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Software product-line evaluation in the large

Understanding product line maturity in an organization

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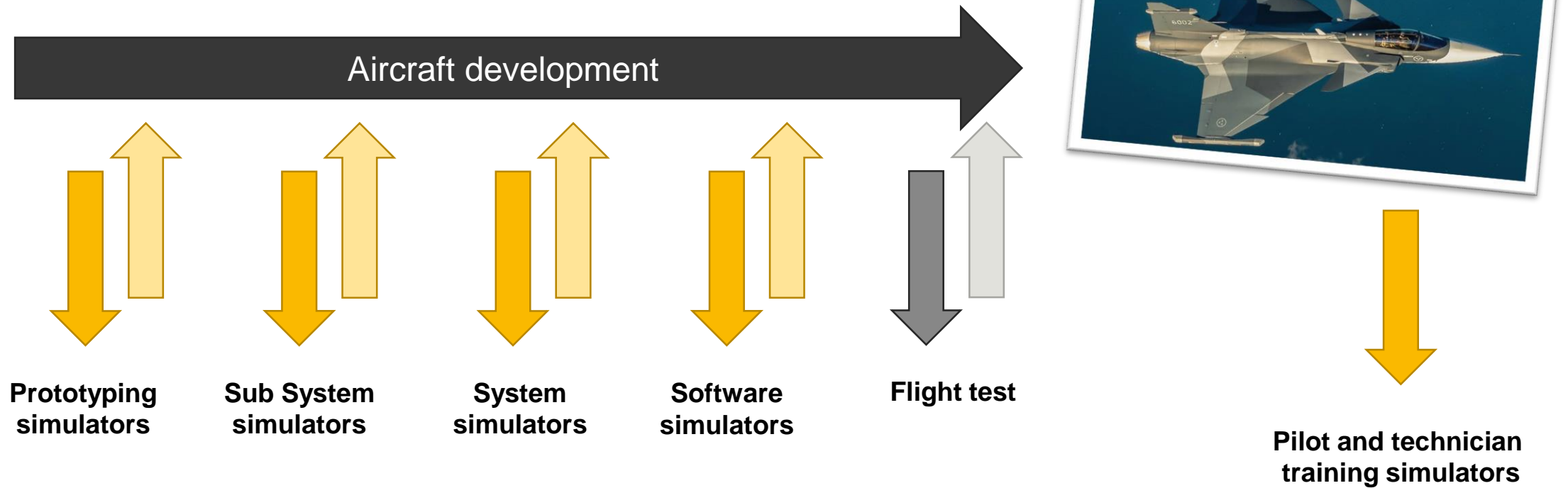


