Current Megatrends influencing today's Markets

business ecosystems

learning from nature

globalization

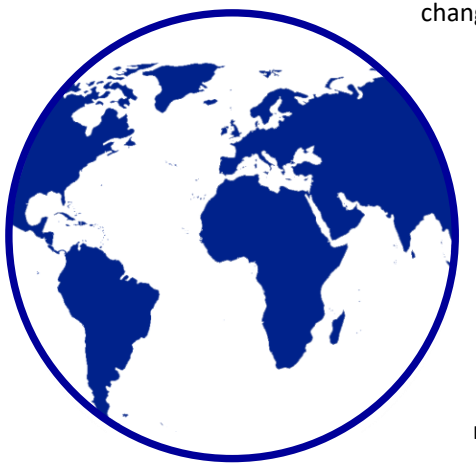
changing working conditions

global security issues

change in world-politics

new ways for transport

climate change and environmental issues



individualization

new ways of consumption

cultural diversity

knowledge-based economy

rethinking energy and resources

better healthcare

feminism

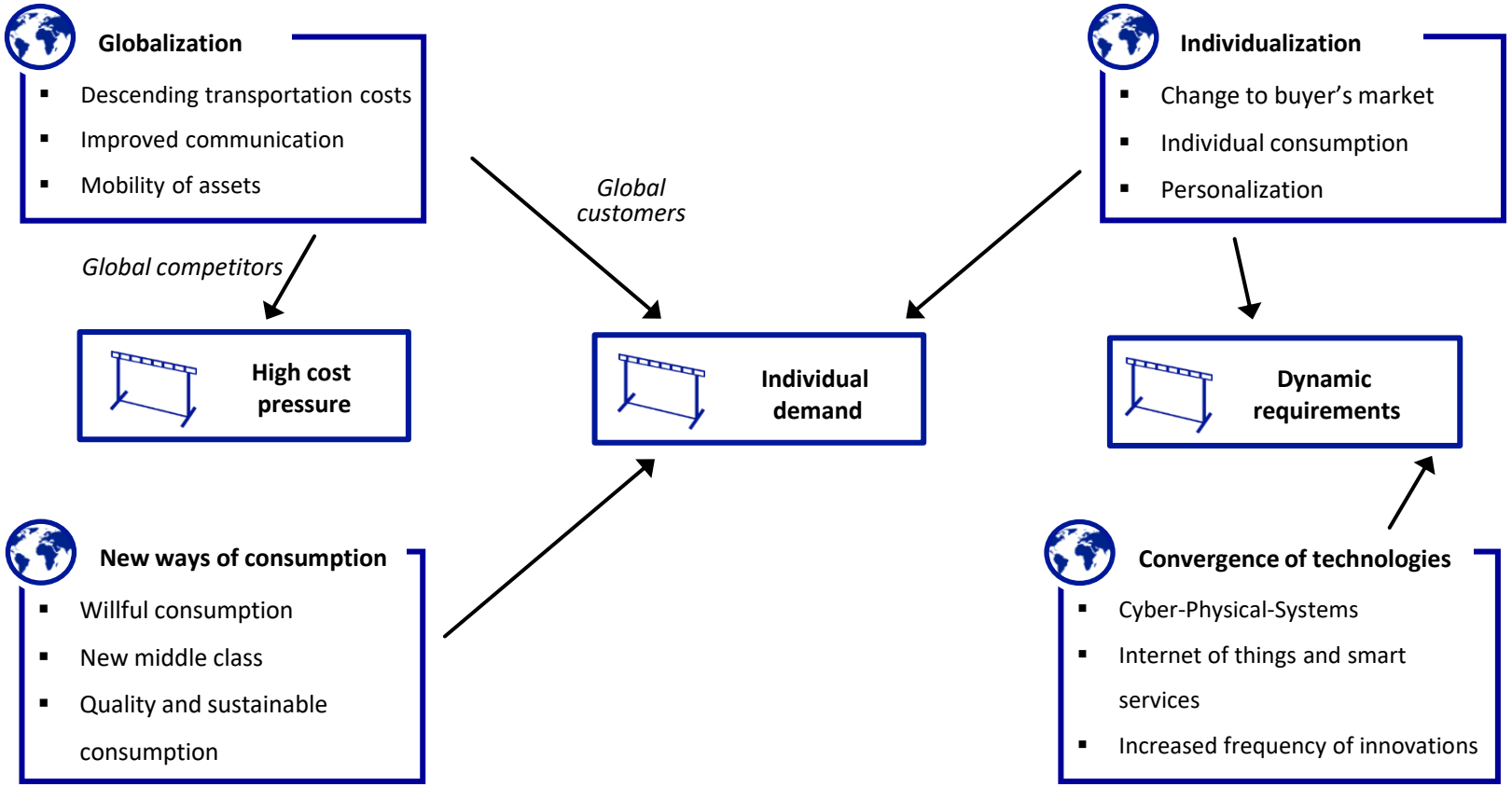
convergence of technologies

digital life

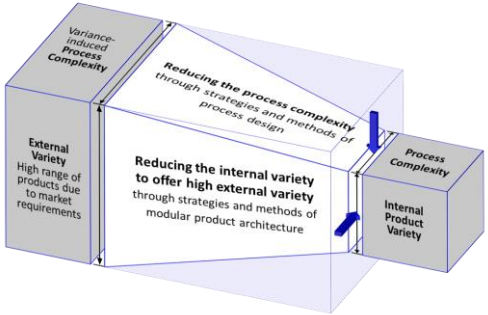
distributed intelligence

Krause and Gebhardt. 2018

Challenges for Companies



Krause and Gebhardt. 2018



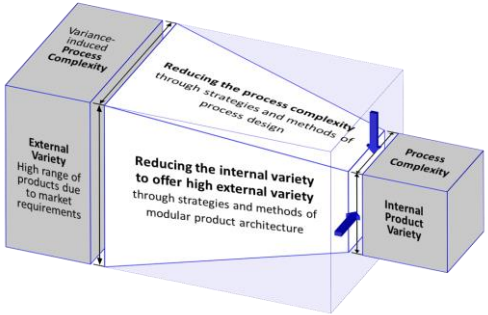
HAUNI
VAPING TECHNOLOGIES

PKT

- Methodical development of modular product families
- Redesign, modification and new design of components to reduce internal variety
- Combinable method unit providing flexible case specific support
- Develop and apply methods with industry

HVT

- Enter dynamic FMCG market with high product variety
- Develop NGP with inventive technology
- Establish modularity from the „green field“ to avoid unnecessary complexity
- Extension of the methods to approach new market segments, taking into account digital eco systems



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Joint project since spring 2017

