32. Staged Configuration with Key Partners and Stakeholders

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1) Staged configuration of value, feature, and component trees
2) The triple-layer BMC

Obligatory Literature

- [Reiser] Mark-Oliver Reiser and Matthias Weber. Multi-level feature trees. Requirements Engineering, 12(2):57--75, 2007.
  - https://link.springer.com/article/10.1007%2Fs00766-007-0046-0
- [Joyce] Joyce, A., Paquin, R.L., The triple layered business model canvas: A tool to design more sustainable business models, Journal of Cleaner Production (2016), http://dx.doi.org/10.1016/j.jclepro.2016.06.067
- [Czarnecki] Krzysztof Czarnecki, Simon Helsen, and Ulrich W. Eisenecker. Staged configuration using feature models. In Robert L. Nord, editor, Software Product Lines, Third International Conference, SPLC 2004, Boston, MA, USA, August 30-September 2, 2004, Proceedings, volume 3154 of Lecture Notes in Computer Science, pages 266--283. Springer, 2004. https://doi.org/10.1007/978-3-540-28630-1_17
  - Explains how to extend a feature model over a supply chain.

Any good business model (also an MVP)
should be improved by new variants or extensions.

Other Literature

- Kwanwoo Lee, Kyo C. Kang, and Jaejoon Lee. Concepts and guidelines of feature modeling for product line software engineering. Lecture Notes in Computer Science, 2319:62--78, 2002. Good overview on feature models, and how to develop feature groups in different concerns
- Don S. Batory. Feature models, grammars, and propositional formulas. In J. Henk Obbink and Klaus Pohl, editors, Software Product Lines, 9th International Conference, SPLC 2005, Rennes, France, September 26-29, 2005, Proceedings, volume 3714 of Lecture Notes in Computer Science, pages 7--20. Springer, 2005.
  - Explains the relationship of feature models and propositional logic.
- Hans de Bruin and Hans van Vliet. Quality-driven software architecture composition. Journal of Systems and Software, 66(3):269--284, 2003.
  - Introduces feature-solution graphs, the bipartite graph between feature trees and product-component trees.

Shortcomings of Lean Startup from the Viewpoint of Software Product-Line Engineering

No support for consistent modeling of product lines (no support for feature modeling and feature variation)