What we do – Saab Aeronautics

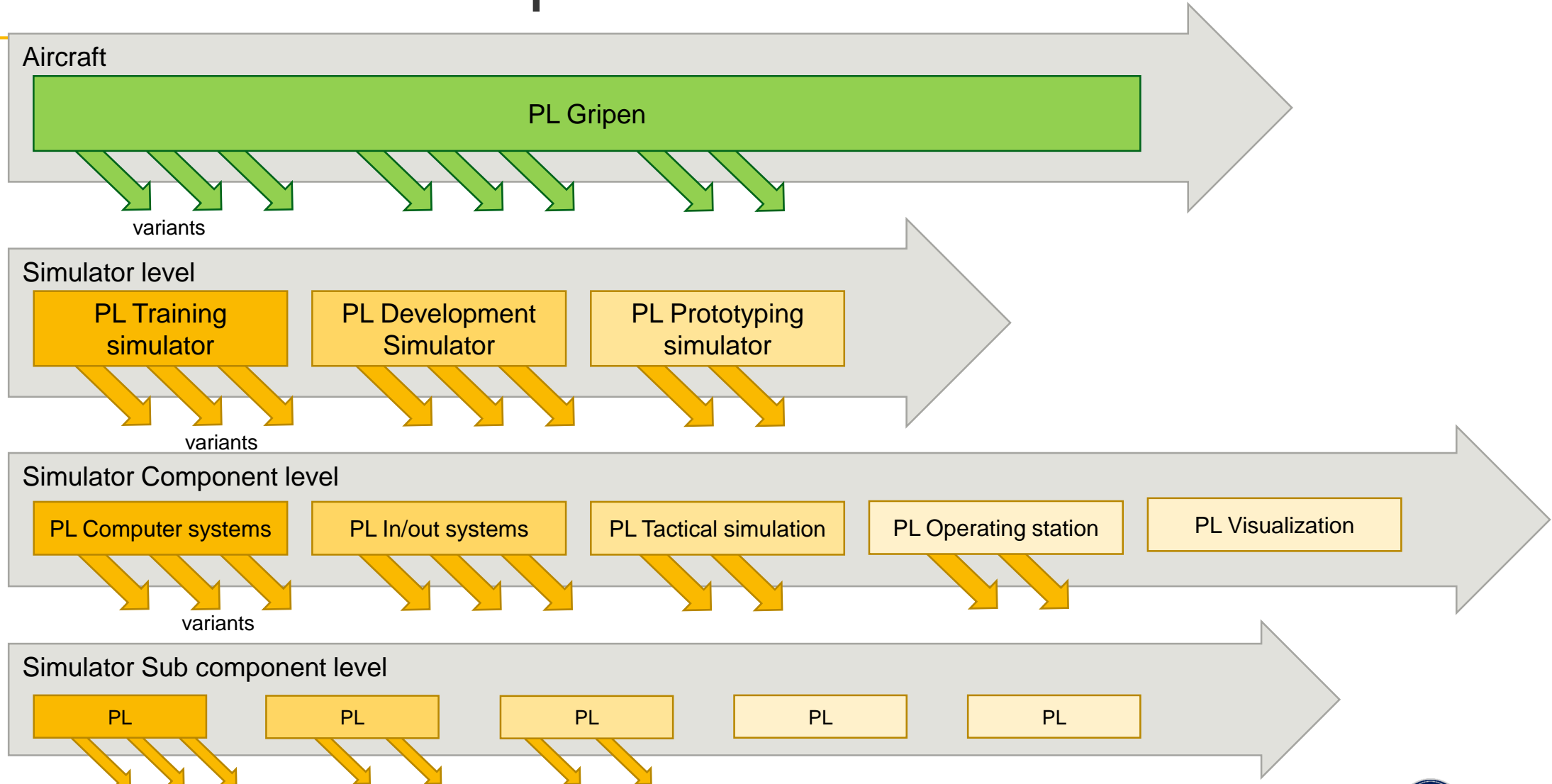
Developing and producing aircrafts for more than 80 years