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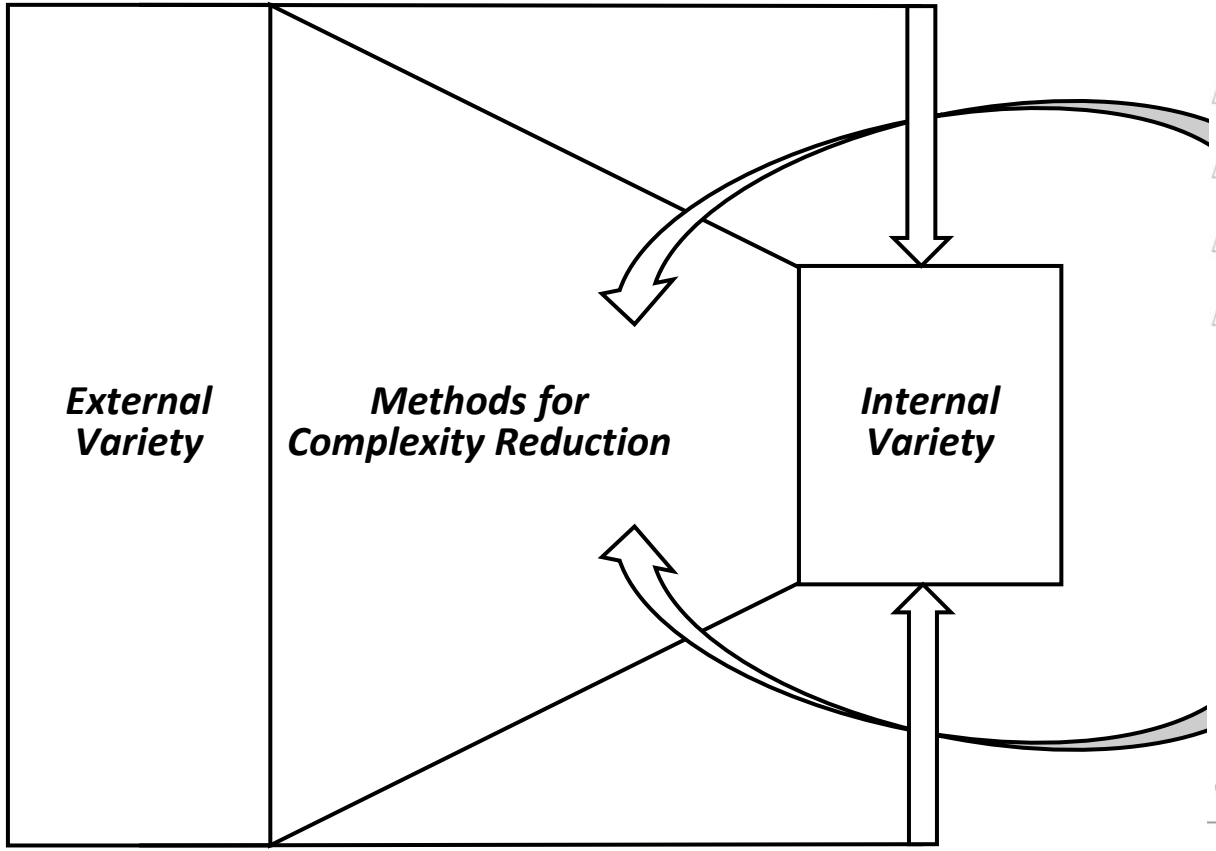
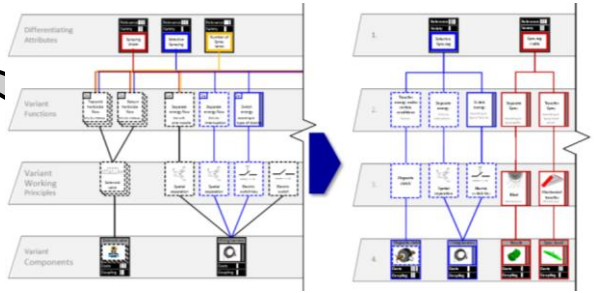
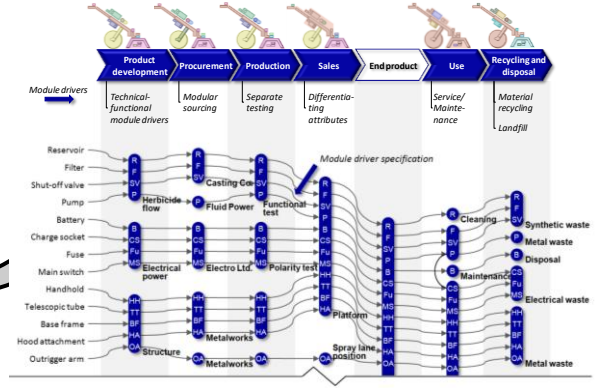


