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Information platform as leverage for model-based development

A case from Volvo Cars

Today

- ✓ The legacy
- ✓ Elektra Information Platform
- ✓ Unplanned success

Image from InterfaceLIFT

Can we agree?

- MDA is the key to re-use through separation of concern
- MDA is the key to early and continuous verification
- MDA improves work division in large organizations as well as towards suppliers
- MBSE give you the possibility to improve the structure of your information
- MBSE allows us to easier detect and use patterns
- MBSE improves supplier communication

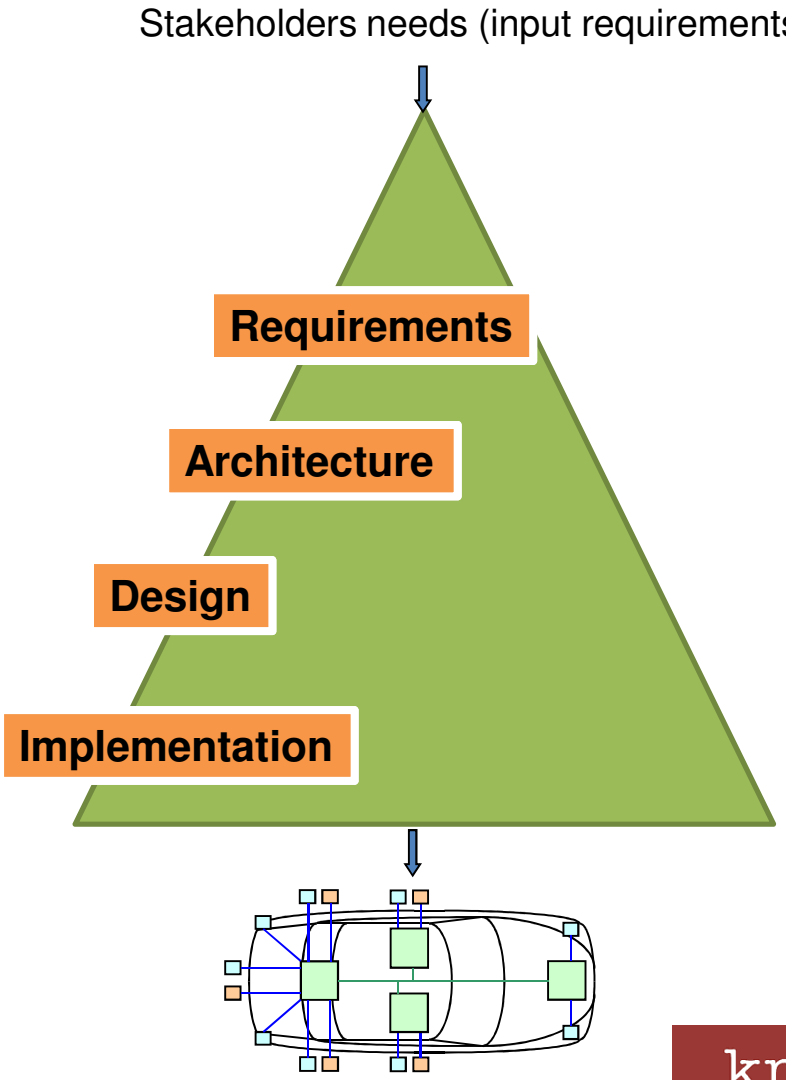
- MBSE without MDA can only go so far in large organizations

Information Hierarchy – Volvo background

Project and product structure dominant

Different levels
- -Attributes
- -Fundamentals i.e. legal
- -Functions
- -Systems
- -Design Prereq
- -Concepts
- -SW/HW Specs

Mapped towards various dimensions
- -Components
- -Subsystems
- -Function areas
- -Organizational units
- -Electrical system



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Opportunities for improvement

- Trade-off between perspectives, details and redundant definitions
  - Readable descriptions require overlap ⇒ redundant work and inconsistencies
  - Critical knowledge never documented, only kept in the minds of individuals
  - Reviews focus on finding inconsistencies instead of assessing technical solutions
  - Hard to find optimal views and satisfy all stakeholders
  - Hard to maintain and observe relations and dependencies

Several perspectives without overlap
⇒ Difficult to read and understand but no inconsistencies

OR

Few perspectives with overlap
⇒ Increased readability but also increased risk of inconsistencies

OR

Several perspectives with overlap
⇒ Good readability but high risk of inconsistencies

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This is probably a more accurate description of the perceived problem

- Our issue is too many documents and requirements spread around all over the place.

- OK, let's get a requirement system that can generate our word files.