Simulators

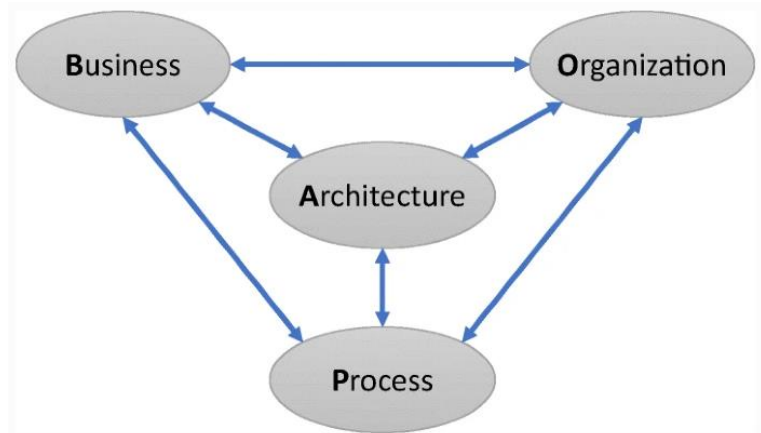


Product lines of product lines

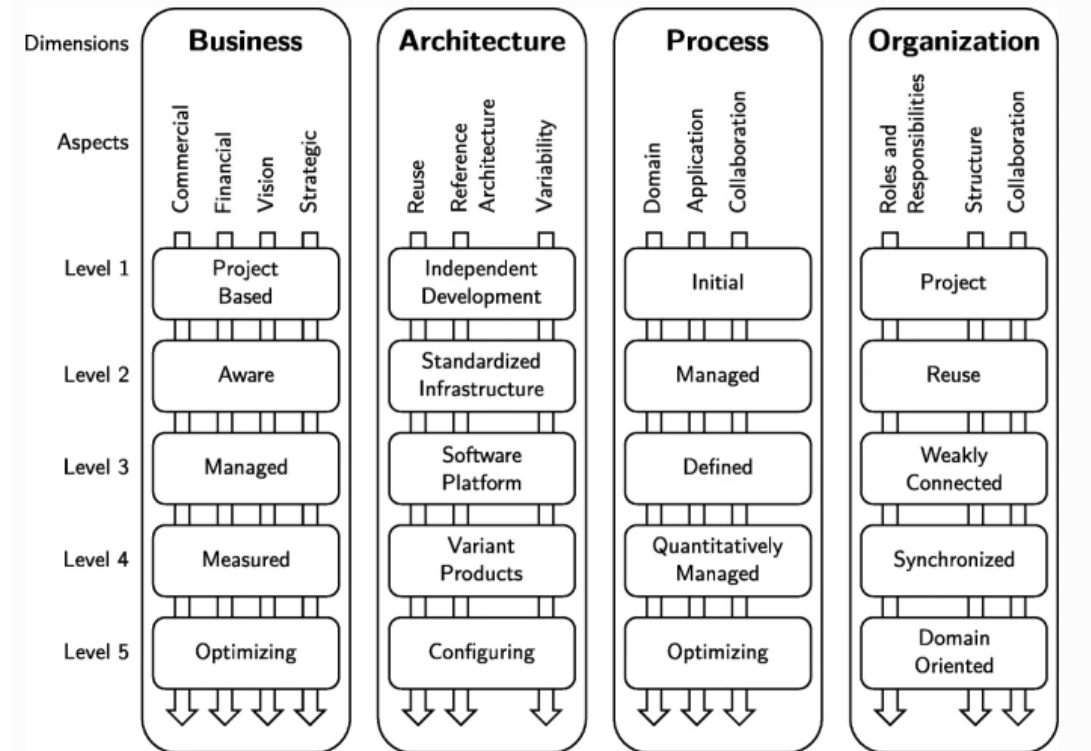


How to evaluate the maturity of a product line?