Design for Variety

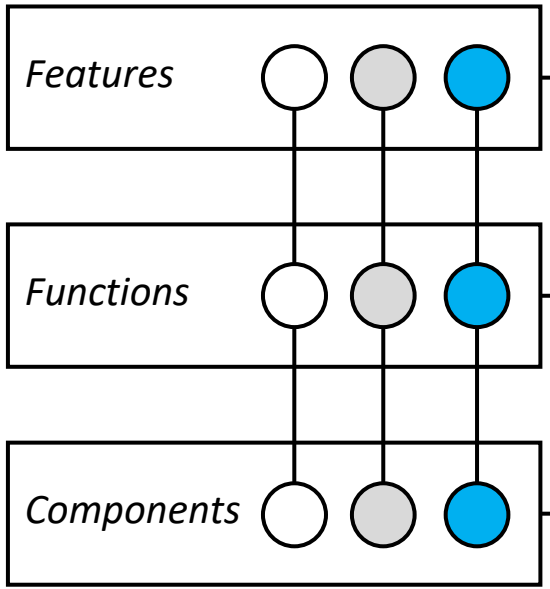


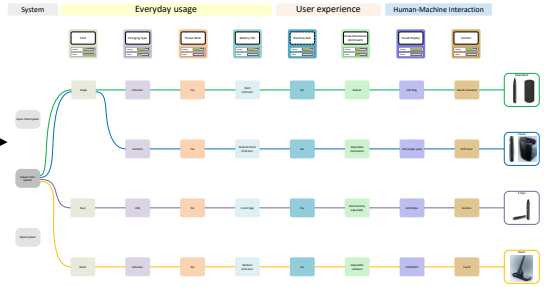
Life Phase Modularization



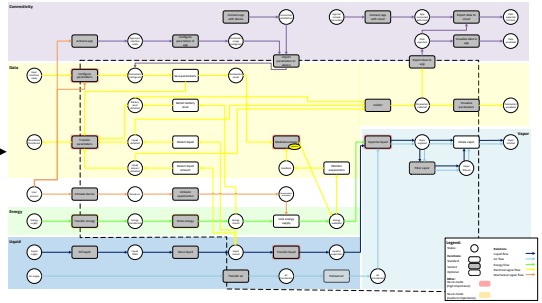
Krause and Gebhardt. 2018

Feature Allocation Model

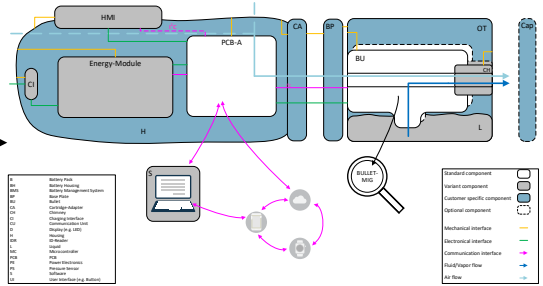




Tree of external Variety



Product Family Function Structure



Module Interface Graph

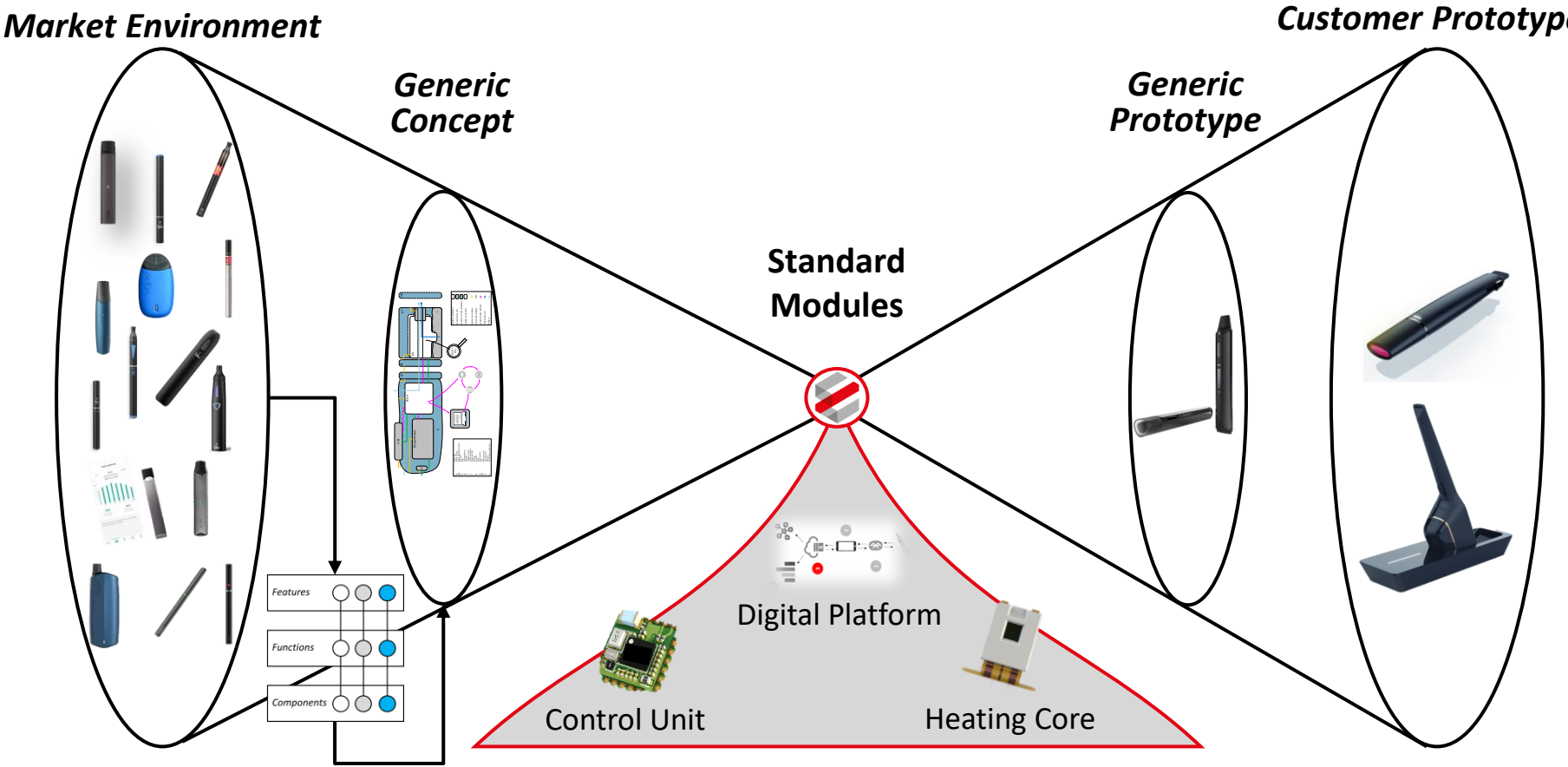
Küchenhof and Krause, 2019

Advantages & Risks of Modular Product Structuring

- Reduced development time
- Improved ability to upgrade/adapt products
- Promotes a better understanding of the products
- Reduces testing effort and certification

- Problems of the platform affect all products of the platform
- Increased fixed costs (platform development 2-10 times as expensive as single development)
- Unsuitable for extreme diversification

