

Brembo Brakes: from Mechanics to Mechatronics

*AUTOSPIN Workshop
Milano 20 March 2007*

Agenda :

1. Brembo Corporate
2. Mechatronic R&D
3. IEC 61508
4. Automotive-SPICE

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1. Brembo Corporate

BREMBO



- A world leader in the **design and manufacturing of high performance braking systems and components.**

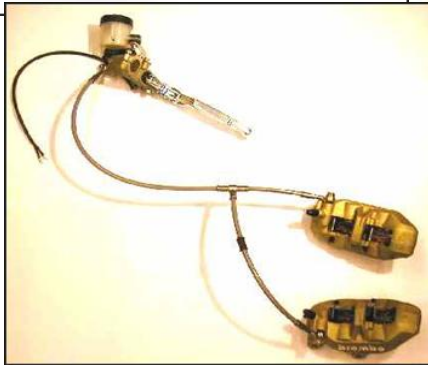
- A fully **integrated industrial process** from foundries to assembly.



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PRODUCTS

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2. Mechatronic R&D

- Mechatronic Projects
- Team

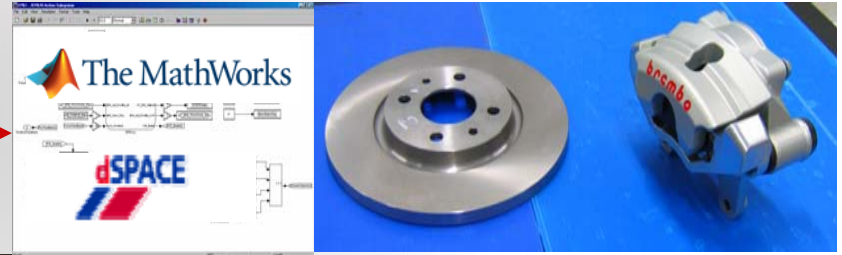
Mechatronic projects: R&D project overview

- Brake by Wire: replacement of the hydraulic brake system by a full electromechanical solution
- Electrical Parking Brake for light trucks: cable-puller
- Electrical Parking Brake for high performance cars: motor on fixed caliper
- Motorcycle racing: motorized brake lever adjustment



