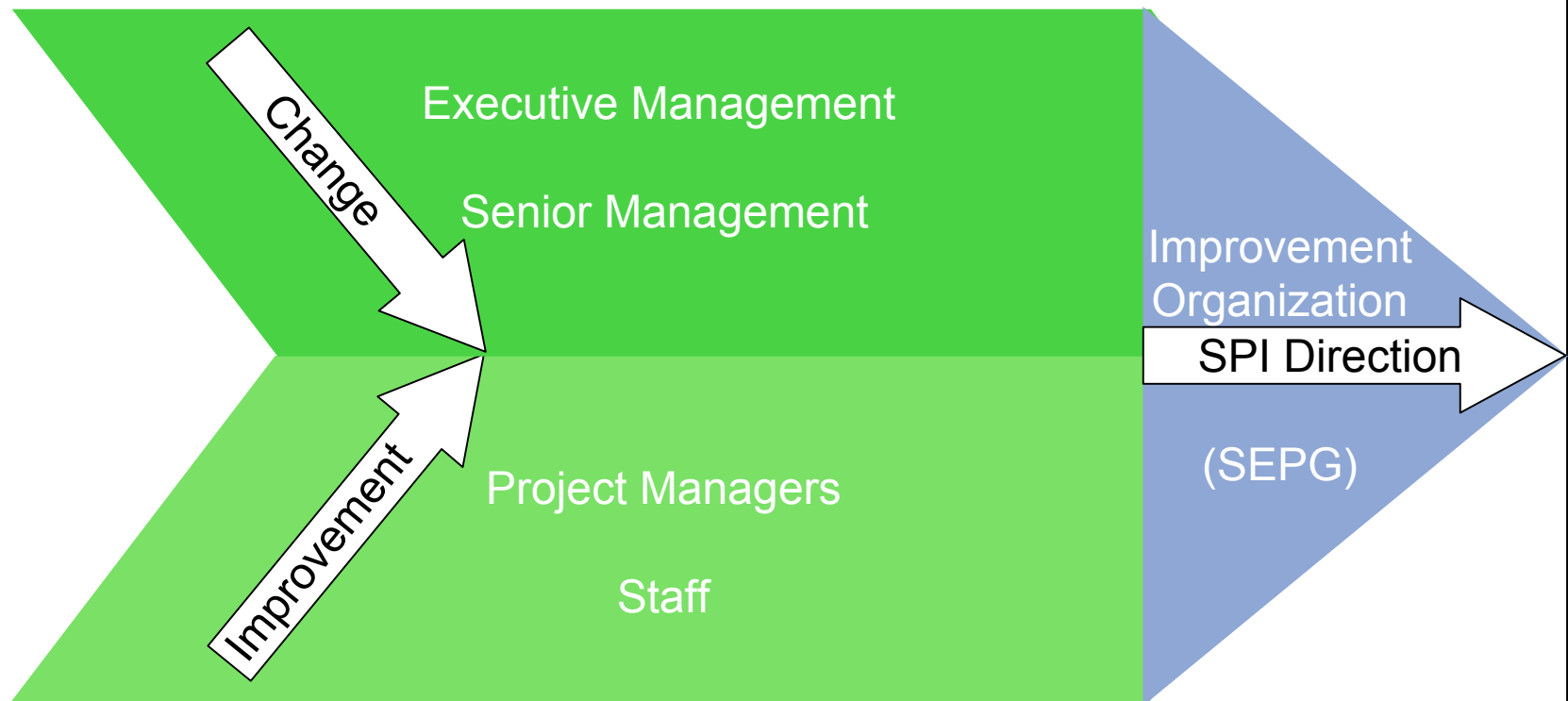
- Increasing software complexity and quality demands