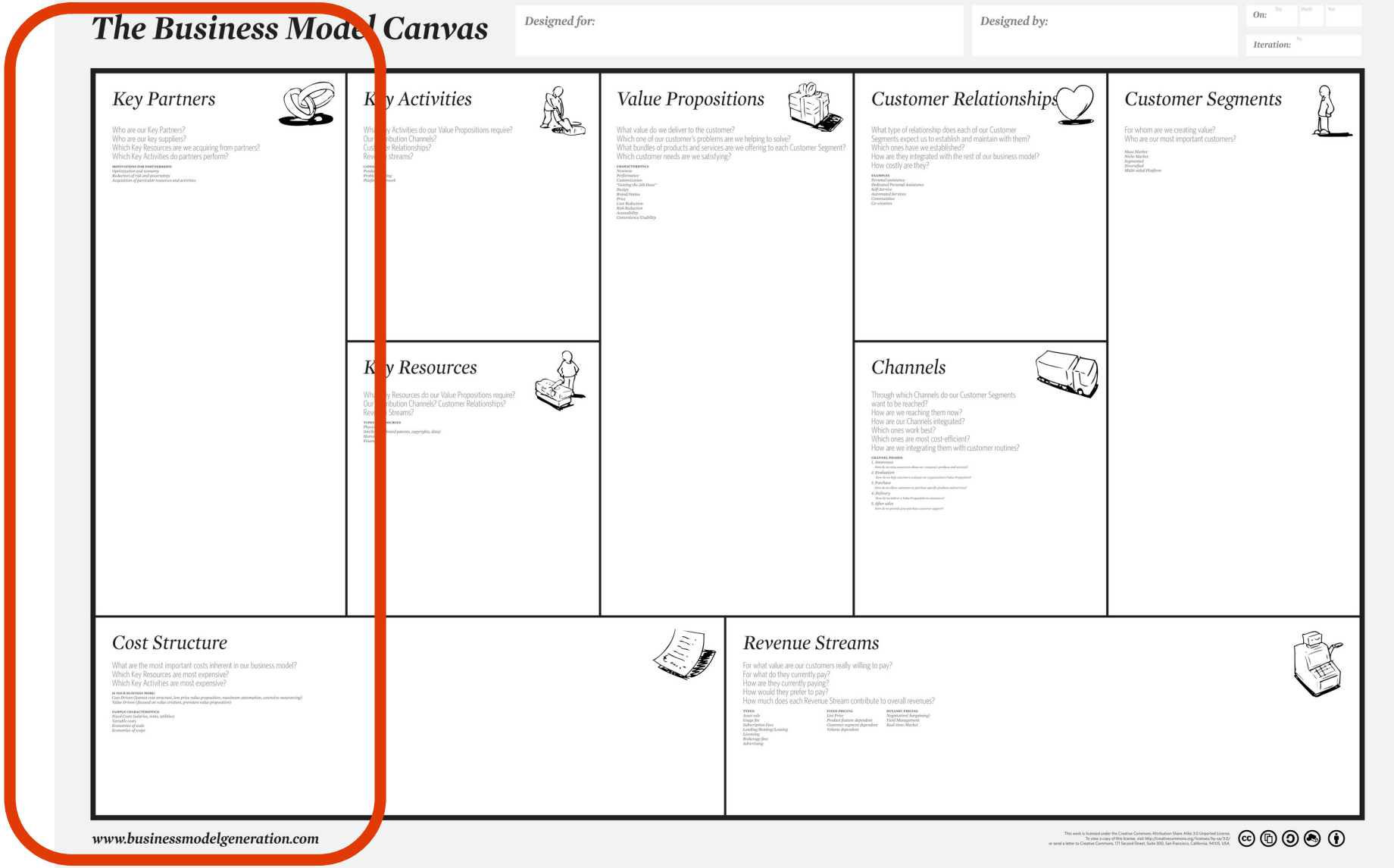
No support for canvas modeling (composition and engineering)

No support for staged feature configuration with suppliers

No support for grading and metrics

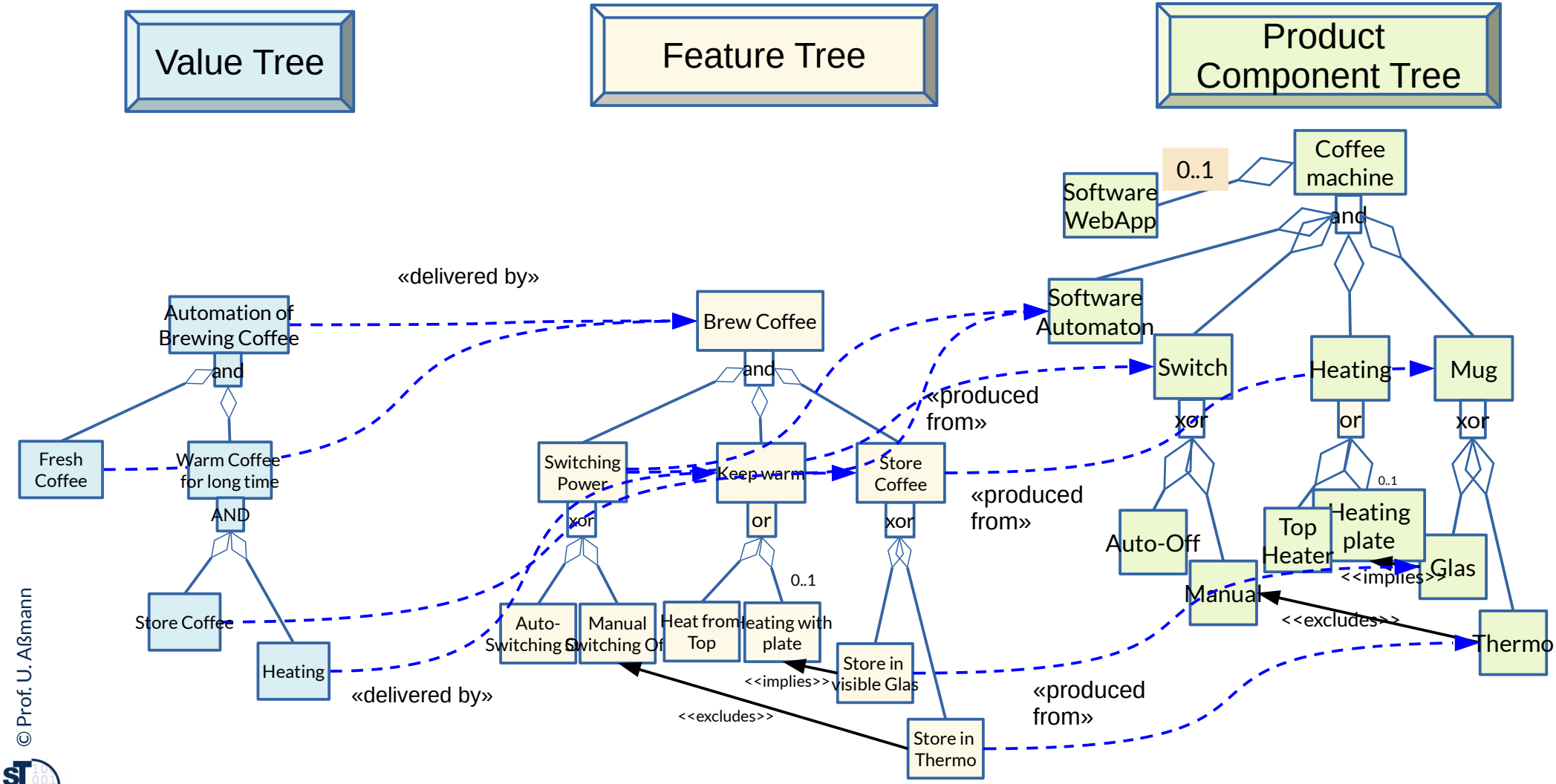
32.1. Staged Configuration of Feature Models and Triple Bigraphs