Mechatronic projects : component and system integration

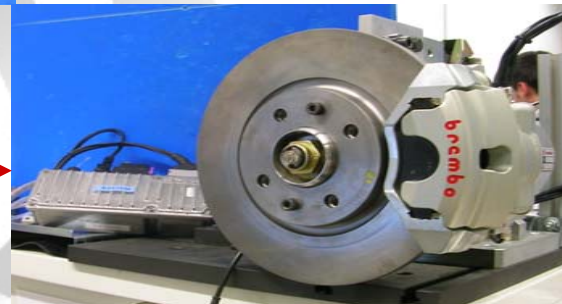
Designed and produced by
Brembo



Produced under Brembo's
specification



Integrated by Brembo



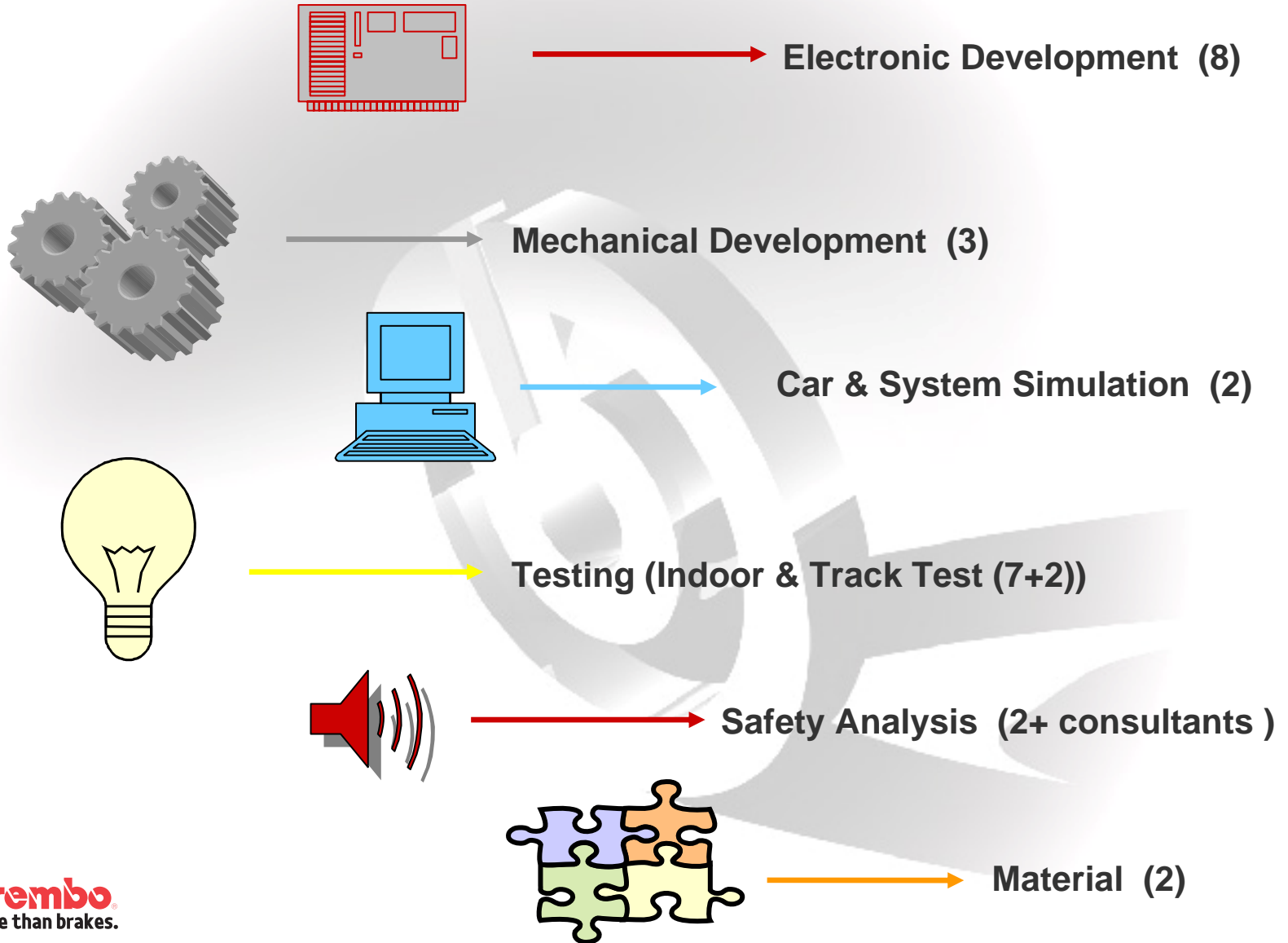
