



# Managing Large Scale Specification Projects

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# REFSQ

19th Intl. Working Conference  
on Requirements Engineering:  
Foundation for Software Quality, 2013



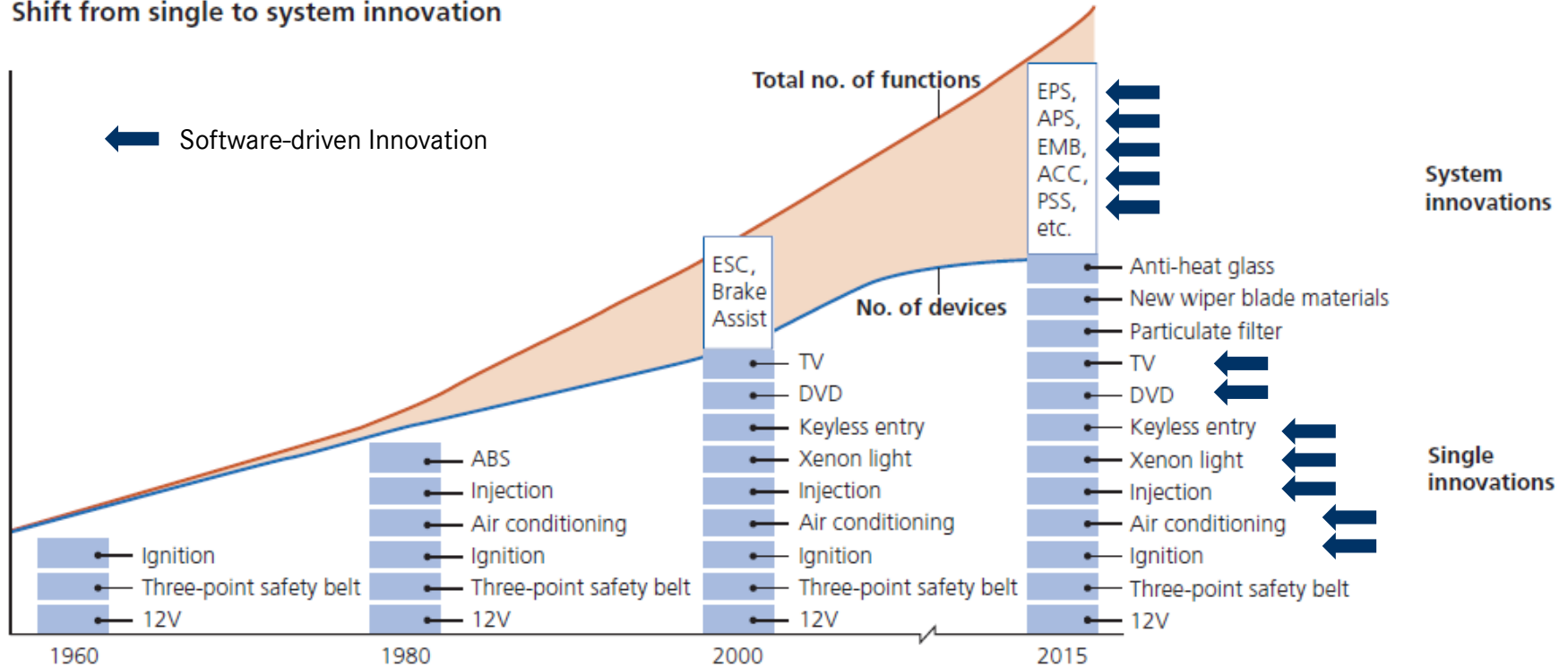
Mercedes-Benz

# Outline

- Motivation: Role of Requirements in Automotive Business
- Vehicle Development and Specification Process at Mercedes-Benz
- Managing Large-Scale RE-Processes

