STUDY

INDUSTRY SURVEY ON THE DEVELOPMENT MATURITY OF **SOFTWARE-DRIVEN PRODUCTS**

How do leading companies manage the tension between PLM and ALM?

BHC

PROSTEP

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ABSTRACT

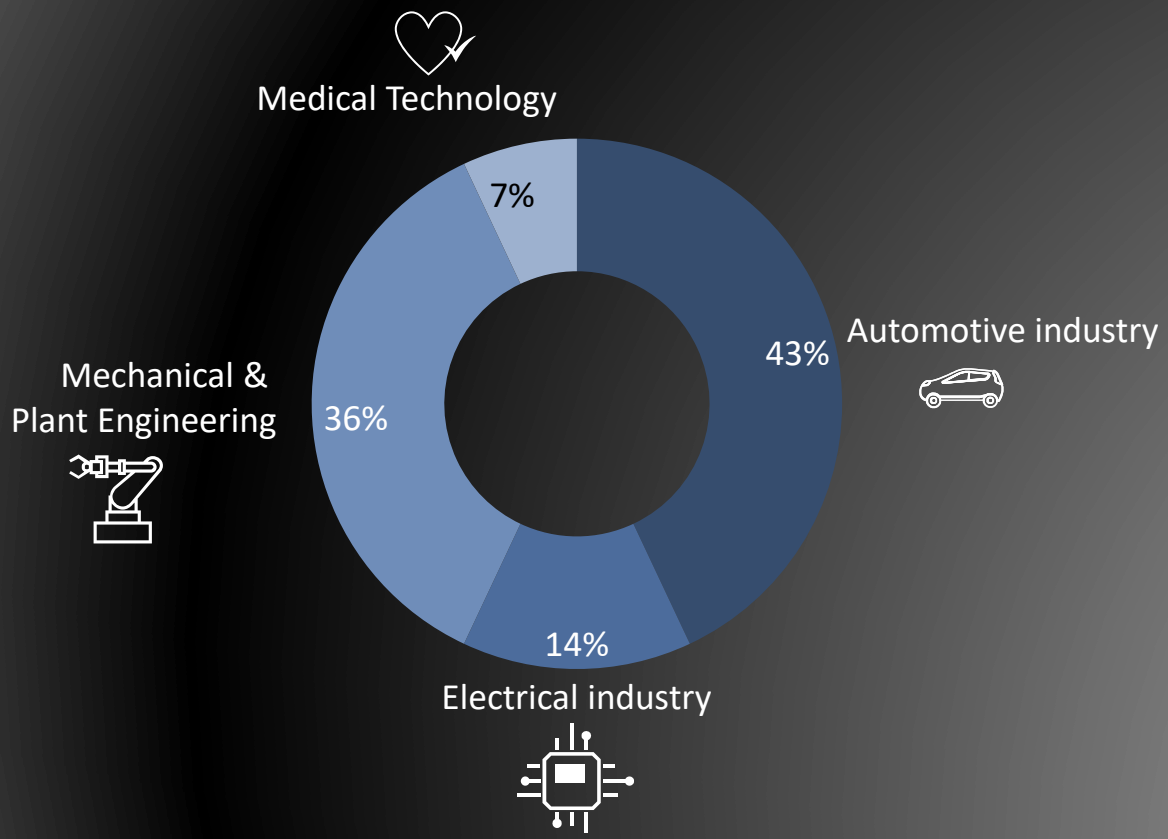
The growing complexity of products, the increasing share of software and electrics/electronics in them, new service concepts and increasing legal requirements are increasingly challenging companies to change their way of thinking.

Issues on everyone's mind are:

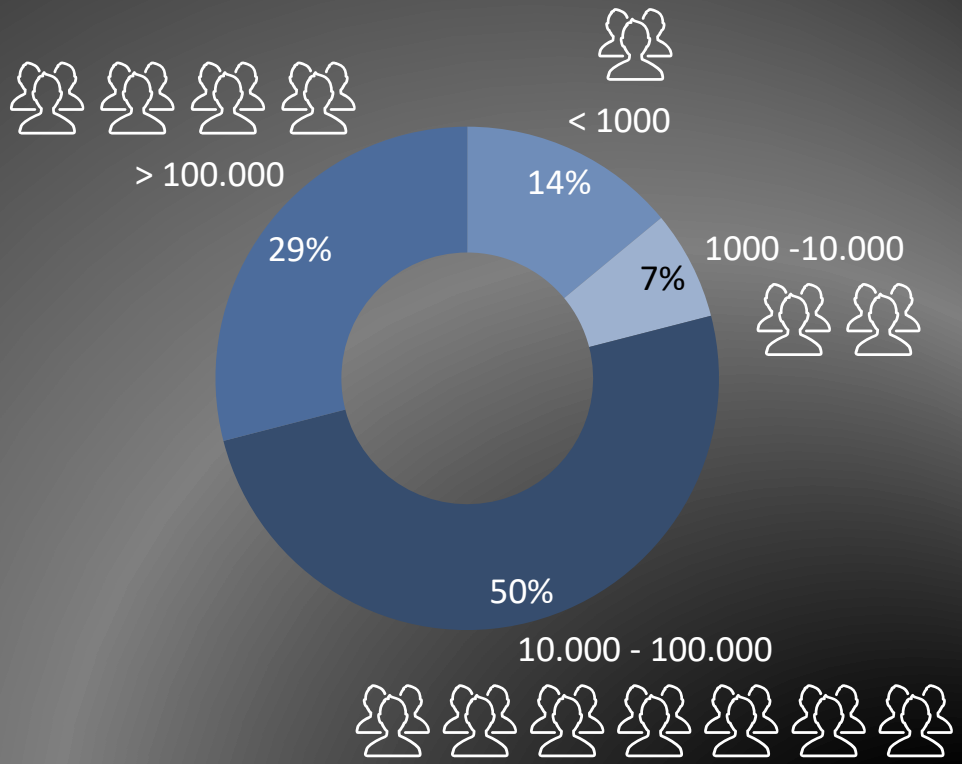
- Shaping new business models
- Establishing consistent information flows along the entire product life cycle
- Agile reactions to the constantly changing market requirements
- Reduceing costs