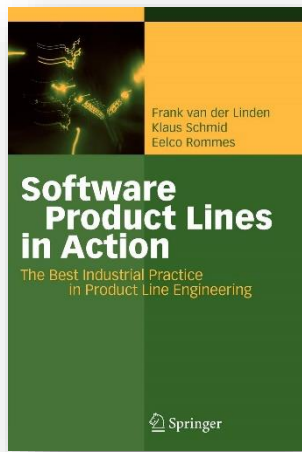
- *Family Evaluation Framework (FEF)*



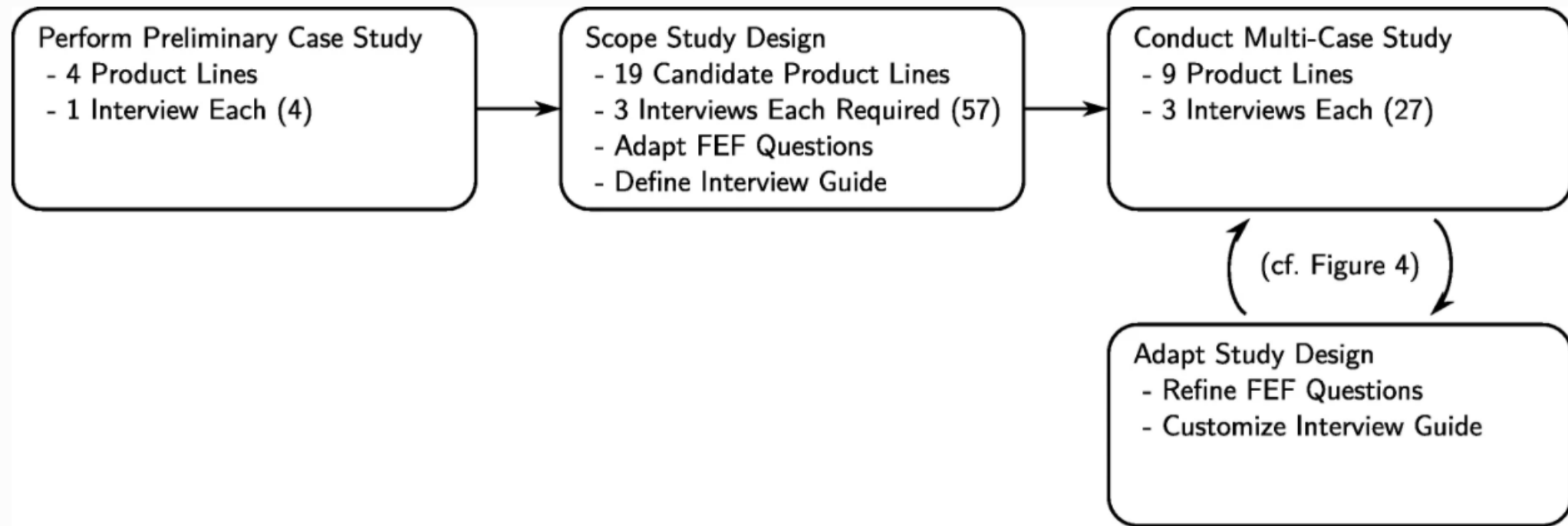
The BAPO model, illustrating key concerns of SPLE and their inter-relations



The family evaluation framework, adapted from van der Linden et al. (2007)