So when we evaluate our Information Platform we should compare it to Requirements Management

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What

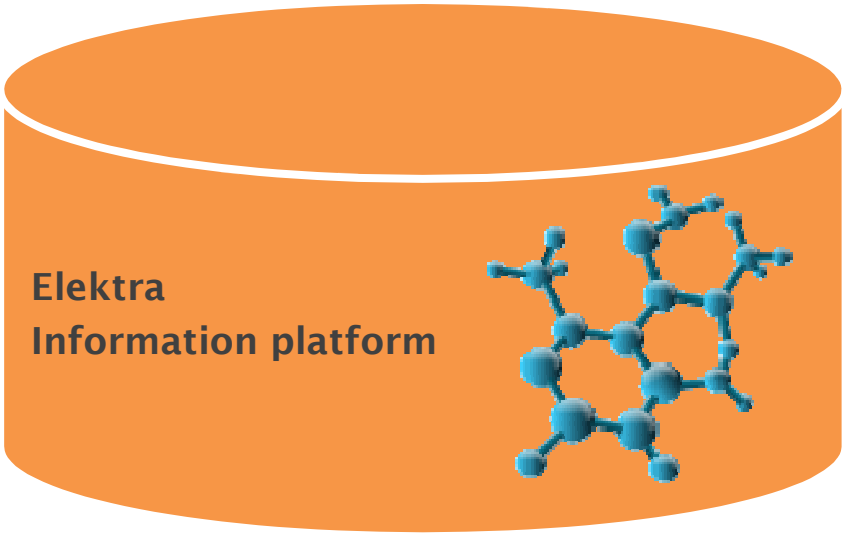
Customization of Vector's eASEE-platform

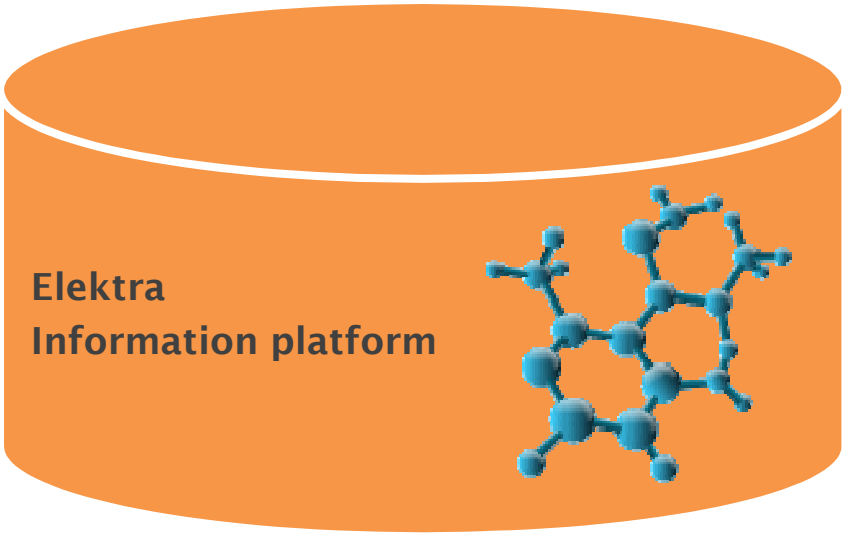
The information set fragmented into small comprehensible elements

The elements are created primarily from a design and engineering perspective

Enables CM, re-use and other benefits on the most fitting decomposition level

MDA patterns used frequently to enforce separation of concern





Not a walk in the park

High precision and small elements creates a huge information set to manage

The combinations of **elements-revisions-variants-links_to_other_elements** must be managed

Variant and version management is necessary but complex

Integration and aggregation on different levels of all design elements must be possible

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Information modeling critical

- You need both information structure and product structure from an engineering perspective
- Different variant and version patterns can be applied to all design elements where best fitted
- The model is the foremost tool to manage the amount of combinations in **elements-revisions-variants-links_to_other_elements**
- Enables a common understanding
- A necessary broker in supplier communication
- Again MDA is used to achieve separation of concern
  - For different responsibilities in the organization
  - For different parts of the product
  - For different stages of the development
  - For different levels of re-use for design elements

A semi-planned success

From 0 to implemented information platform in very short time

Thanks to a solid information model

The success of the information model came from the fact that experts made it.
*You need domain knowledge **and** modeling knowledge. Not either or.*

*In this case you **also** needed to understand the complexity of information management.*

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The unplanned success

Strong spontaneous shift in the organization towards modeling

To really appreciate this one must remember the complexity of business development in a large organization

Strong spontaneous shift in the organization towards modeling

The chain of events…

- *Elektra was seen as a document generator for requirements – not as yet another MBSE project – as such it got acceptance much faster than a COTS tool for modeling (the constant debate over rhapsody/EA/RSM etc could be avoided)*

- *But as opposed to a RM-tool Elektra deals with elements derived from how the product actually is built up*

- *And being an instantiation from the meta-model it becomes a textual modeling tool*

- *Additionally the smaller design elements suddenly reveal all dependencies, trace links etc that where hidden in redundancy and larger block requirements. These dependencies are hard to get an overview of without graphics.*

Strong spontaneous shift in the organization towards modeling

- *Elektra is also extremely precise with a lot of variant and version info and you need to be able to discuss the solution with some level of abstraction without loosing structure*

- *Additionally when less time is spent on editing and managing documents more effort can be put into engineering solutions*

- *Finally the information model and MDA patterns makes UML modeling favorable*

Seamless information management will improve your business

IF YOU DO YOUR HOMEWORK

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