The aim of this study was to record the status quo regarding the development of software-driven products across all industries, as well as the respective strategies for the future interaction of PLM and ALM.

PARTICIPANT - COMPANIES



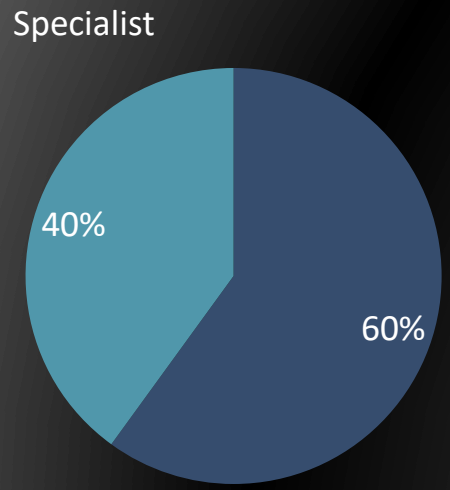
Industries
Companies from five different industries participated.



Company sizes

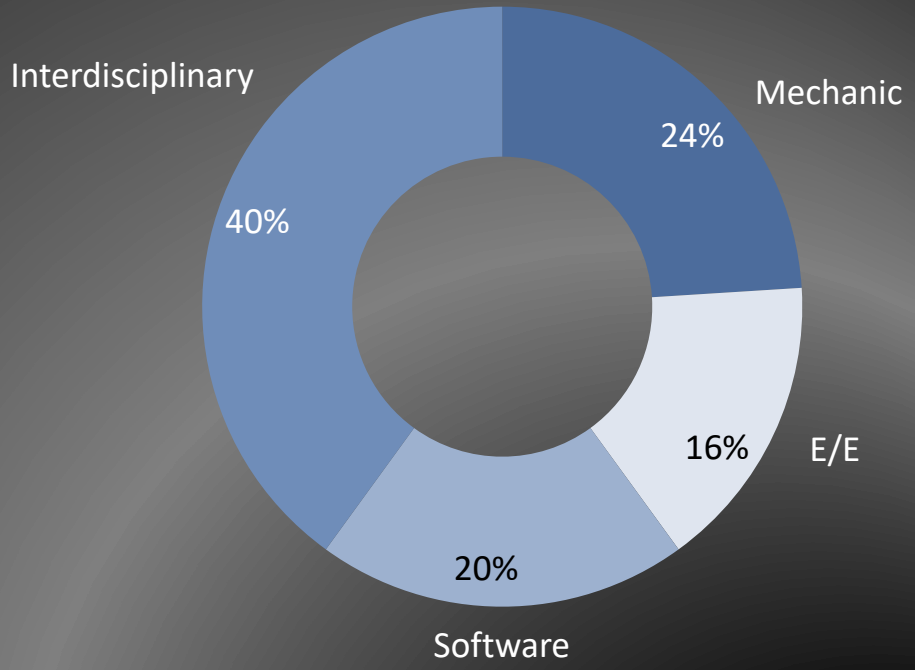
The largest participating company has about 400000 employees, the smallest about 100 employees.

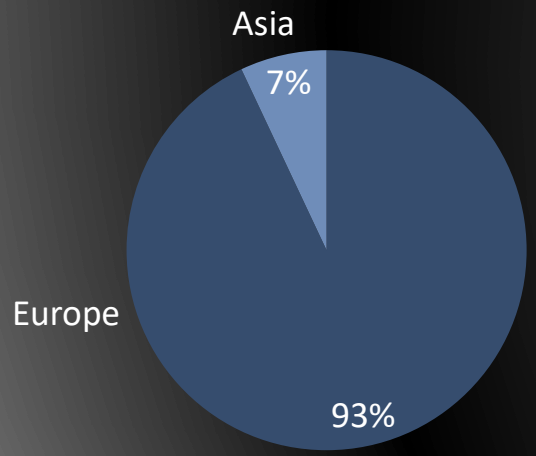
PARTICIPANT - ROLES & ORGANIZATION



Position

60% of respondents had a leadership or management role, 40% were specialists. The participants surveyed came in equal numbers from the IT and development organizational units.