# Increasing Relevance of Software in the Automotive Industry

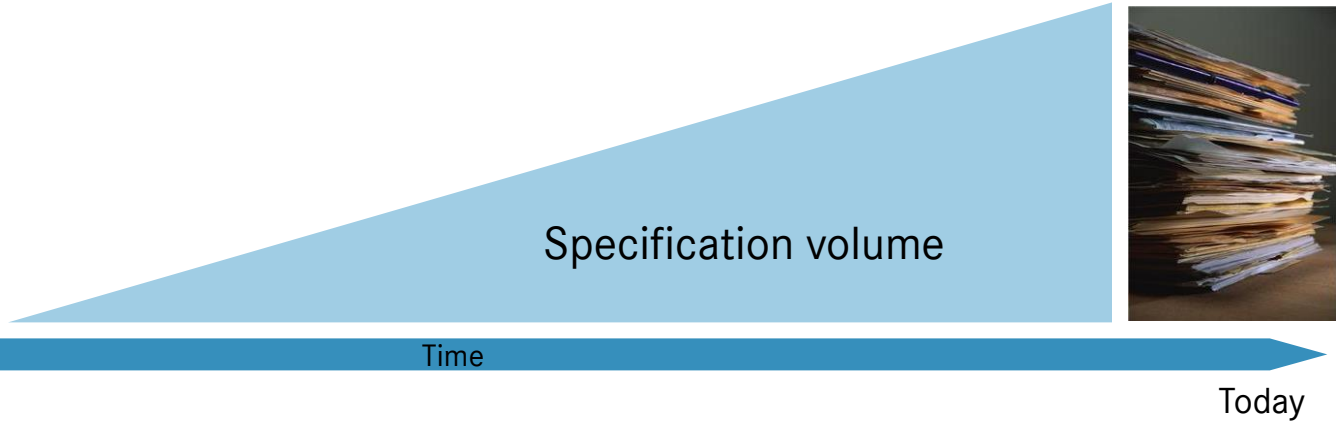
## Shift from single to system innovation



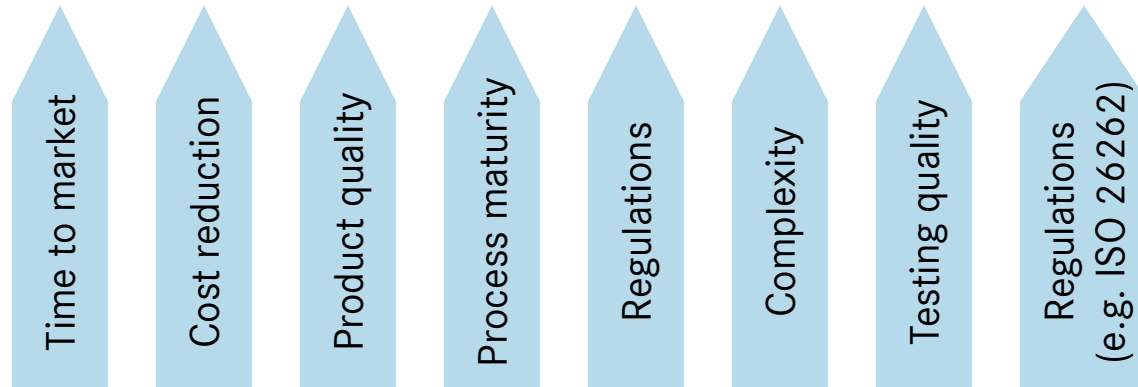
Please note: ABS = anti-lock braking system, ESC = electronic stability control, EPS = electronic power steering, APS = adaptive power steering, EMB = electro-mechanical braking, ACC = adaptive cruise control, PSS = predictive safety systems

Source: 2015 Car innovation: A comprehensive study on innovation in the automotive industry, Oliver Wyman, 2007