- “Multi-talented” engineers of automotive electronics are rare

**Achieve explicit business goals
in the realm of software intensive systems
based on systematic, strategic reuse**



Change Management towards Organizational Maturity

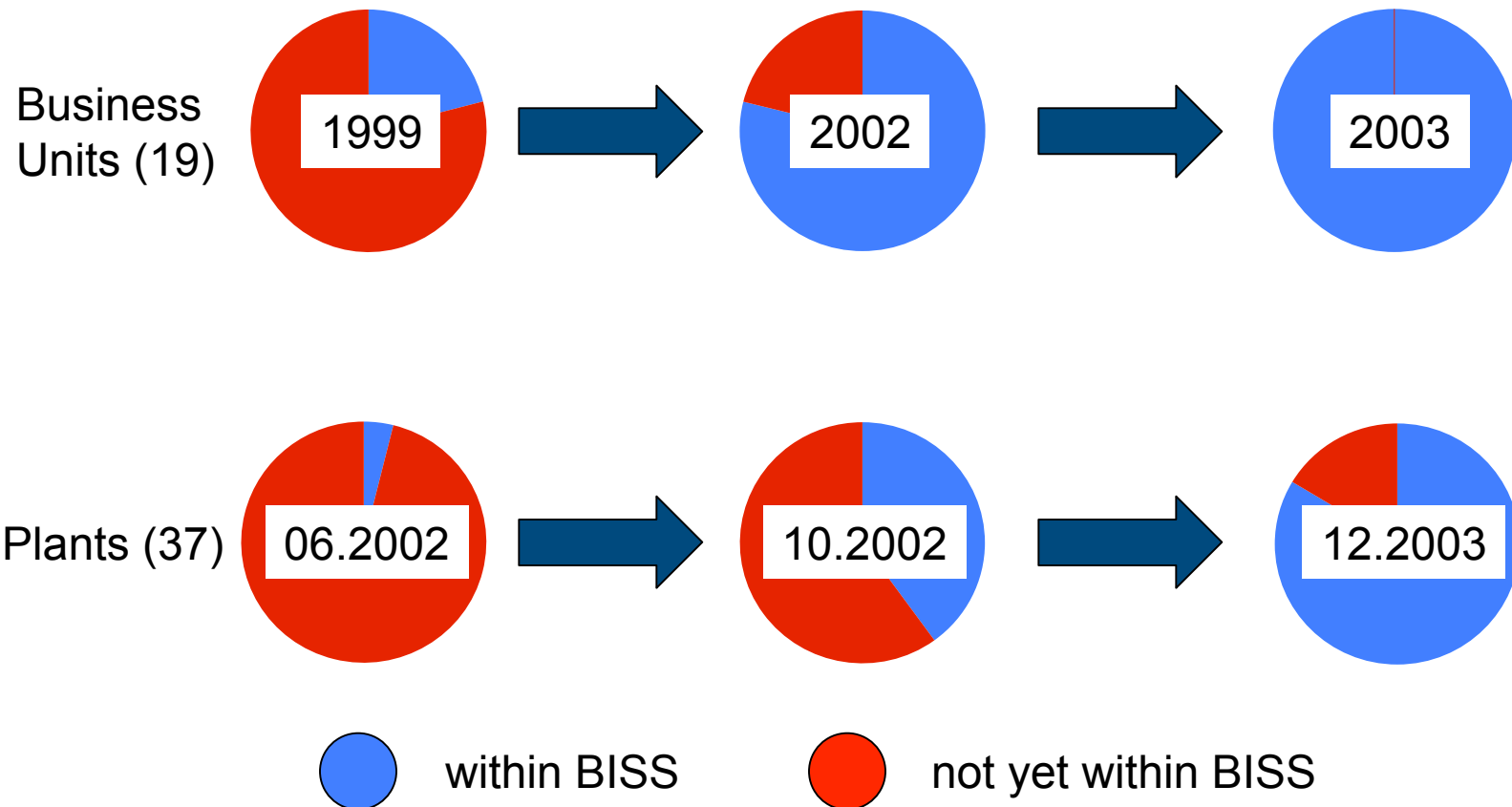




BISS

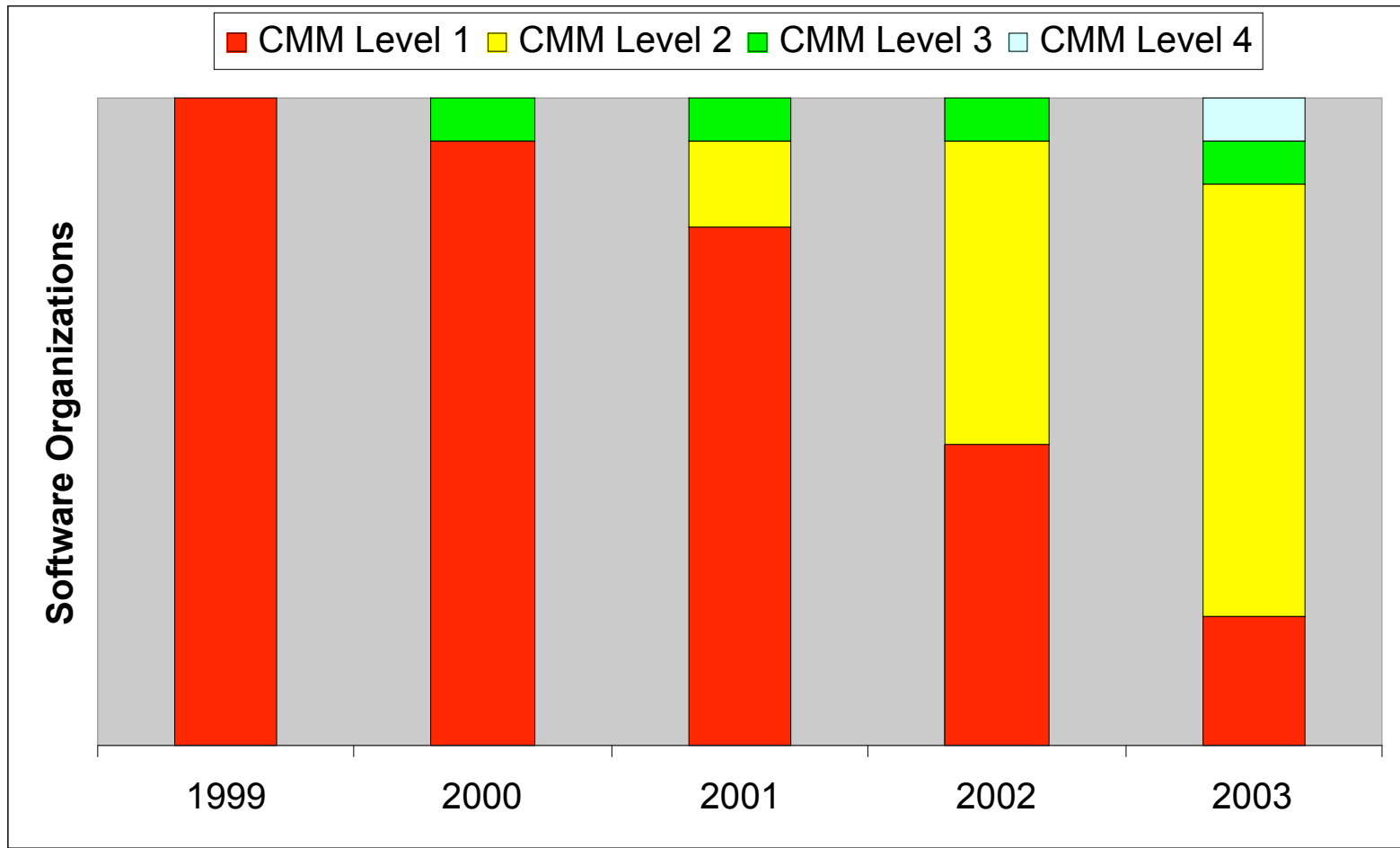
BOSCH

“Breitensport”