Geographical distribution

The majority of the companies interviewed are based in Europe.

Domain

The focus of the activities of the interviewed participants was predominantly in interdisciplinary functions. Domain-specific topics such as mechanics, software and E/E were similarly divided.

THE CHANGING WORLD!

„Software is eating the world! … More and more major businesses and industries are being run on software and delivered as online services — from movies to agriculture to national defense.“

Marc Andreessen, Inventor and founder of Netscape

“The ALM system takes the reigns, the PLM system must submit!"

Dirk Denger, AVL (Study participants)

„Cars are becoming smartphones on wheels. To remain competitive, we need to master the software as well as the hardware. We are investing billions in electromobility and digitization. We are developing a software platform, a completely new operating system. Imagine something like Windows for cars.“

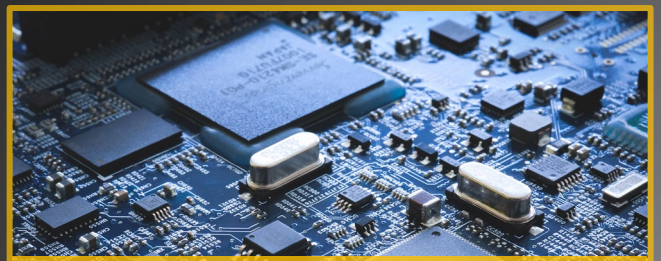
Ola Källenius, Daimler AG (25.05.2020, Handelsblatt)

STATUS QUO OF INTEGRATION IN ENGINEERING

ALM works very well as an island. Integration with the other domains is often still poor.

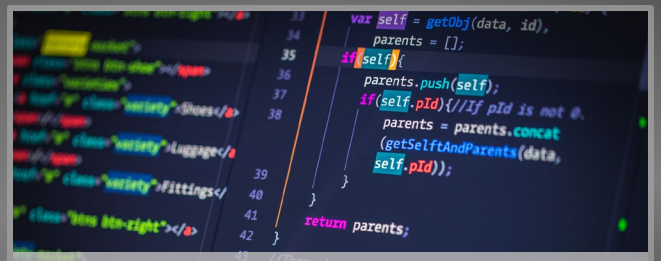
Mechanics

Mechanics is very well integrated into the engineering backbone.



Electrics/Electronics

E/E is well integrated with engineering backbone, partially integrated with software.