Integrated on vehicle with
the customer



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Mechatronic projects: skills inside the team

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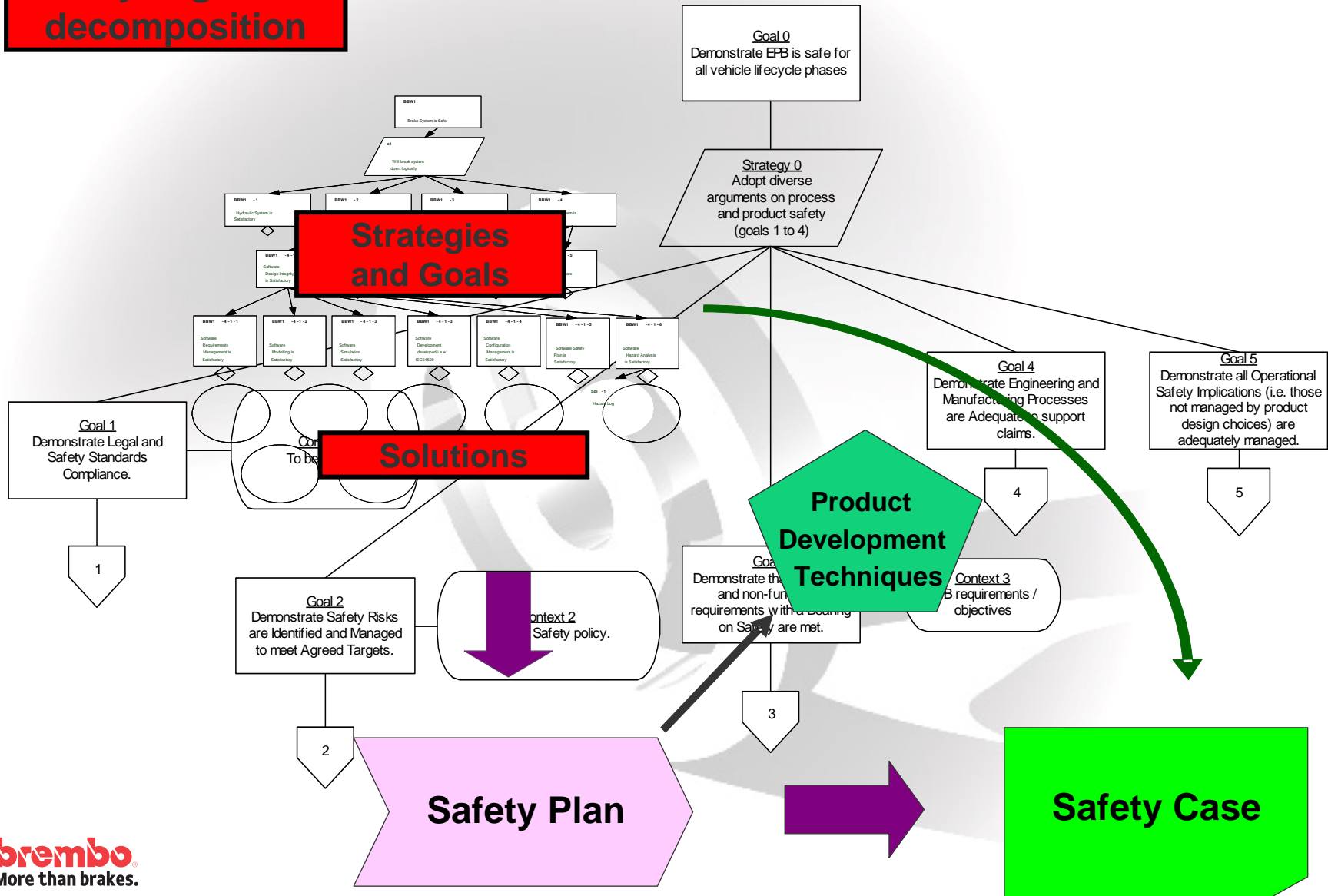
3. Development Processes