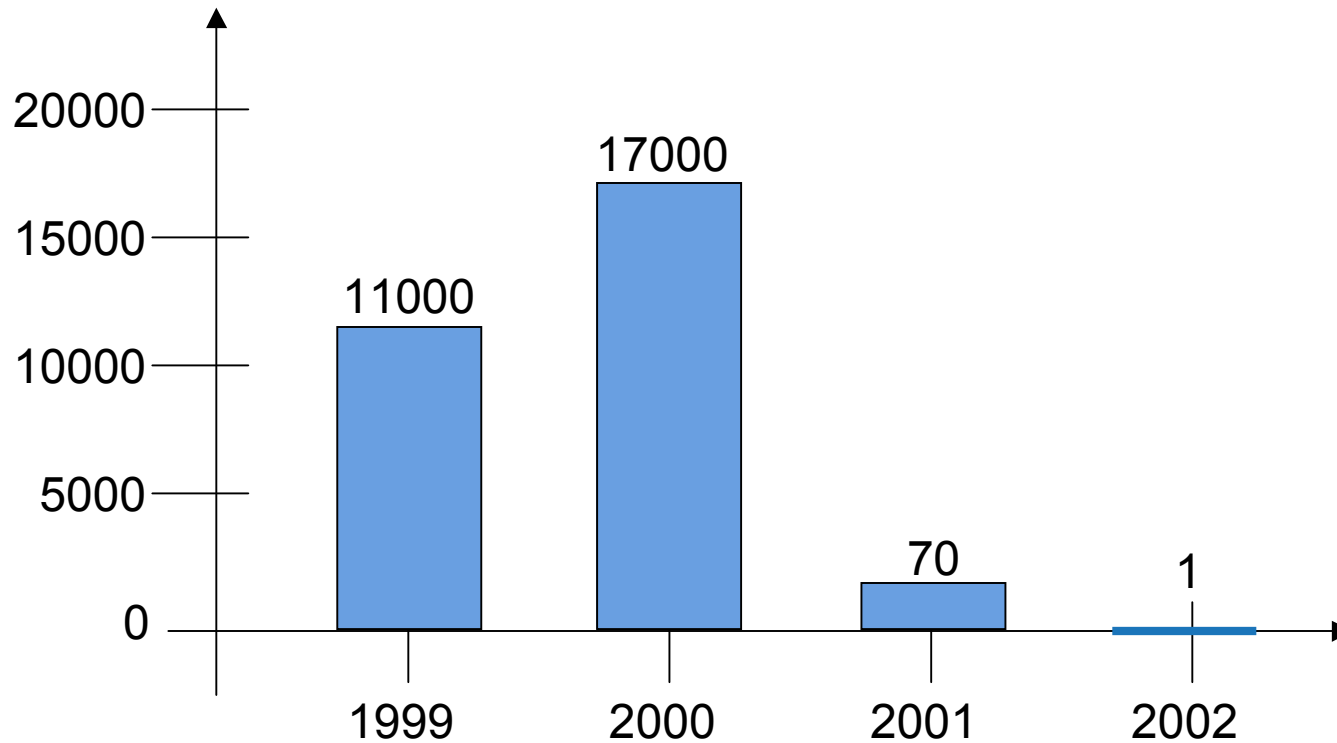


CMM Results





0-km Failures Caused by Software Defects



According to manufacturing date of electronic control units
(relative numbers: 2002 = 1)