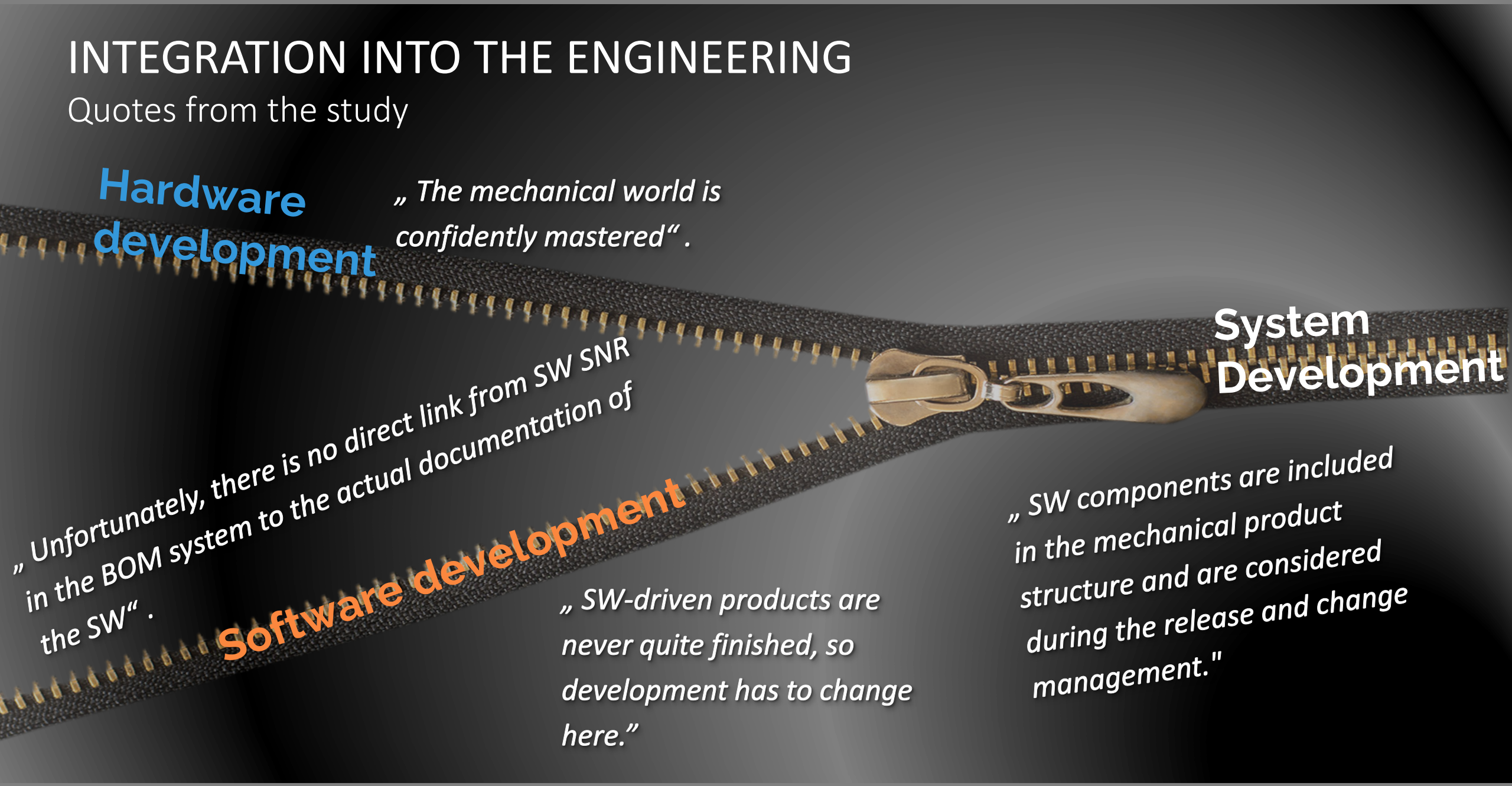


Software

Looking at the SW alone, it is well-developed. However, poor overall integration.

INTEGRATION INTO THE ENGINEERING

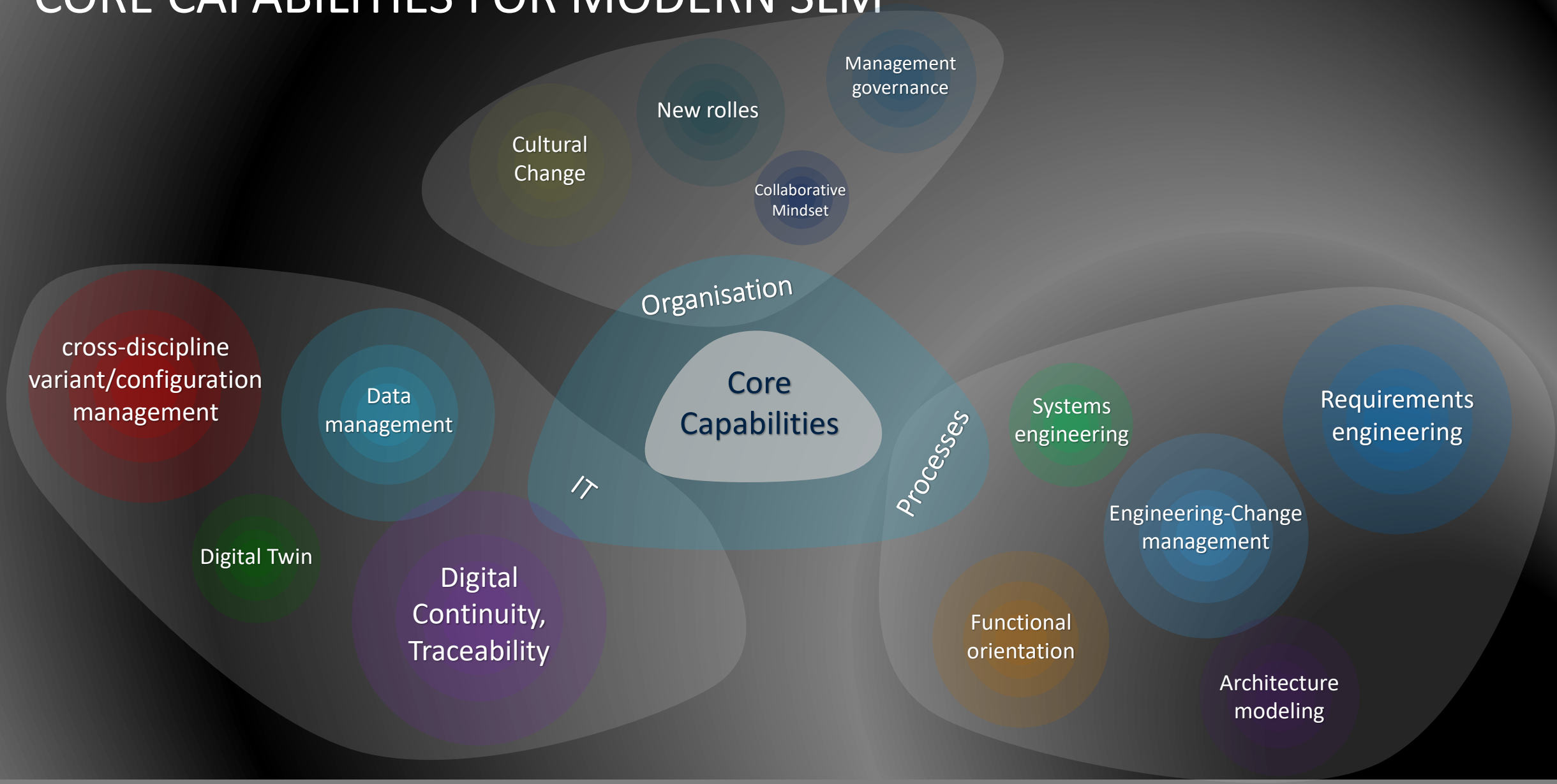
Quotes from the study



CORE CAPABILITIES FOR MODERN SLM

Processes, organizational aspects and IT must be considered equally.