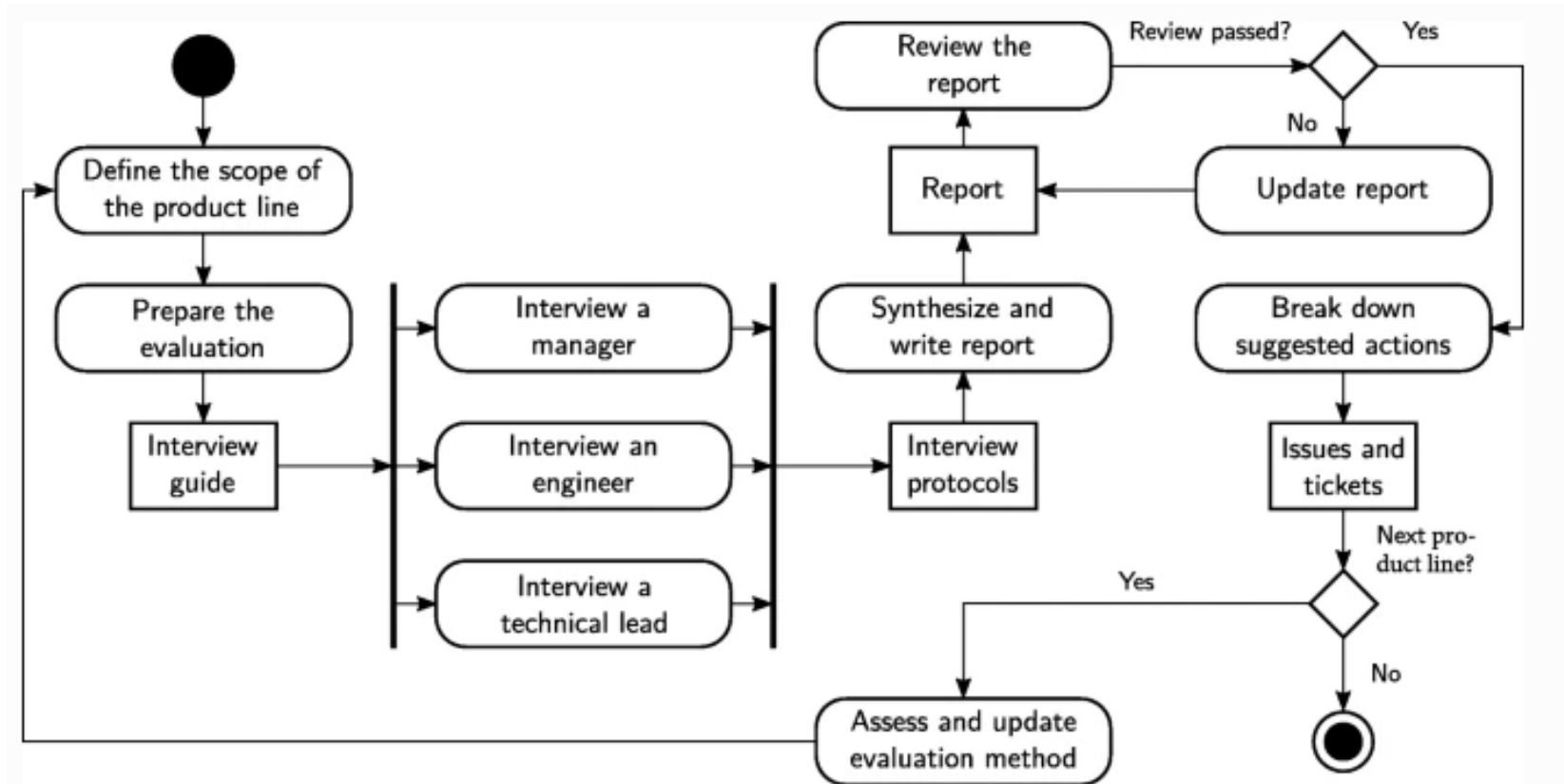


Our implementation of the FEF



Overview of the study design

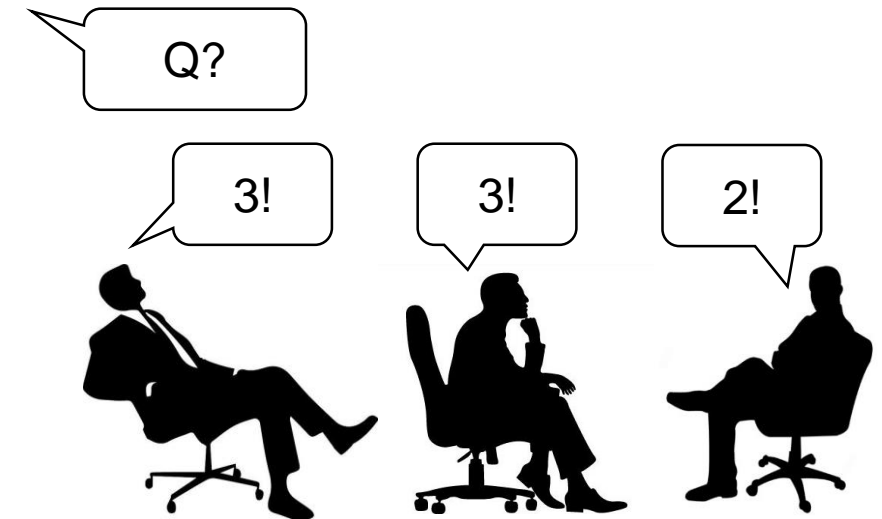
The workflow of the assessment method



The workflow of the assessment method

Example of the 67 adapted FEF questions:

- Are the systems developed, planned, and marketed as single systems or as a product line? (M)
- Have you calculated the benefits of using SPLE? In time/effort, time-to-market, and investments? (M)
- What strategies for inactive features are used? Are they included in the delivery, but disabled? How are they disabled? Is the feature removed? Are both, the feature and its interface, removed? (T, E)
- Are you separating data and algorithms or otherwise trying to minimize the amount of duplicate code between variants? (T, E)
- ...