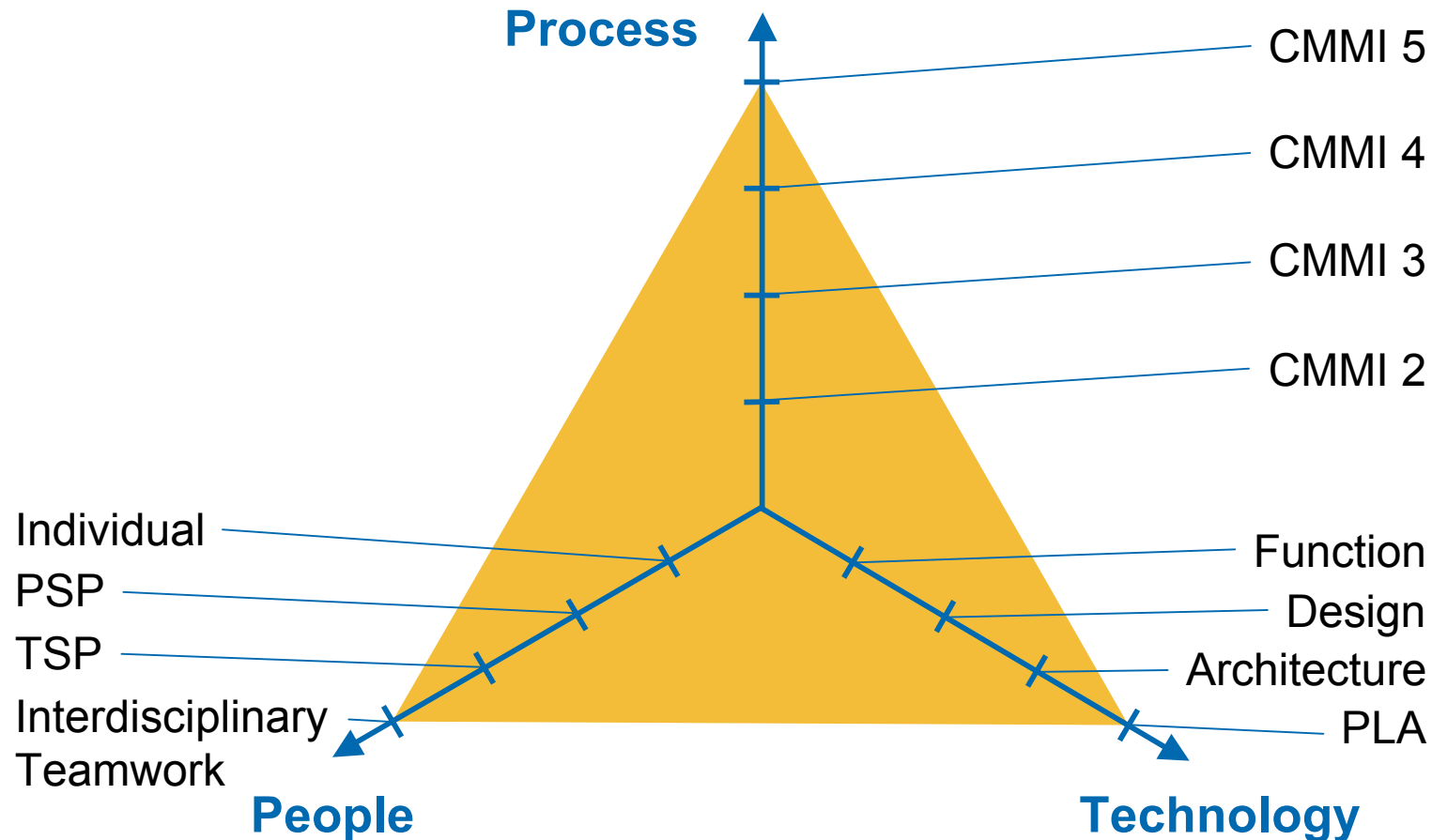


Agenda

- Software in the Automotive Industry
- Bosch Initiative for Software-Intensive Systems (BISS)
- **Future SPI at Bosch**