CORE CAPABILITIES FOR MODERN SLM



DIGITAL CONSISTENCY - A CHALLENGE!

For most companies, digital consistency and traceability are key enablers for the future.
For almost all participants, however, comprehensive traceability is only established on a small scale and not yet across the board.

DIGITAL CONSISTENCY - A CHALLENGE!

Challenges

- Lack of tool support related to usability and evaluability.
- A common understanding of the use cases of digital continuity and traceability still needs to be established in the companies.
- Lack of user acceptance.
- Digital continuity must be actively demanded by higher management to support corporate goals.
- The deeper the network of suppliers, the more challenging it is to establish consistency across company boundaries.

TRACEABILITY AS A MOTIVATION FOR CONSISTENCY

Depending on the company, different use cases crystallize for the continuous traceability of information.
This makes traceability like a Swiss army knife....

TRACEABILITY AS A MOTIVATION FOR CONSISTENCY

Regulatory requirements
Facilitated proof of compliance with regulatory requirements, scope of proof requirement depends on industry and company history

Service offering
Knowledge of product configurations and customizations used by the customer enables further services to be offered.

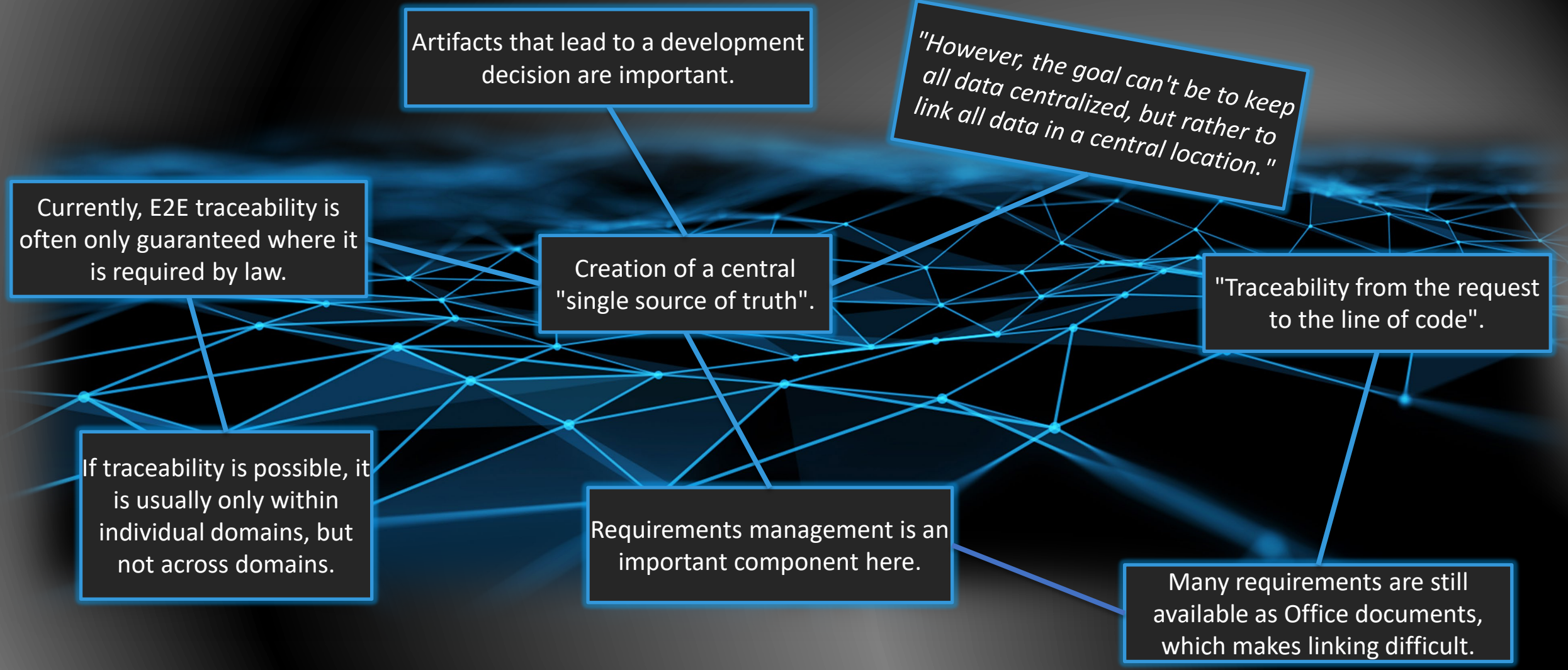
Increasing collaboration
Facilitating collaboration, as knowledge of where certain information is stored is often known to only one person.

A-SPICE
Traceability is required by standards such as A-SPICE, and auditing is demanded by the customer.

Reusabilty
Enables reuse of related groups of artifacts, not just individual artifacts.

Impact Analysis & Data Mining
Analysis of the impact of changes through necessary adjustments but also playing through scenarios, such as: What financial impact do certain changes have in interaction with variant management.