- IEC 61508
- Automotive-SPICE

IEC61508: Safety Concept and Process Definition

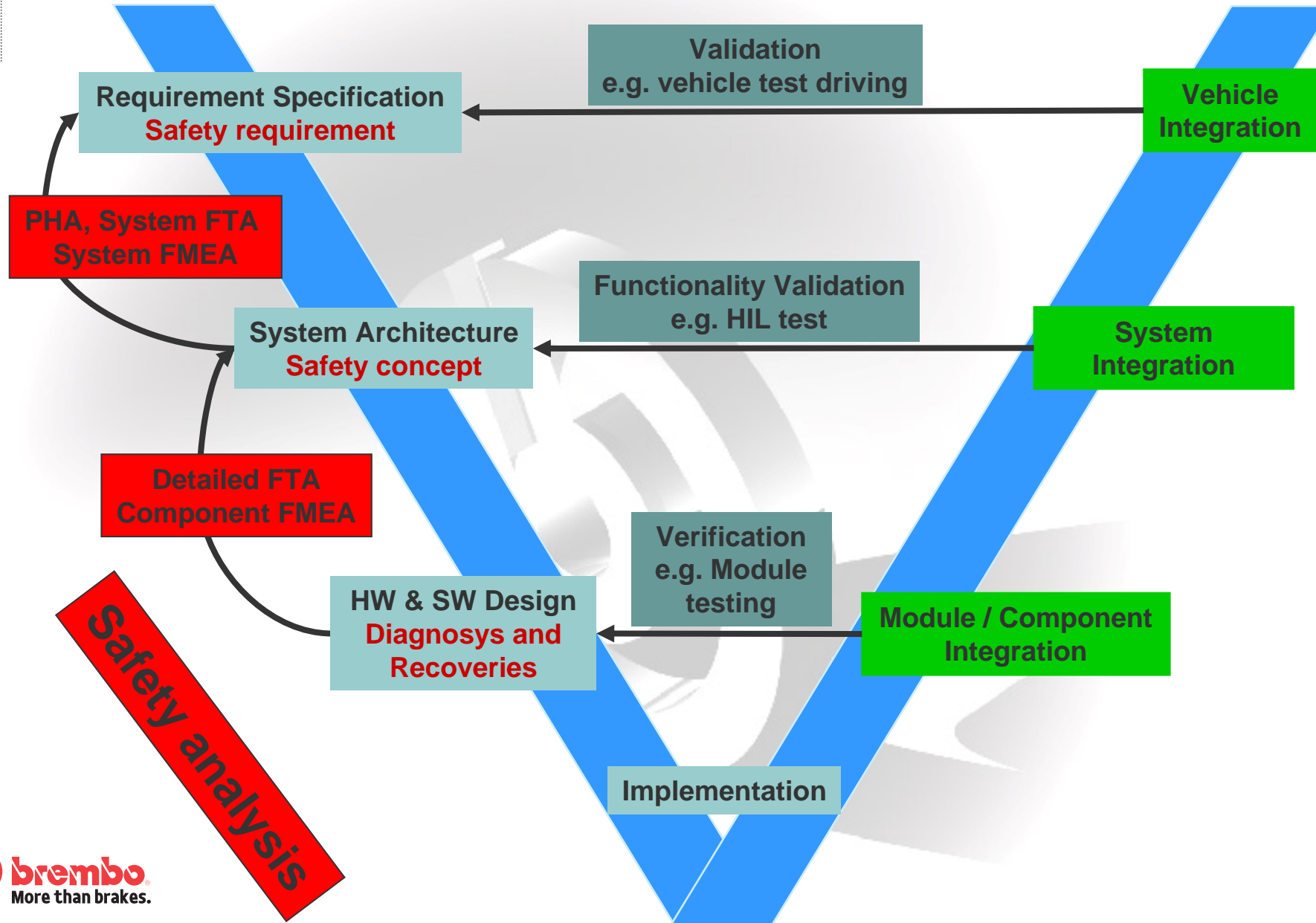
Safety Argument decomposition

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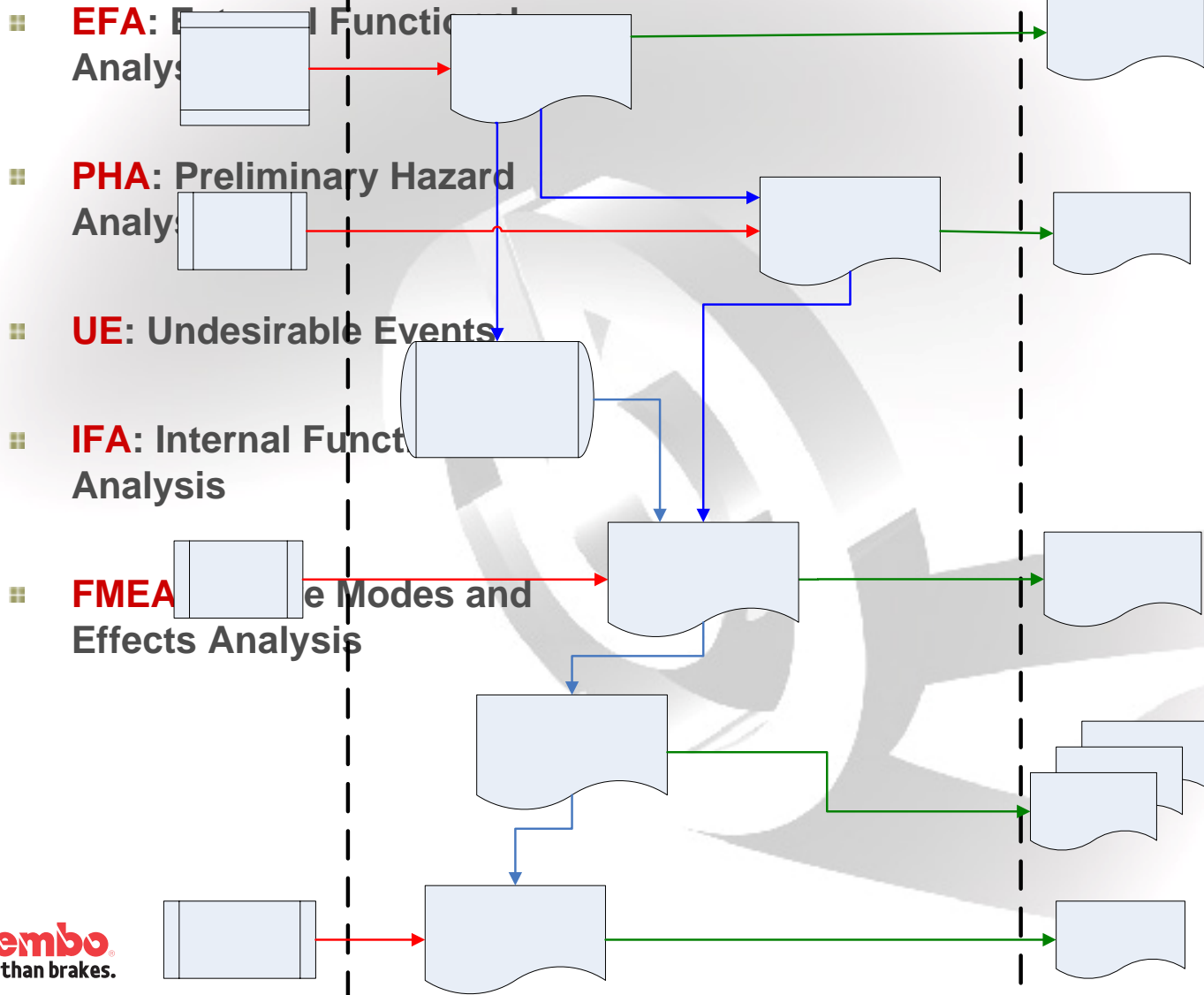
IEC61508: Safety Analysis in the V-Model