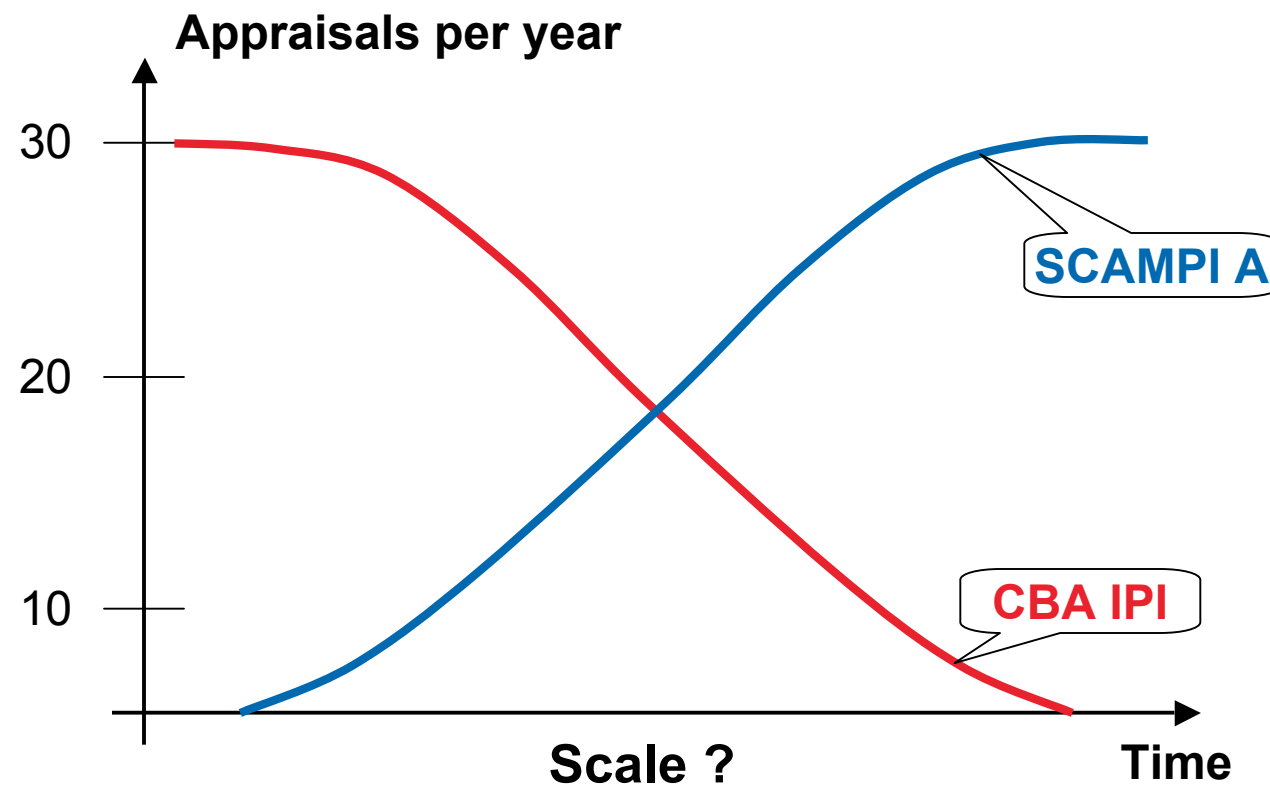


SW-intensive Systems: Triangle of Excellence





Transition from CMM to CMMI at Bosch





Motivators to Upgrade

CMMI is

- + Compliant to our current and future needs for model-based improvement
- + Highly interrelated with the “Product Lines Framework”
- + Applicable to both systems development and hardware development
- + The better model w.r.t. business orientation, terminology and structural consistency

but CMMI requires SCAMPI



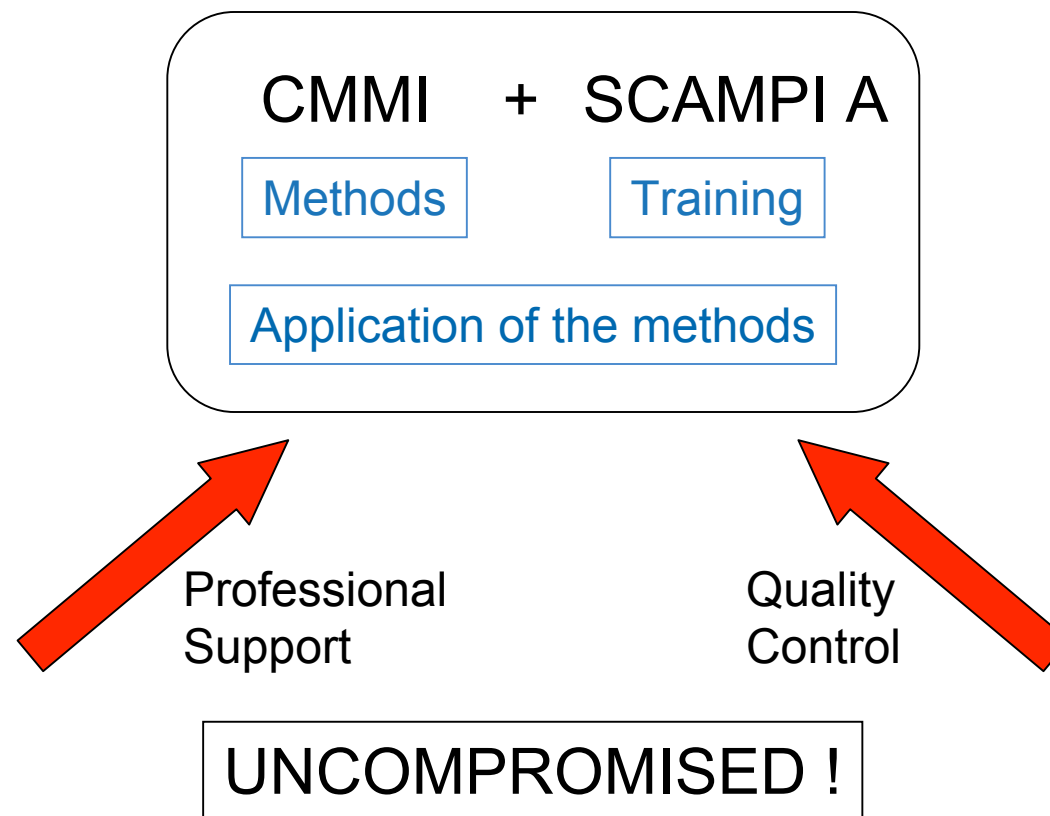
Delayers to Upgrade

As for SCAMPI A it seems, that

- There is little experience, instead open questions
- It will take time to have enough Bosch-internal lead appraisers
- SEI's observation policy may conflict with language constraints



Our Expectation to the SEI





Summary

- The automotive industry has recognized to be “software-dependent”
because
- Software in Automobiles strongly influences innovation, safety, and environmental protection
therefore
- Automotive software will be required to be Quality Software



**AND WE ALL
DEPEND ON THIS
MORE AND MORE !**



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