Suppliers in a Supply Chain



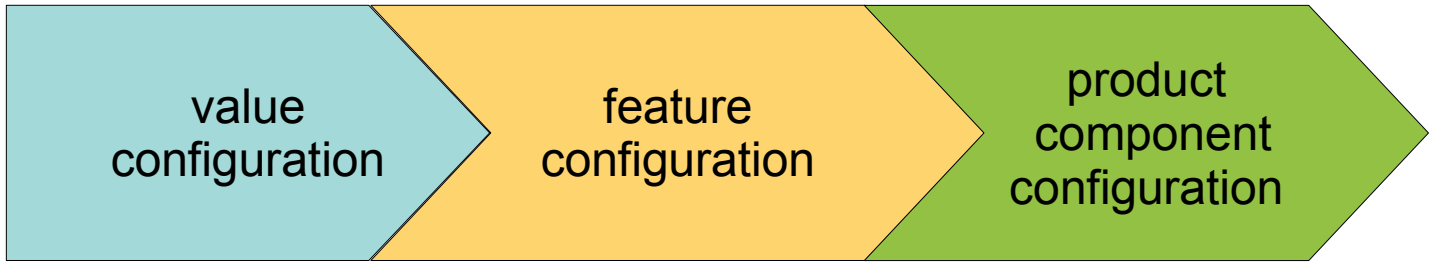
Bridging three Worlds: From Value Trees via Feature Trees to Product Component Trees

- Values can be traced via features to components of the product in the ***triple bigraph*** over values, features, and product components