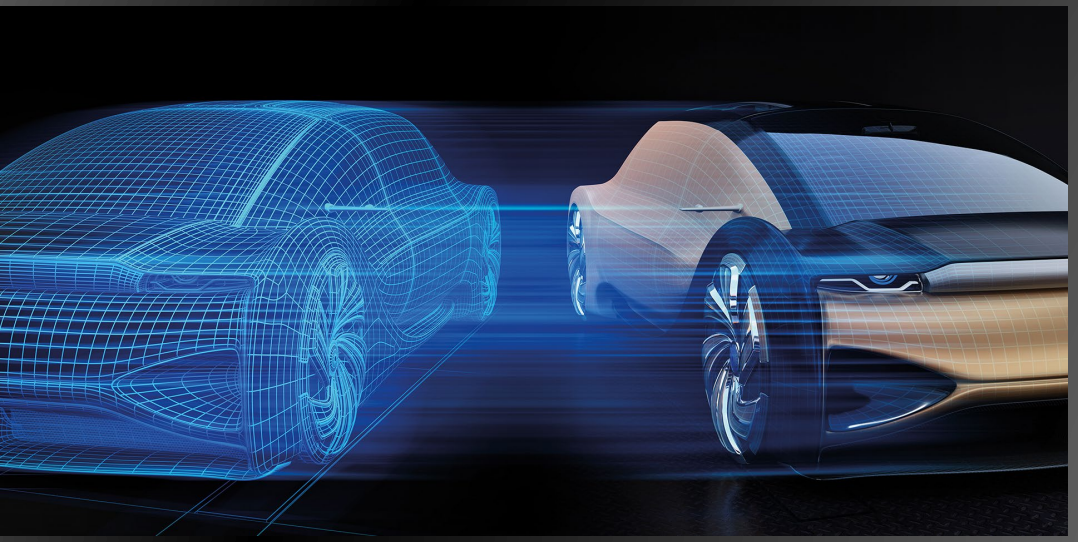
IMPORTANCE OF END-2-END TRACEABILITY



INFLUENCE OF NEW TECHNOLOGIES

New technologies enable new business models and in some cases have an impact on the engineering. Existing architectures and regulatory frameworks make it difficult to introduce new technologies.

INFLUENCE OF NEW TECHNOLOGIES - QUOTES



- *"IoT will open up new sales channels. Customer requirements will be different in the future. IoT lifts functions and software out of the "embedded realm."*
- *"The digital twin is a must-have topic to open up new business models. For this, the SW and HW -states of the products at the customer must be known.“*
- *"Update over the air would be desirable, but is enormously difficult to handle due to existing regulations."*
- *"Our vision: predictive maintenance - operating data from the customer is taken into account in development, mathematical modeling alone is not enough because a model never corresponds to reality.“*
- *"The influence of new technologies on product architecture is currently only moderate. The reason for this is that existing product architectures prevent innovation. Strategically, it would be desirable to prune existing product architectures to unleash innovation."*

IT-SYSTEMS IN USE

In initiatives regarding PLM-ALM integration, a mix of all known IT solutions can be observed. But often these integrations do not support the goal of continuous traceability of system information.

IT-SYSTEMS IN USE

MATURITY OF AVAILABLE IT SYSTEMS

Despite the massive advertising of their IT solutions by various vendors, large companies in particular rely on in-house solutions in order to be able to react more flexibly to new requirements.

MATURITY OF AVAILABLE IT SYSTEMS - QUOTES

"Maturity not yet clear, driven by market requirements e.g. update over the air, - and what does that mean for product data management?"

"The target picture is continuously shifting and with it the maturity classification -> Better is an IT framework that can be continuously developed in an agile way ..."

"User experience is not yet made for development ("engineers made something for engineers") - software has become too complex over the years"

"The willingness of the vendor to work together to come to a good solution and not "just sell their product" is seen as essential"

VENDOR STRATEGY FROM THE COMPANY'S POINT OF VIEW

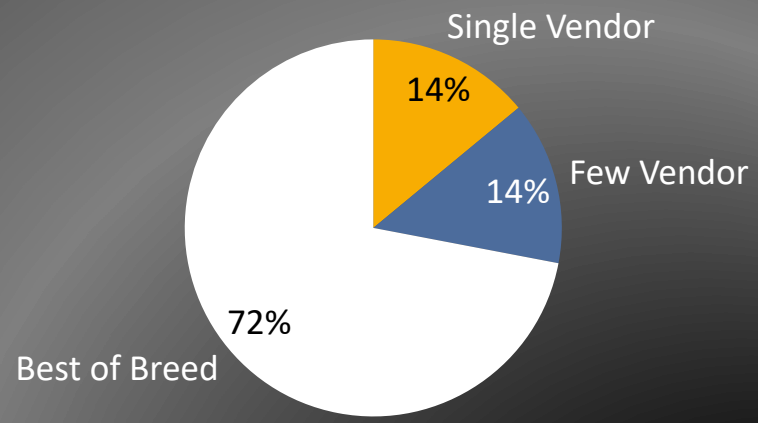
The majority of companies pursue a best-of-breed strategy and thus use the tool that is best for them in a particular area - regardless of which technical solution is used to implement the "engineering backbone".