# Core Competence Requirements Engineering

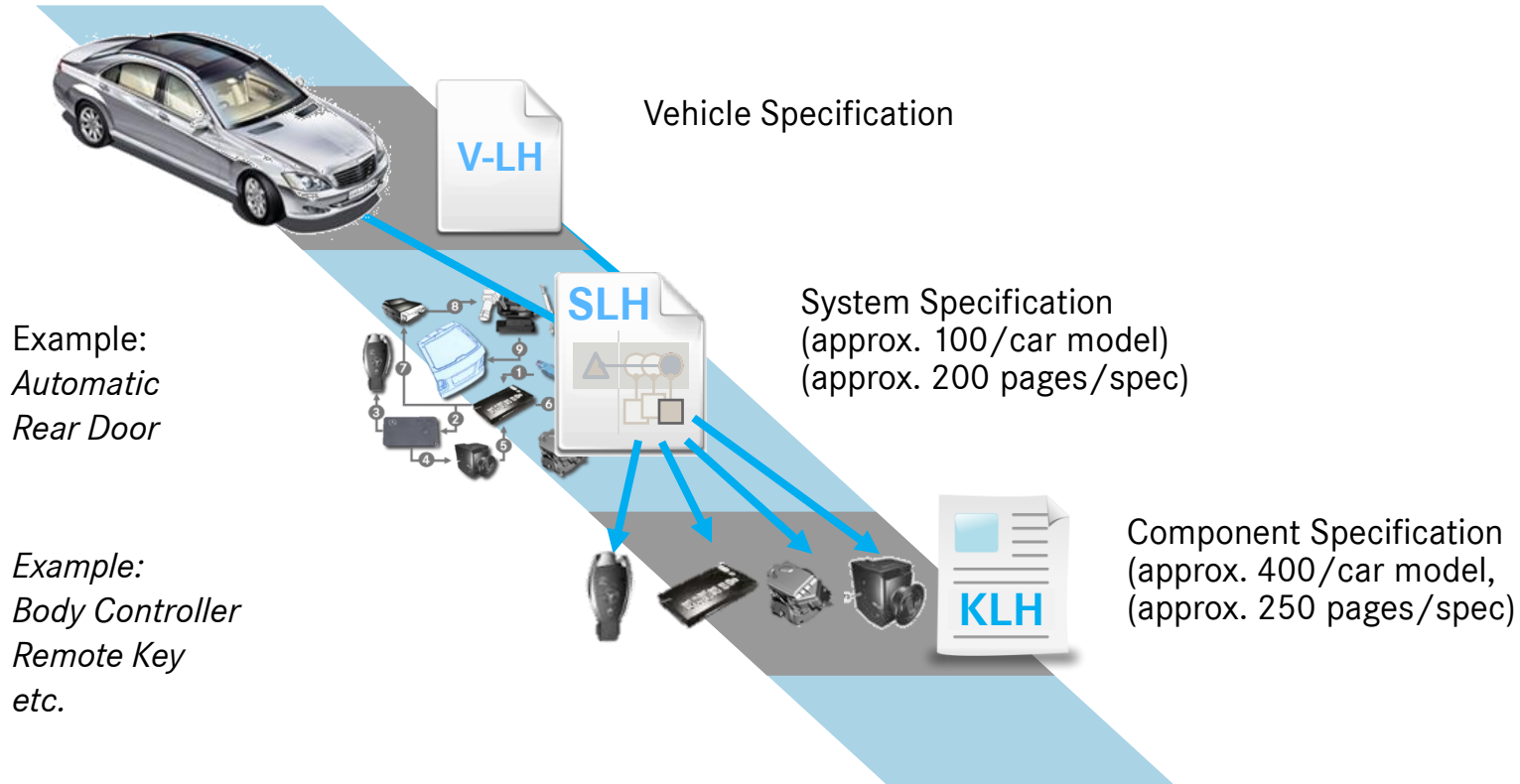


Main Drivers:



Nowadays, requirements engineering is considered to be a core competence of an automotive OEM