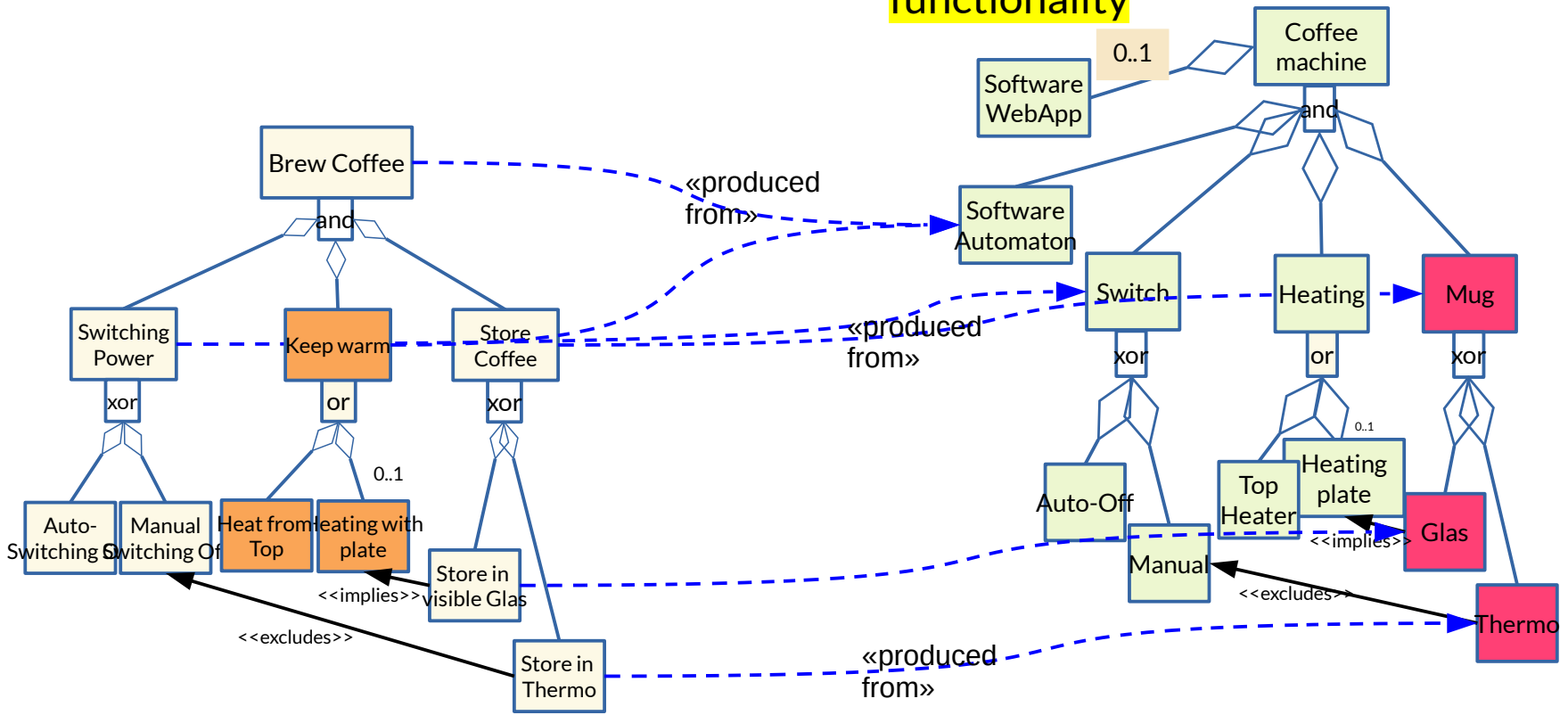
Different Classes of Configurations in the Triple Bigraph

- Value Trees, Feature Trees, Product Component Trees need to be *configured*
  - XOR configuration
  - IOR configuration
  - Optional part configuration
- ***Value configuration*** is the process of choosing a value
  - Features and product components are selected too (via the relations *delivered-by* and *produced-from*)
- ***Feature configuration*** is the process of choosing a feature
  - Product components are selected too (via the relation *produced-from*)
- ***Product component configuration*** is the process of choosing a product component implementation



Subtrees in Configuration can be Attribted to Key Partners (Suppliers)

- Feature trees can be decomposed into feature subtrees
- If subtrees are left to a supplier, a supply chain results
- Definition of test suite proving feature
- Product component trees can be decomposed into component subtrees
- These subtrees can be bought from a supplier (key partner)
- Definition of functional interfaces
- Definition of tests proving subsystem functionality



Buying Feature or Component Subtrees from a Supplier

- Requirements document for the feature or component subtree
  - Definition of functional interfaces
  - Definition of tests proving subsystem functionality
- Pricing of the subtree supply
- (Sub-)Contract about these points

- See courses
  - Softwaretechnologie
  - Softwaretechnologie II
  - Requirements Engineering und Testen

- Multi-Stage configuration is the process of confining subconfigurations to all supplier-based subtrees of the triple bigraph (values, features, components) [Reiser] [Czarnecki]