VENDOR STRATEGY FROM THE COMPANY'S POINT OF VIEW

Single Vendor vs. Best of Breed

"There is no such thing as one opinion:

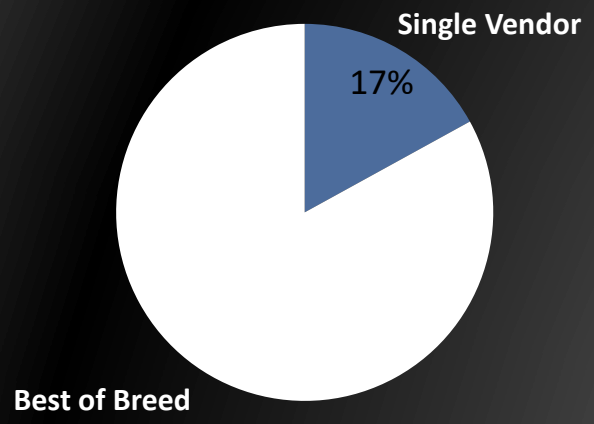
- *Tooldiversity brings competitive advantage by using customized tools for a specific area*
- *Tools from a single vendor brings more synergy and strengthens collaboration"*



VENDOR STRATEGY RELATED TO PLM/ALM

Despite the better integrability of PLM and ALM systems from one vendor, other criteria are usually decisive in the selection of an ALM solution.

VENDOR STRATEGY RELATED TO PLM/ALM



Stand: Heute

Finding

Even though the tendency is to obtain the ALM tool from the PLM vendor, this development is not very pronounced. From the customer's point of view, the reason for this is the insufficient integration of the PLM and ALM IT tools of the vendors. Other capabilities, such as the possibility of working agilely or the cloud capability of the ALM tool, currently play a greater role in the selection of the appropriate ALM solution.

TECHNICAL REQUIREMENTS FOR IT SYSTEMS

Important current requirements for IT systems are cloud capability, usability, traceability and integrability.

TECHNICAL REQUIREMENTS FOR IT SYSTEMS - QUOTES

Cloud capability

„ Cloud/SaaS capability must be available for IT solutions“

„ the advantage of cloud solutions is that the issue of infrastructure no longer generates so much effort“

" Very good experience made with a managed private cloud "

Usability

„ Especially the topic of UX is an important aspect that must be emphasized“

" Tools are mostly made for experts e.g. SAP and Polarion, occasional users have difficulties "

„ The complexity must be hidden “

Traceability

„ The topic of traceability is limited by what the tools offer“

" An overall view in impact analyses is missing. It is only possible to jump from artifact to artifact "

" A cross-tool variant management is important "

Integratability

Common data backbone: but not one IT system, but several systems that are integrated