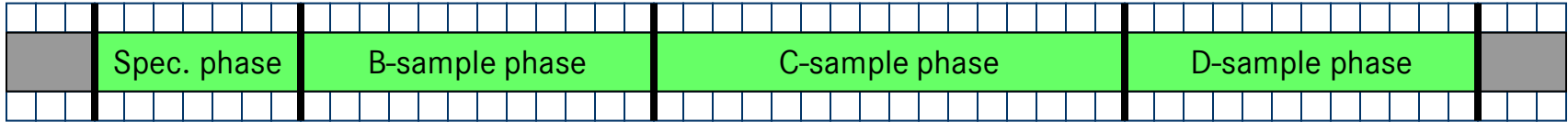
# Large-Scale Specifications



For a new car model, specification document with more than 100.000 pages have to be created

# Vehicle Development and Specification Process

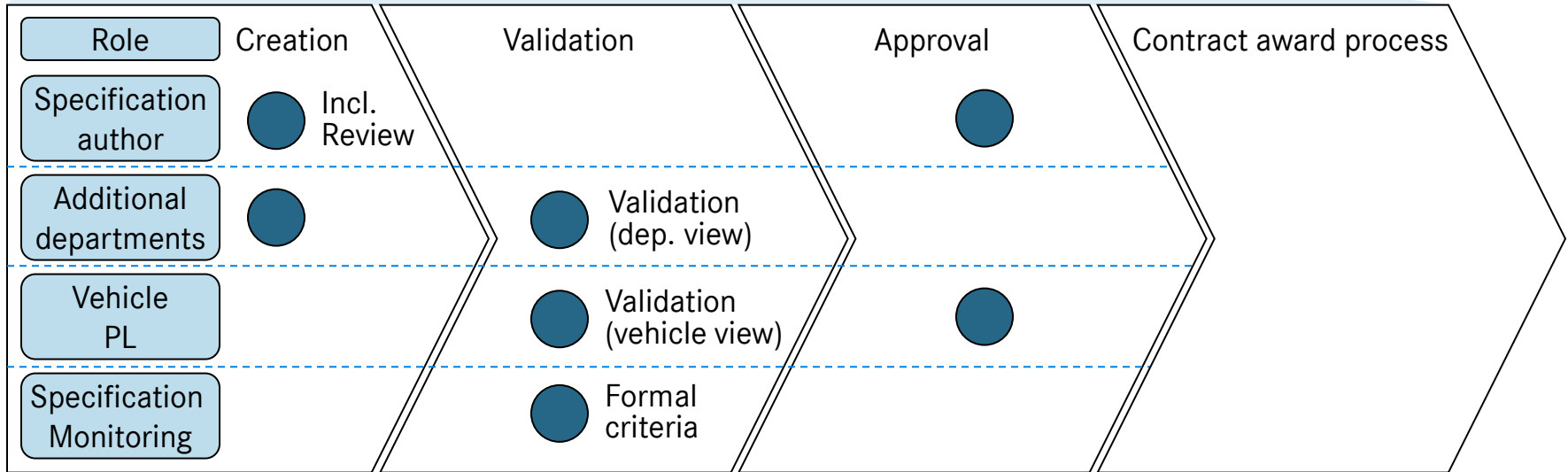
Simplified excerpt of the Daimler Passenger Cars development process



QG concept specification

QG component specification

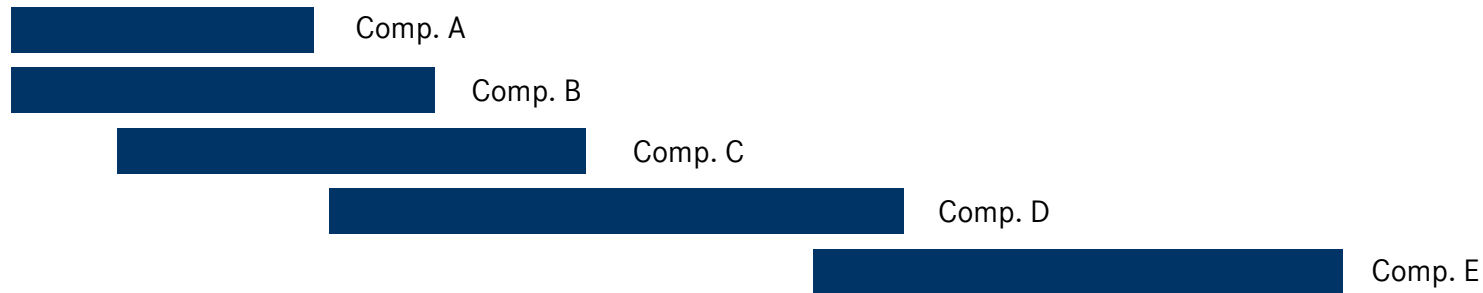
QG validation vehicle



After creation of a specification, an extensive validation and approval process starts.