32.2 Triple Layer BMC (TLBMC) for Sustainability of Key Partners and Key Resources

Shortcomings of Lean Startup from the Viewpoint of Software Product-Line Engineering

No support for consistent modeling of product lines (no support for feature modeling and feature variation)

No support for green and social aspects

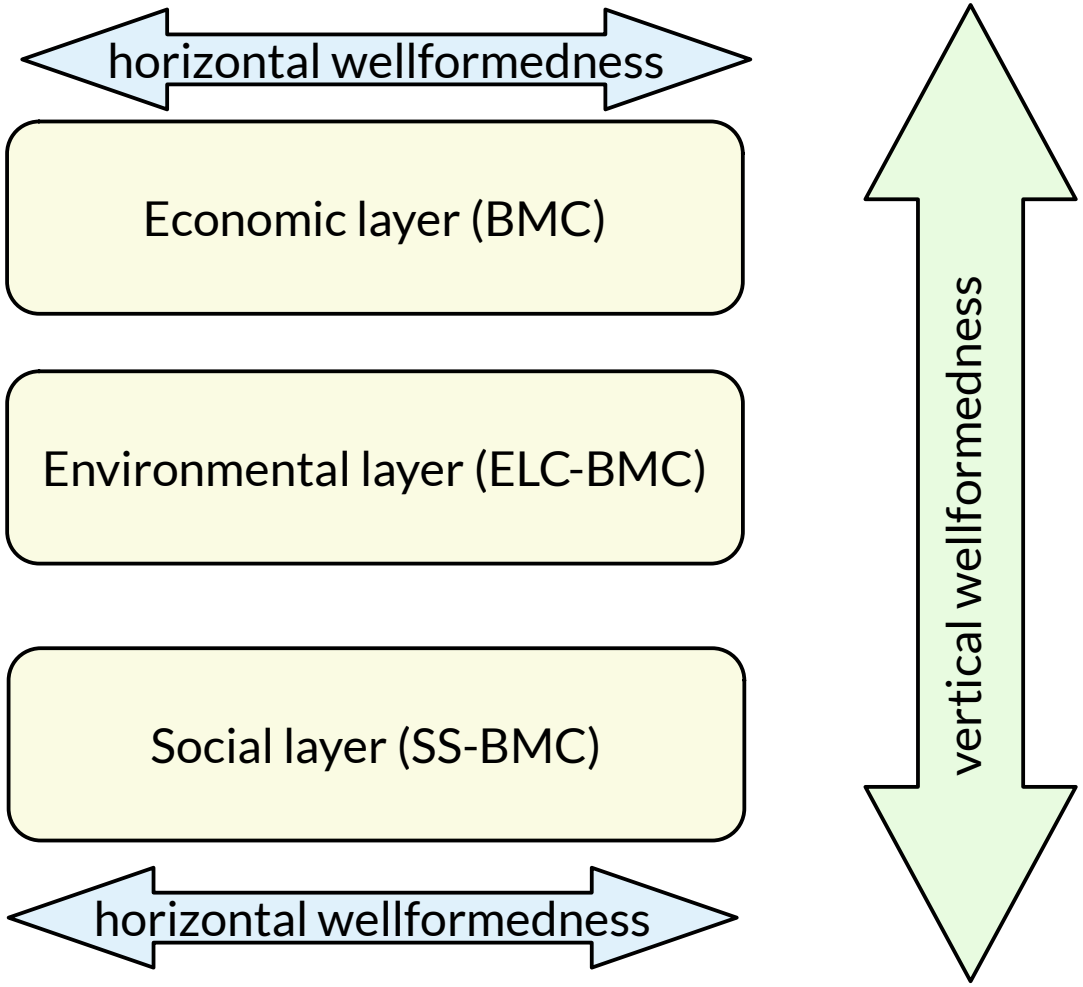
No support for canvas modeling (composition and engineering)