M = Manager

T = Technical lead

E = Engineer

Analysis after the interviews

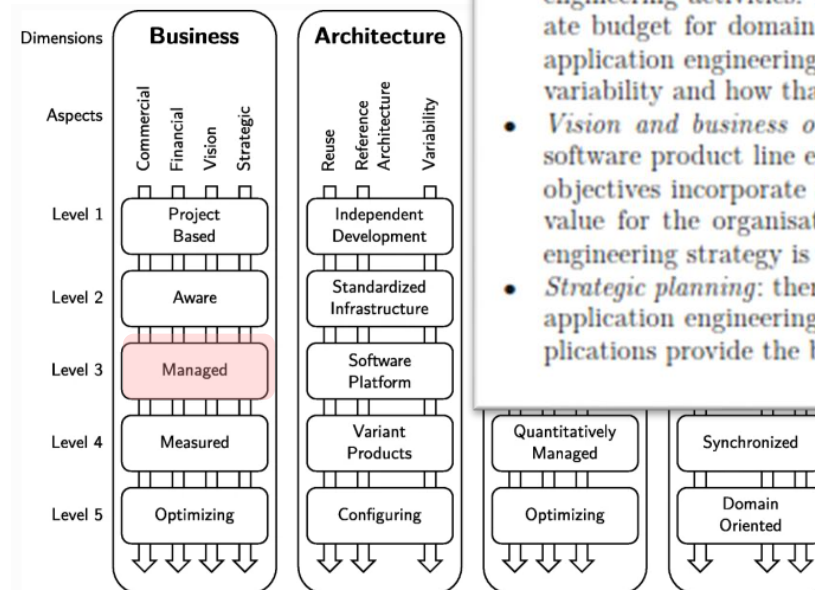
- The report is more important than the levels in the BAPO scale
- Report (~10 pages)
 - B, A, P, O
 - Results
 - Suggested actions
 - Summary

Example from "Product Lines in Action".
Business Dimension, level 3.

6.3.3 Level 3: Managed

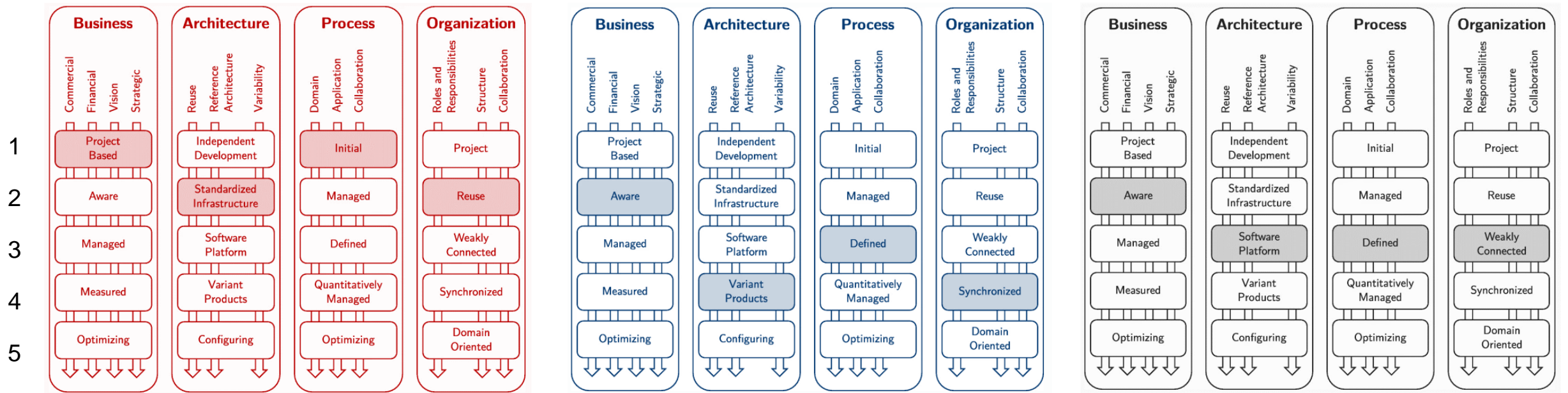
At this level, software product line engineering is part of the business strategy. Management takes control of the execution of corresponding activities. It recognises the benefits and drawbacks of software product lines.