# Specification Process Characteristics

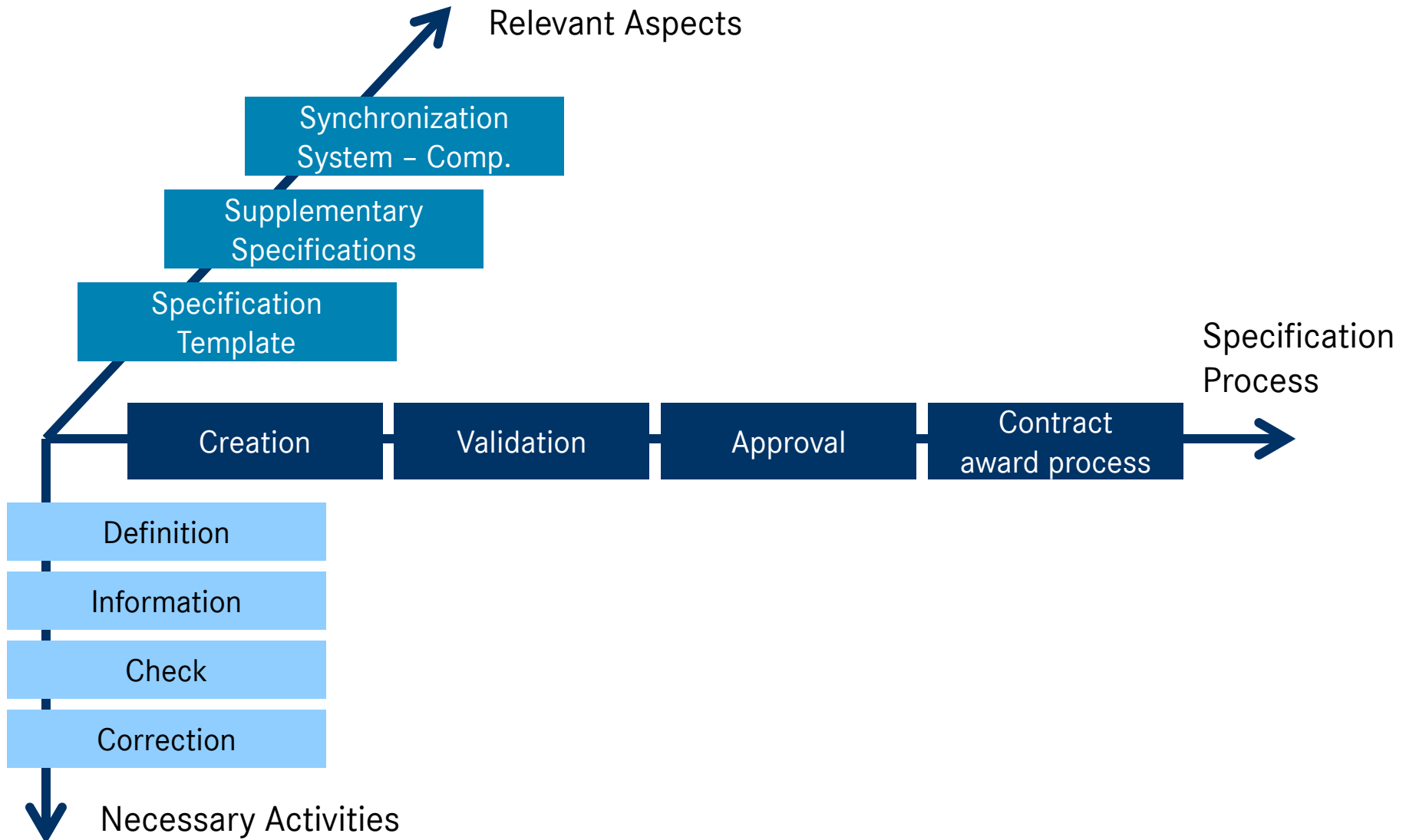
- Template-driven specification creation
- Component-Individual time-lines