No support for staged feature configuration with suppliers

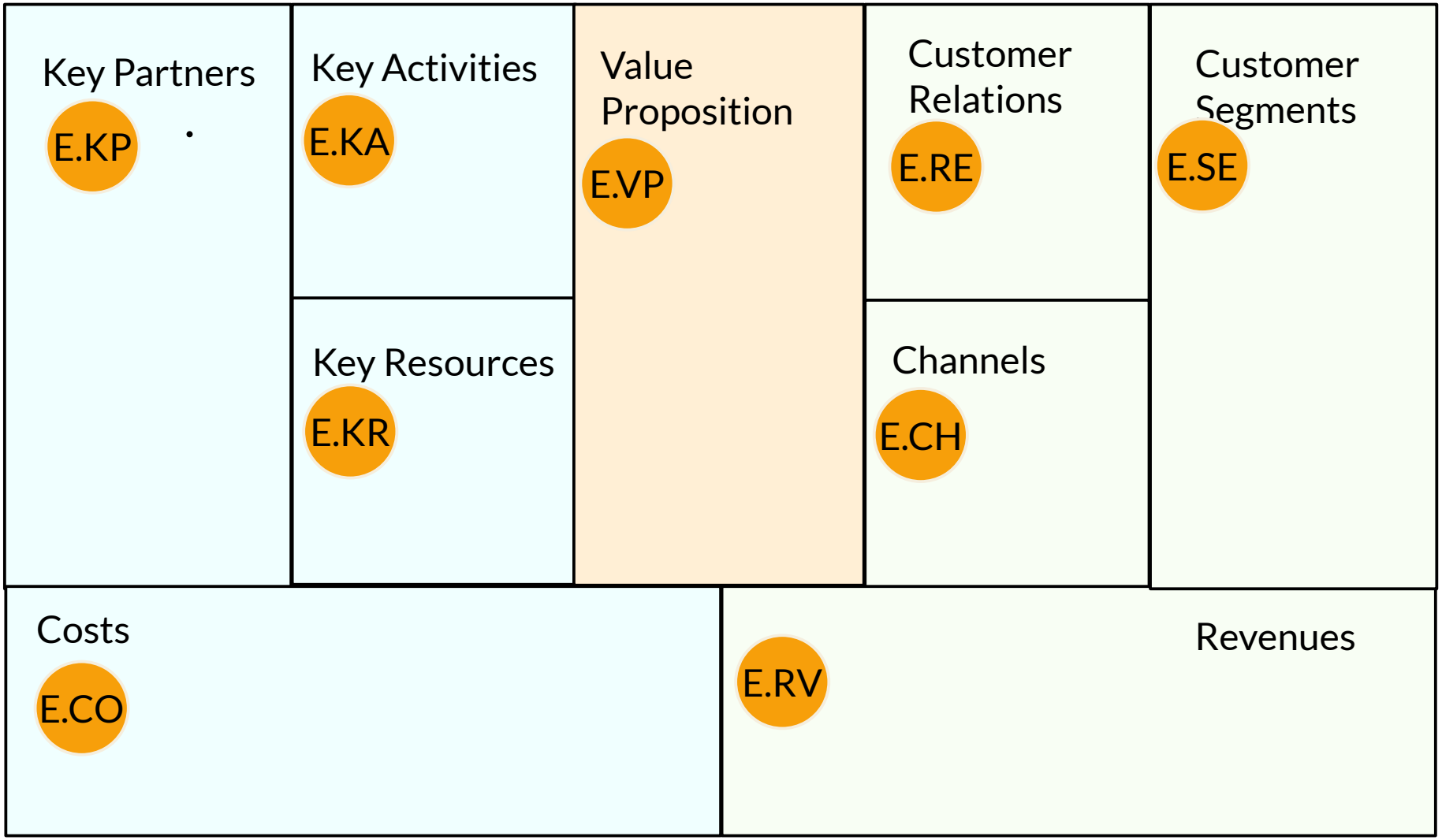
No support for grading and metrics

The Triple Layer BMC [Joyce]