Simpson et al., 2012



Product Structure Designed for Variety

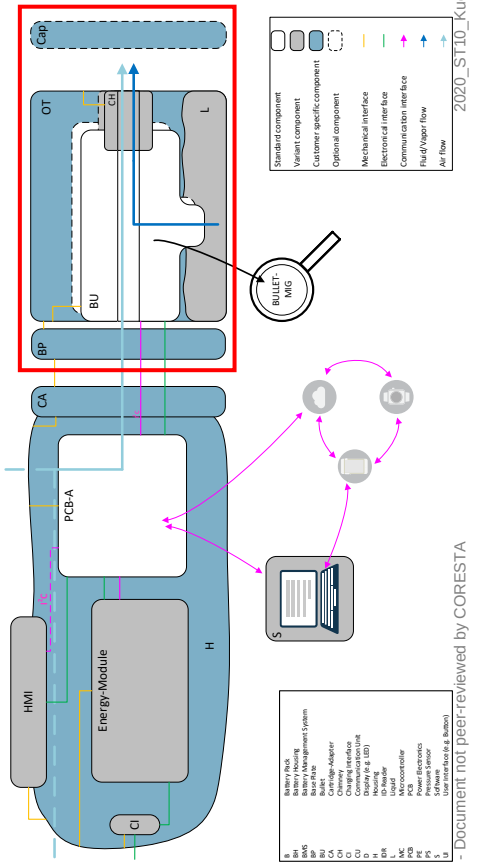
Standard Components

- Off-the-shelf components
- Certification and tests can remain
- Risk diversification due to parallel development possible
- Carry over part for different product designs and releases

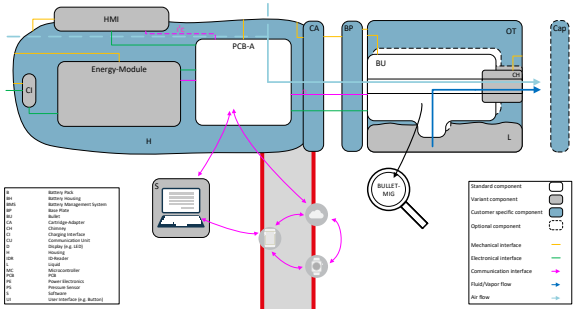
Variant and Customer Specific Components

- Designed for easy adaptations
- Minimal lead time for design changes and rapid testing of different designs
- Rapid Prototyping possible through 3D-Printing
- Use of simple molding processes

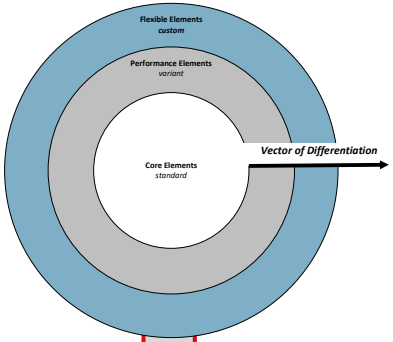
Cartridge	Variety
	n = ∞
	n = ∞
	n = 1
	n = m



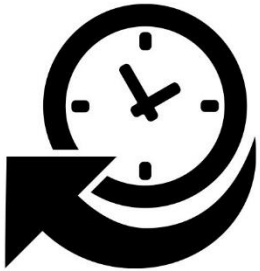
Case Study Results



Applied for 5 different product variants



With 80% standard components



From scratch to prototype in less than 48h

Learnings

- Defining the “right” interfaces is challenging,…
- …, but once defined, advantages of modularization take effect
  - Simultaneous module development (risk reduction)
  - Reduced development lead times (time to market and flexibility)
- Usage of product development methods and tools fosters interdisciplinary, collaborative work
- Efficient transition from product to process development (derivation of process platform)
- Holistic development allows for
  - End-2-end approach (from user and customer needs to complete product life cycle)
  - Incorporating digital shares (app, cloud, business intelligence)

Outlook

- Adjusting and scaling the product and process platform
- Addressing organizational complexity with agile development methods and an open innovation approach

Thank you for your attention!

Contact

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Literature

- Krause, D., Gebhardt, N., 2018. Methodische Entwicklung modularer Produktfamilien. Springer, Berlin.
- Küchenhof, J., Krause, D., 2019. Entwicklung eines Produktarchitekturmodells zur Ableitung modularer Produktstrukturen, 30th Design for X Symposium. Jesteburg, Germany.
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