→ Challenge for cross-system and cross-domain topics

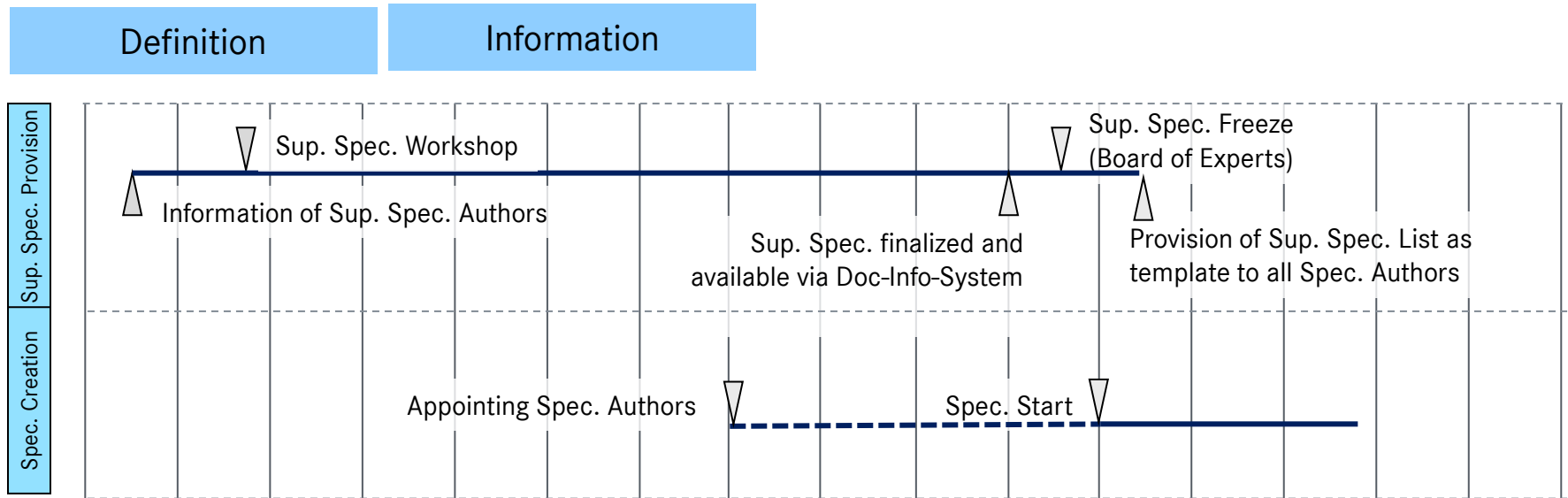
- High degree of reuse: Often more than 80% reuse
- Many Supplementary Specifications (often with late changes)

# Managing Large-Scale RE-Processes: Key Elements





# Managing Supplementary Specifications



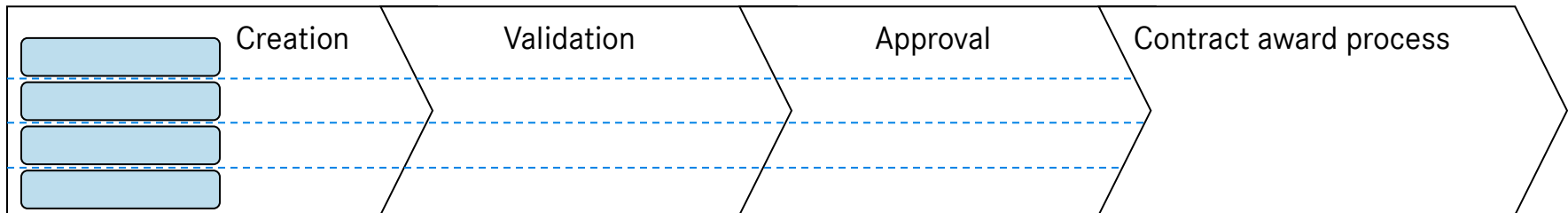
## Check

- Automated Supplementary Specification Check
- Manual cross-check during Specification Validation