- Designing economic, sustainable and social products

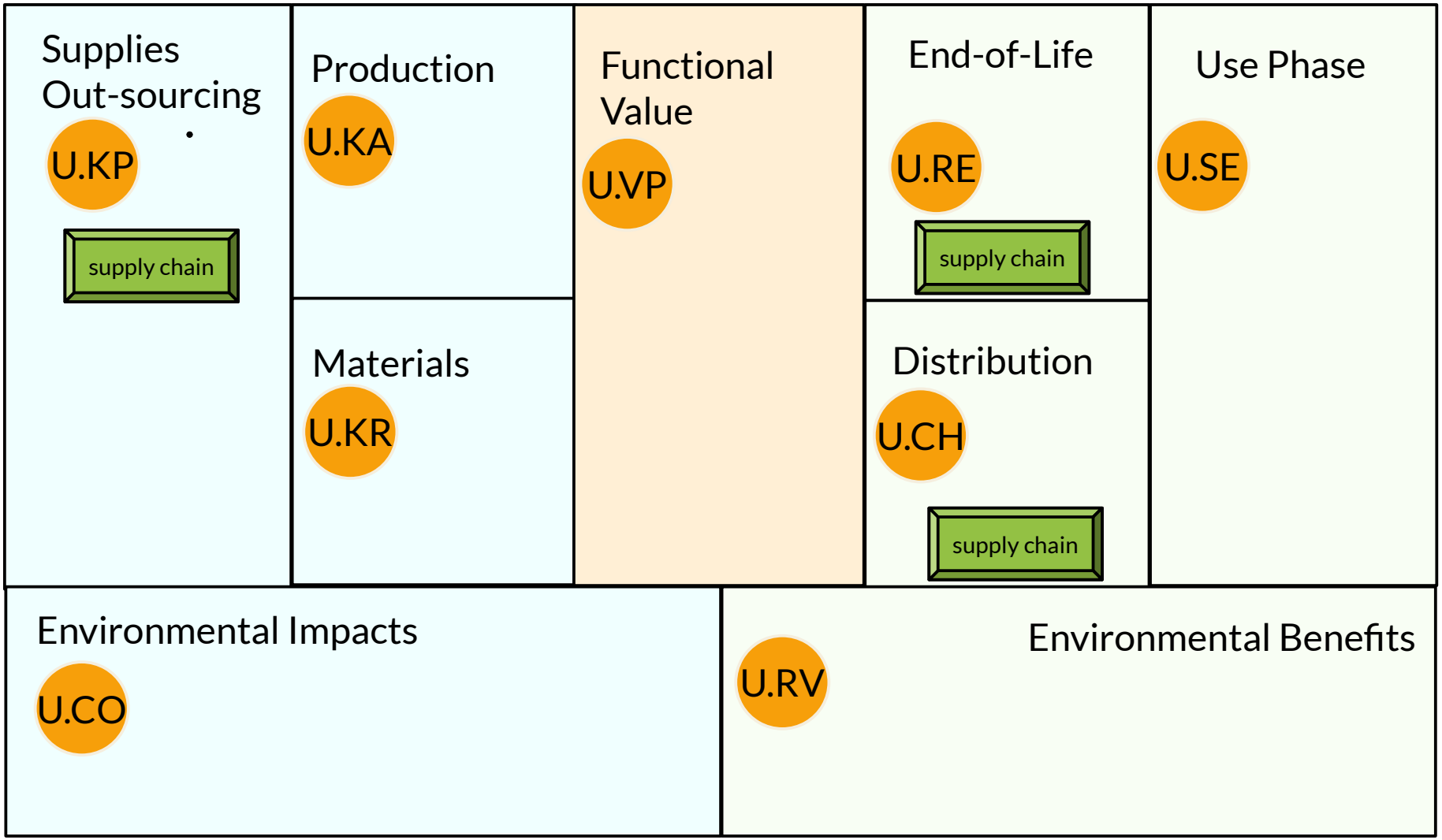


BMC (economic layer)