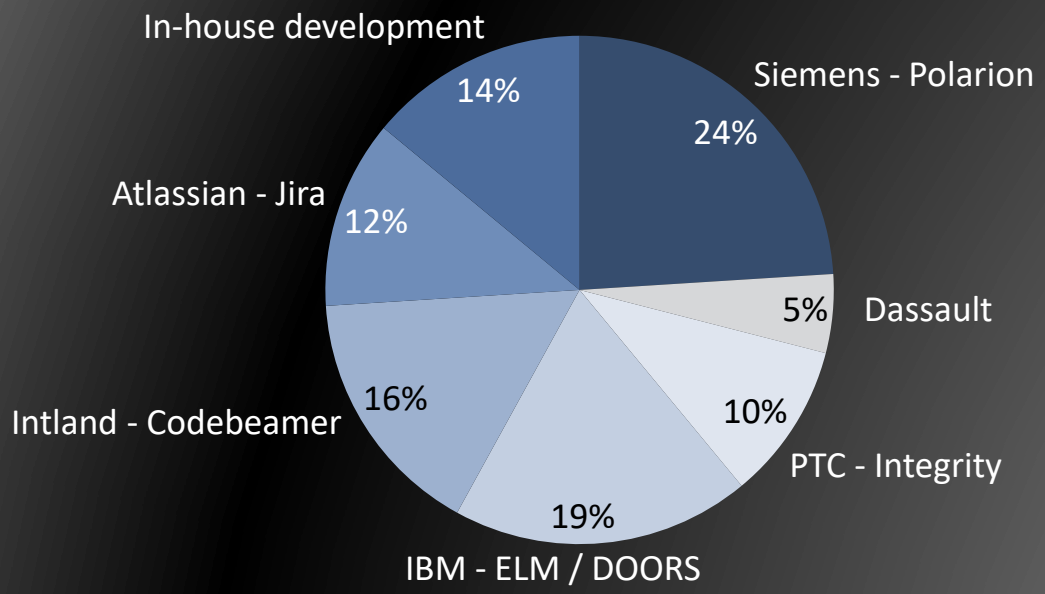
„PLM – ALM Integration“

„ Standardization and open interfaces are important“

IT SYSTEMS USED WITH FOCUS ON SW

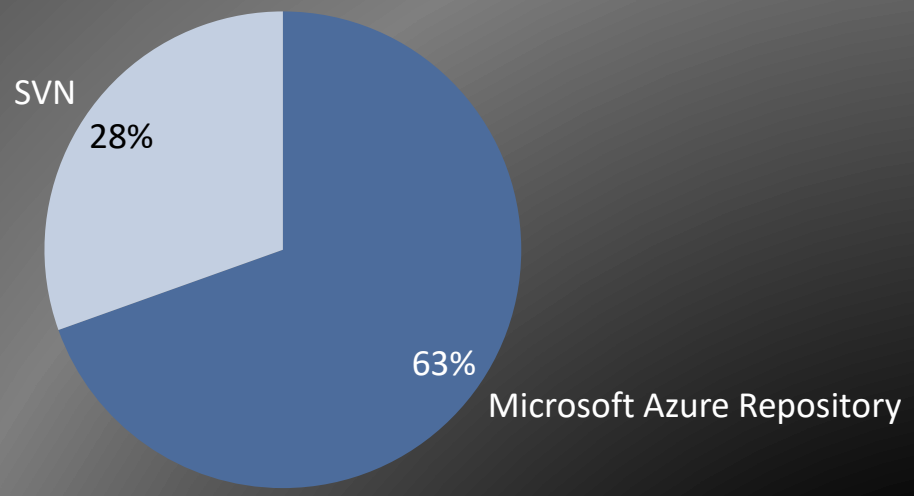
All known tools and vendors were named for the ALM tools used. In most companies, another tool was used as a SW repository in addition to an ALM tool.

IT SYSTEMS USED WITH FOCUS ON SW



ALM Tools

Indication of the relative frequency of the ALM tools mentioned in the interviews*.



SW Repository / Version control Tools

The relative frequency of the special tools mentioned with a focus on SW Repository functionality*.

* Die Auswertungen sind nicht repräsentativ für den Gesamtmarkt

WHERE IS THE JOURNEY HEADING FROM THE COMPANIES' POINT OF VIEW?

Current state

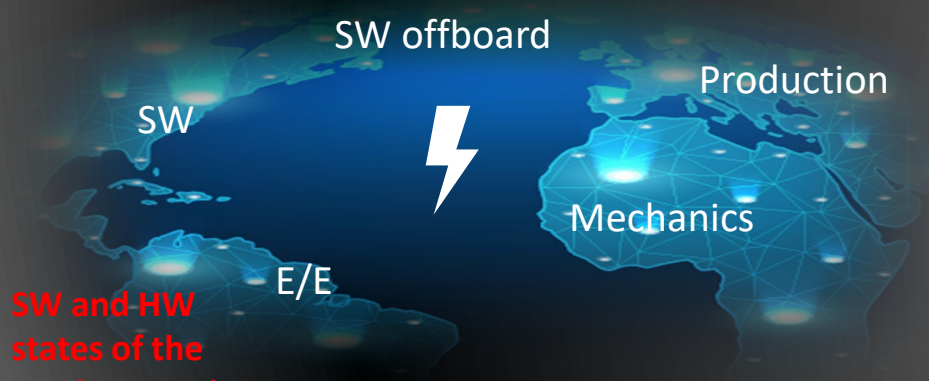
Technical Compliance?

A-SPICE?

Requirements all covered?

Effects of frequent SW changes?

How to integrate SW with remaining development?



SW and HW states of the products at the customer ?

Tools are too hard to use!!!

Dealing with variants?

Transition measures

- Clarify the significance of topics such as "traceability" or "PLM-ALM integration" for the company
- Organization to be included (from "above" and from "below")
- Establishment of an end-to-end information model and implementation of E2E processes
- Selecting the best IT tools and implementing integration tools and cockpits
- Pilot the concepts in small projects and extend them to other areas

Vision

Variants are mastered confidently

SW integrated with HW and yet SW can develop freely

Impact of changes are immediately visible

Technical compliance ensured

everything in the cloud

HW and SW states at the customer known

Tools easy to use, complexity is hidden

All information visible across all tools in the cockpit

Tools agilely expandable

SUMMARY

Nothing is more consistent than change. Neither does the process follow IT, nor vice versa. However, the organization must be prepared for the digital transformation and have understood it for itself.

With the significance of software in the product, the significance of ALM is also changing. A paradigm shift can be seen, with ALM increasingly taking the lead over PLM. However, it is also accepted that there is not one system, but a network of integrated systems.

The available IT currently does not sufficiently support the desired consistency - especially with regard to end-2-end traceability. There is no tendency with regard to single/few/multi-vendor strategies or in-house developments.

New business models, changing requirements and ever stricter legal regulations demand agile and flexible IT - this is reflected in the increased demand for cloud and micro-services solutions.

The demand for easy-to-use standard solutions is clear.

We are aware that we are in a phase of dynamic change. For this reason, the present results are not a final status, but are to be continuously developed. We therefore warmly invite you to participate in the further development and an exchange of experiences.

ABOUT US

BHC is a company of the PROSTEP Group.
The focus is on ALM and PLM
for mechatronics and SW-based products

PROSTEP is the leading vendor-neutral consulting and software house for product lifecycle management (PLM) topics.

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Publisher
BHC GmbH
PROSTEP AG

Edition 1, 2021