## Correction

- Findings during Validation: Rework of specification author
- Late-Changes: Inserting via Support

# Requirements Controlling while Specification Creation



## Requirements Controlling

- During Specification Creation, ongoing Monitoring of Specification Maturity

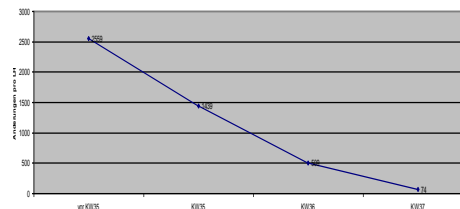
**Beneficial:**

Specific aspects  
→ Immediate correction activities

Name	Nr.	Template	Language	ISO-View	Rare earth metal
Body Controller	QEV111EA3TV	6.2	German	Yes	Yes
Remote Key	QEV111HG4RE	6.1	English	No	Yes
Wiper Motor	QEV111D2231	6.1	English	Yes	No

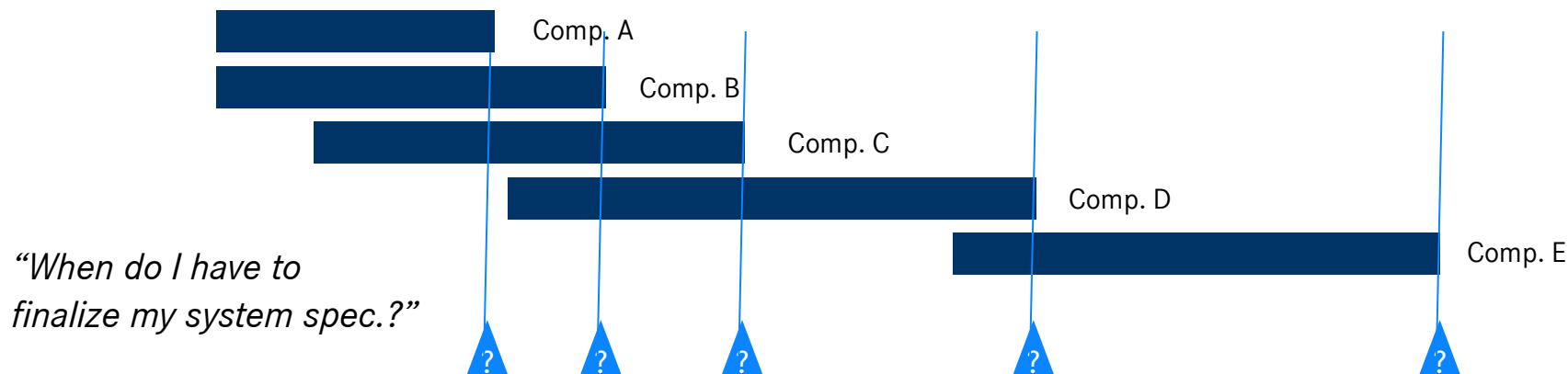
**Limited benefit:**

Formal progress data



Change Rate

# Synchronization System - Component

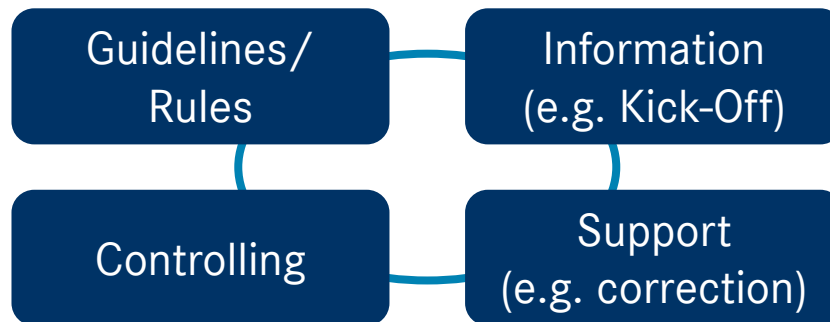


- Essential: Create Awareness  
→ Information to System Spec. and Component Spec. authors
- Beneficial, but hard to organize: Bring together meetings

Time	System	Body Controller	Remote Key	Wiper Motor	...
8:00	Automatic rear door	X	X	X	...
8:10	Outside light control	X	-	-	...
8:20	Wiper system	X	-	X	...

# Summary and Outlook

- Necessary: Explicit management of Large-Scale Specification Landscapes