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IEC61508: Brembo Safety Analysis, activities flowchart

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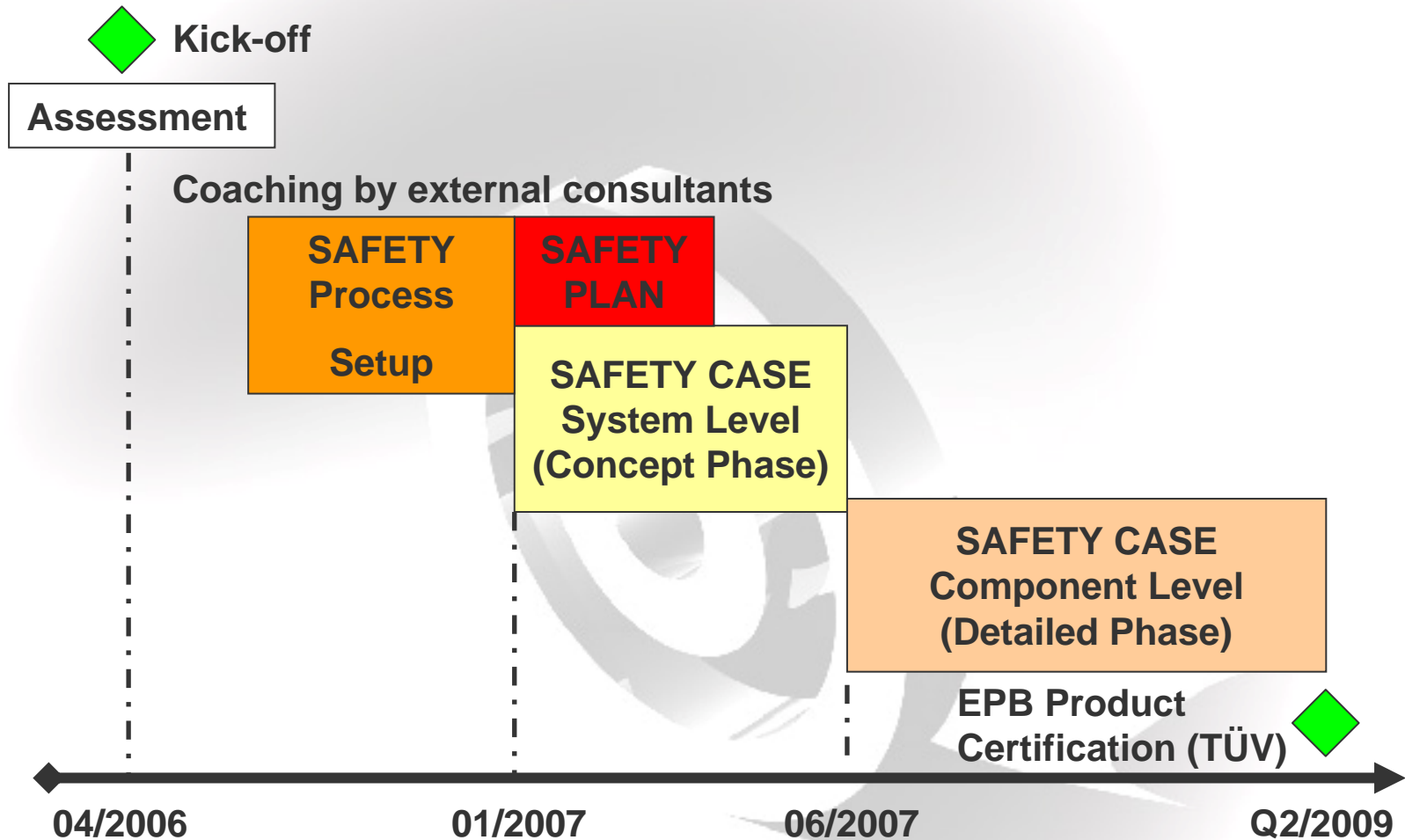