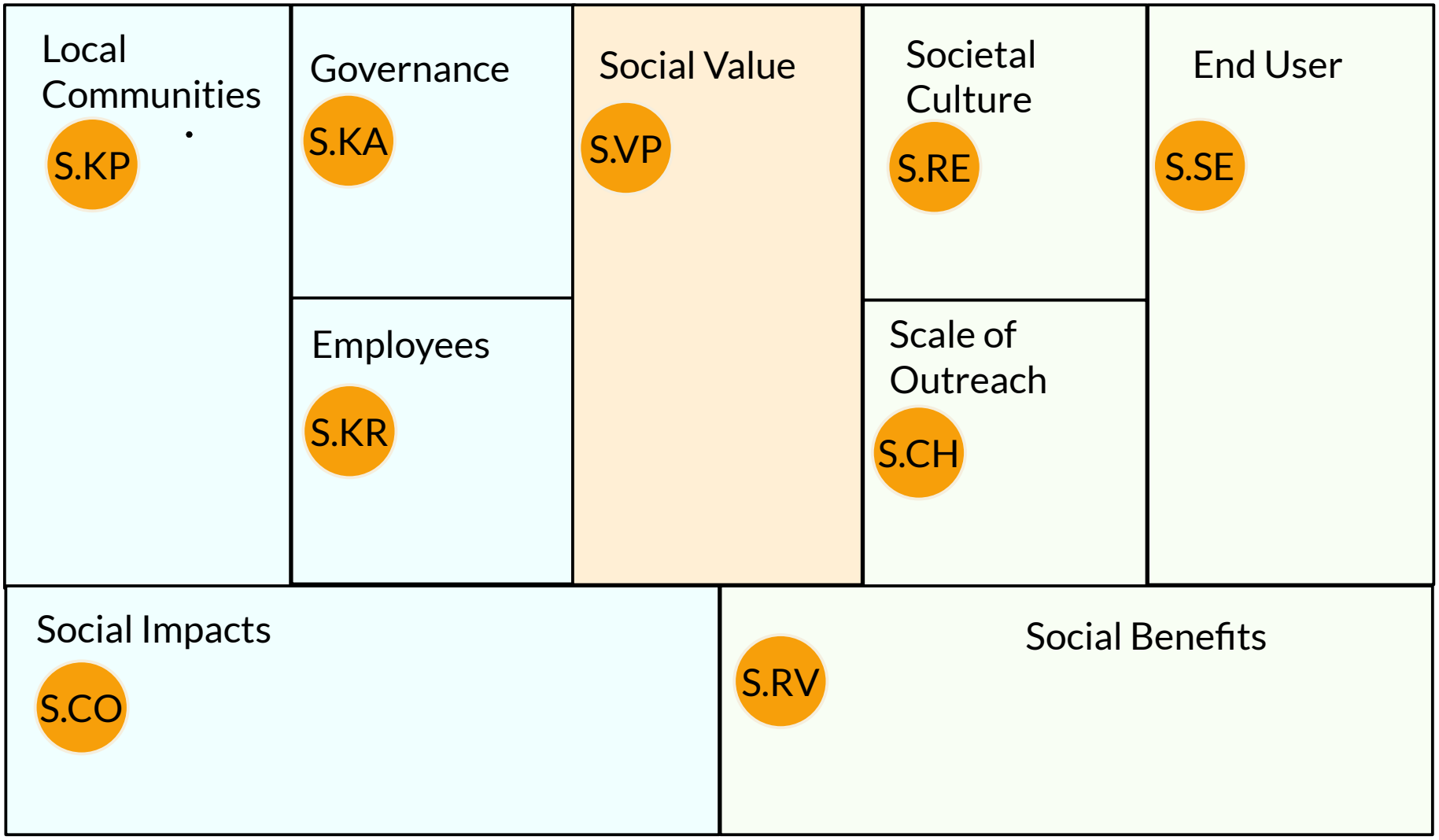
Environmental Life Cycle BMCanvas (environmental, Umwelt layer)

- What is the environmental value of the product (U.VP)?



Social Stakeholders BMCanvas (social layer)

- What is the social value of a social business company?



Horizontal Wellformedness (Consistency)

- There is a simple consistency algorithm:
- `forall field in Fields: compare E.field to U.field to S.field`

- The TMBMC generates much larger value trees that the BMC.
  - How are feature trees influenced from these larger value trees?
  - Some economic values become red due to the social and environmental values.
    What does this mean?

- Excercise: in the paper [Joyce], Nespresso TLBMC is discussed with aluminium capsules. Put up a new TLBC for coffee pads in filter bags (compostable), and compare the TLBMC, in particular the environmental layer.

The End

- Explain the difference of a BMC and a TLBMC. What is vertical consistency?
- How do you distribute features to your supply chain?
- Which tests do you need if you delegate a subtree of the feature model to a supplier?