- Essential: Right balance



- Start early

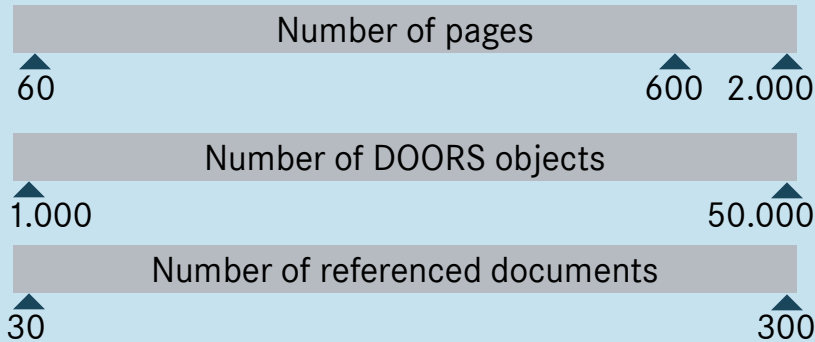
## Outlook

- Further automation (controlling)
- Online-Information channel

# Some Facts about Specifications at Daimler Passenger Cars



## Specification Size



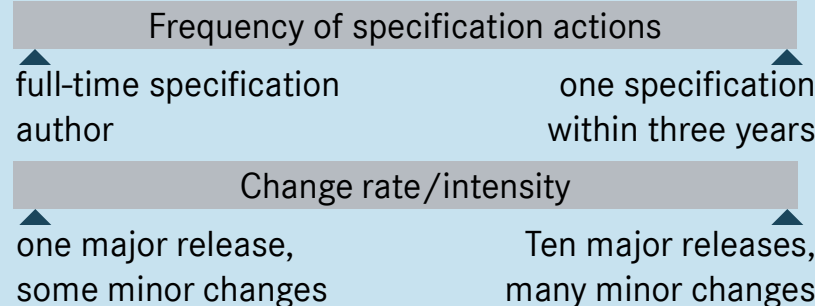
## Specification Template

- 17 chapters
- More than 150 pages
- More than 2000 DOORS objects
- Many standard phrases

1	Vorwort
2	Allgemeine Projektvorgaben
3	Allgemeine Prozessvorgaben
4	Ansprechpartner und Verantwortlichkeiten
5	Termine, Prototypen und -werkzeuge
6	Dokumentation
7	Komponentenumgebung
8	Eigenschaften der Komponente
9	Prüfung, Erprobung und Absicherung
10	Montageanforderungen
11	Logistik
12	Lagerfähigkeit, Verpackung und Transport
13	After-Sales Anforderungen
14	Ergänzende Angaben
15	Abkürzungsverzeichnis
16	Mitgeltende Unterlagen
17	Anhang



## Frequencies



## Specification Style

- Mainly natural language (German, English)
- Where appropriate: Tables, figures, etc.
- Usually no formal specification, except
  - Executable models (Matlab/Simulink)
  - CAD drawings
- Labeling: requirement, information