Input

Life cycle
System
definition

Automotive-SPICE in Brembo: Brembo Roadmap on Pilot Project EPB1

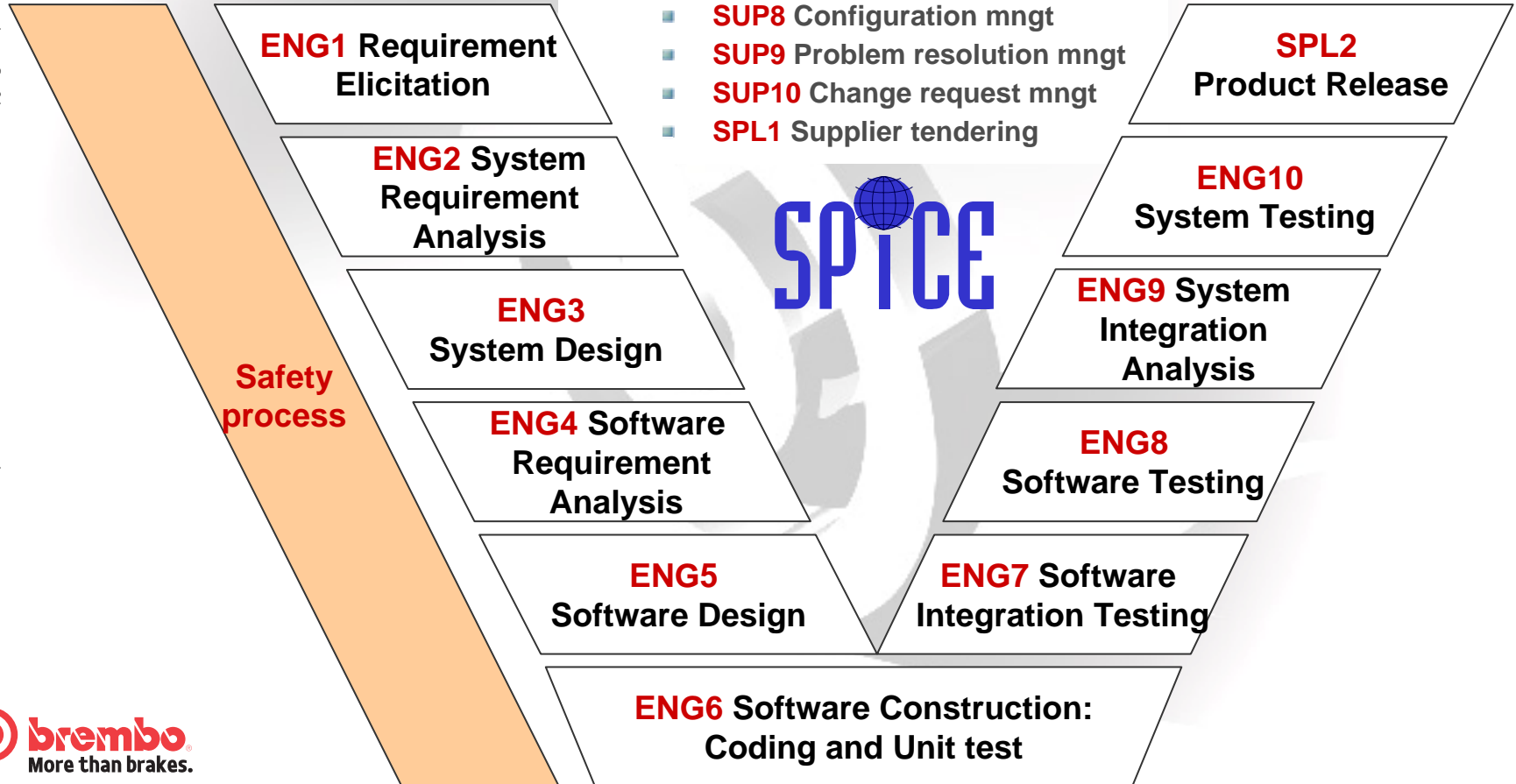
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Automotive-SPICE in Brembo: Activities

+ Supporting activities:

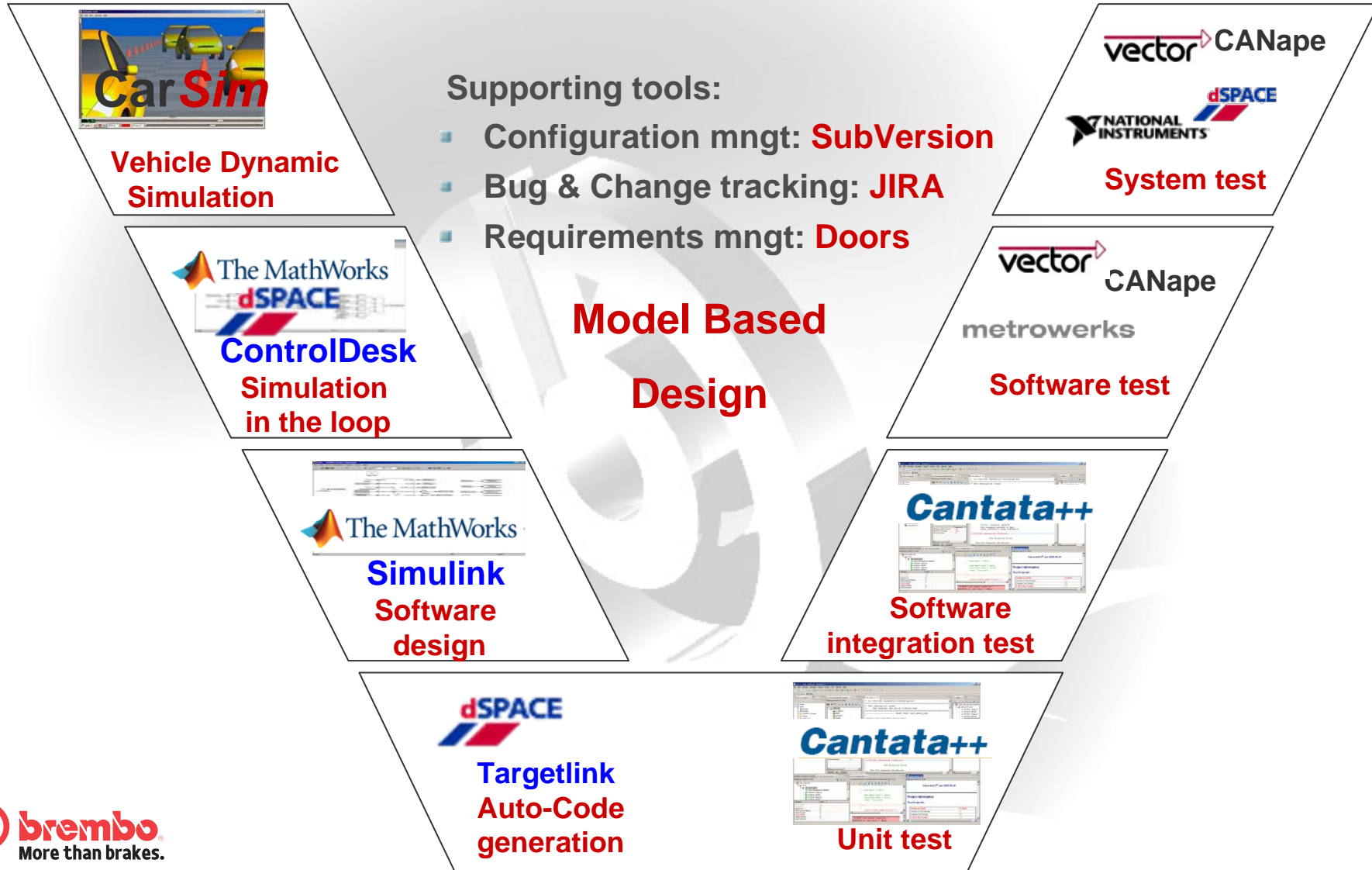
- **MAN3** Project mngt
- **MAN5** Risk mngt
- **ACQ4** Supplier monitoring
- **ACQ11** Technical requirements
- **ACQ13** Project requirements
- **SUP1** Quality assurance
- **SUP8** Configuration mngt
- **SUP9** Problem resolution mngt
- **SUP10** Change request mngt
- **SPL1** Supplier tendering



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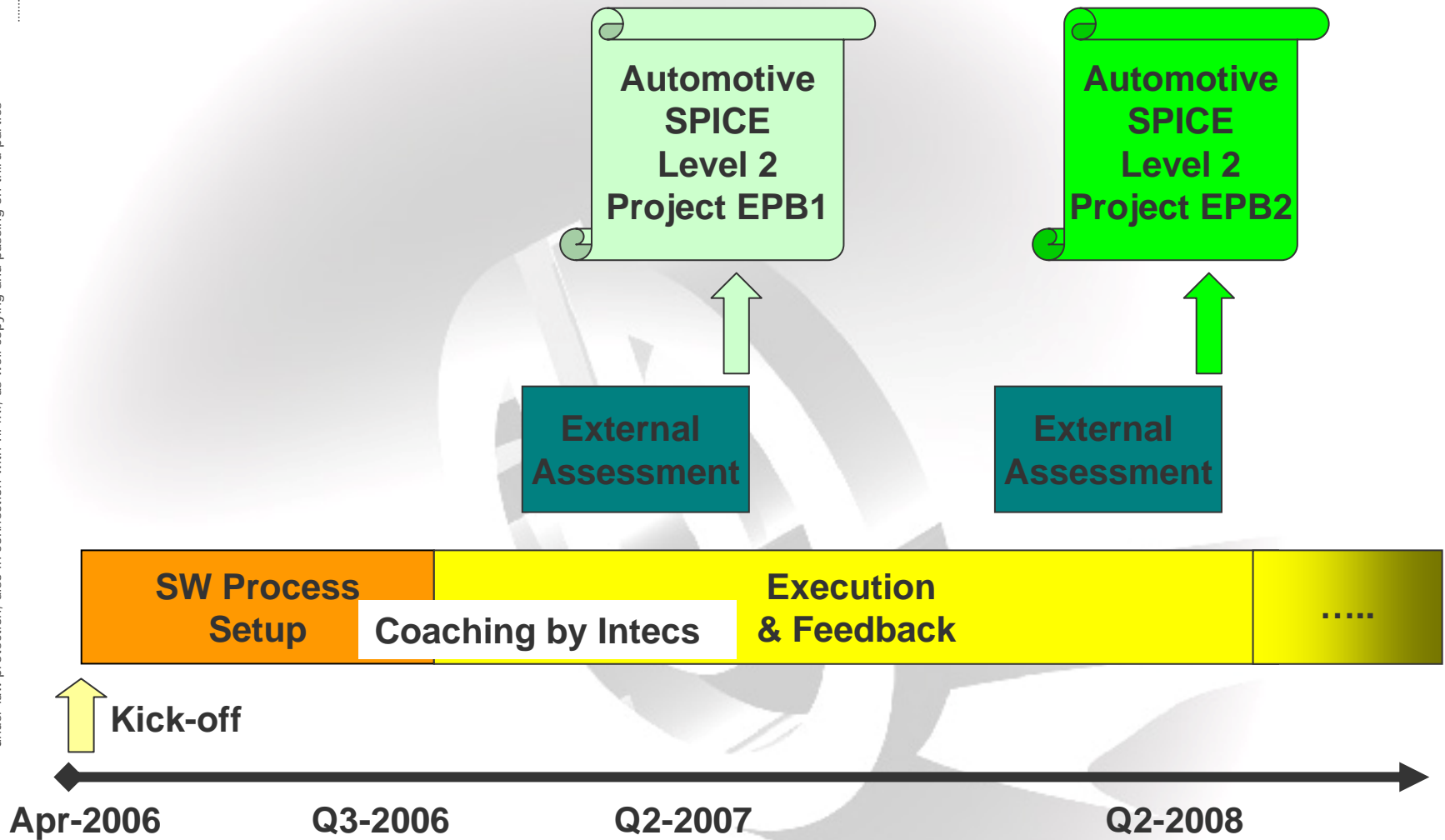
Process Activities: Software Development Toolchain

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Automotive-SPICE in Brembo: Roadmap

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Automotive-SPICE and IEC 61508: Remarkable points

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Automotive-SPICE

“Plug & Play” process guidelines

Well accepted process for Automotive OEMs

IEC 61508

Reference for safety process

Structured guide for safety-case construction and execution

Automotive-SPICE and IEC 61508: some open issues...

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Automotive-SPICE

Model based design and autocode generation not explicitly taken into consideration

IEC 61508

Difficult to implement without strong coaching

Overall

Waiting for automotive WD26262 adaptation

Automotive-SPICE and IEC 61508 mutual interfacing and optimization

High impact on resources and time-schedule

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Thank You!