- *Commercial*: the expected return on investment drives the marketing, sales and development of software product line products. Marketing addresses the user values of having a large amount of variability for low costs.
- *Financial*: software product line engineering is influencing the investment decisions. There is a well-defined budget for domain and for application engineering activities. There is an institutionalised mechanism to generate budget for domain engineering by the sales of systems produced by application engineering. There is an awareness of the costs and profits of variability and how that generates a return on investment.
- *Vision and business objectives*: the top management strongly supports software product line engineering. The organisation's vision and business objectives incorporate in a qualitative way the software product line, its value for the organisation and its evolution. The software product line engineering strategy is visible to the organisation.
- *Strategic planning*: there are separate plans and roadmaps for domain and application engineering. The plans are related, and commonalities in applications provide the basis of the domain engineering plan.



The family evaluation framework, adapted from van der Linden et al. (2007)

Example results



Summary of experiences

RQ1.1: Operationalization

For the operationalization and tailoring, we experienced that it was helpful to:

- *Understand and define the scope of each product line before the actual assessment.*
- *Adapt the questions of the FEF towards the organization's needs and domain.*
- *Unify terminology and explain the concepts to the stakeholders.*
- *Involve different stakeholders into the assessment of a product line.*

Treat every product line uniquely and get to know the product line before evaluating it.

RQ1.2: Information Elicitation

To elicit information, we found it valuable to:

- *Conduct semi-structured interviews with different stakeholders.*
- *Assign questions based on each interviewee's role and knowledge.*
- *Document the responses and make them visible to the interviewee.*

Be open to learn more than you ask for in the evaluations. You can not predict everything.

RQ1.3: Information Analysis

While analyzing the available information, it was important to:

- *Synthesize information from all interviews to assess FEF levels.*
- *Consider discrepancies between answers in particular.*
- *Evaluate and update the results together with the stakeholders.*

The ones working in the product line are the experts, use their knowledge.

RQ1.4: Actions

To decide on actions based on the FEF assessment, we considered it valuable to:

- *Derive actions with the stakeholders and break them down into smaller stories.*
- *Prioritize actions according to responsibilities and goals.*
- *Provide feedback on the performance of implemented actions.*

Make FEF an natural part of the goals and improvement process for the product line.

Summary of experiences

RQ2.1: Challenges

For applying the FEF, we experienced that it can be challenging:

- *To distinguish between domain and application engineering, which may be tangled.*
- *To focus on the FEF assessment during interviews, due to other legacy problems.*
- *To align other software engineering practices with SPLE to convince interviewees that SPLE can be successful.*
- *To identify problems that occur outside of—but affect—the product line.*
- *To justify why the FEF assessment and the proposed actions should be applied.*
- *To manage change requests by propagating them to the responsible stakeholders.*

RQ2.2: Benefits

Applying the FEF had the benefits of:

- *Disseminating SPLE knowledge among the stakeholders of a product line.*
- *Connecting stakeholders by providing a unified report as knowledge base.*
- *Identifying shortcoming in the BAPO dimensions based on a structured assessment.*
- *Defining roadmaps for missing domain-engineering activities of a product line.*
- *Setting goals for product lines that are comparable.*
- *Lowering maintenance and development costs based on the proposed actions.*

Challenges:

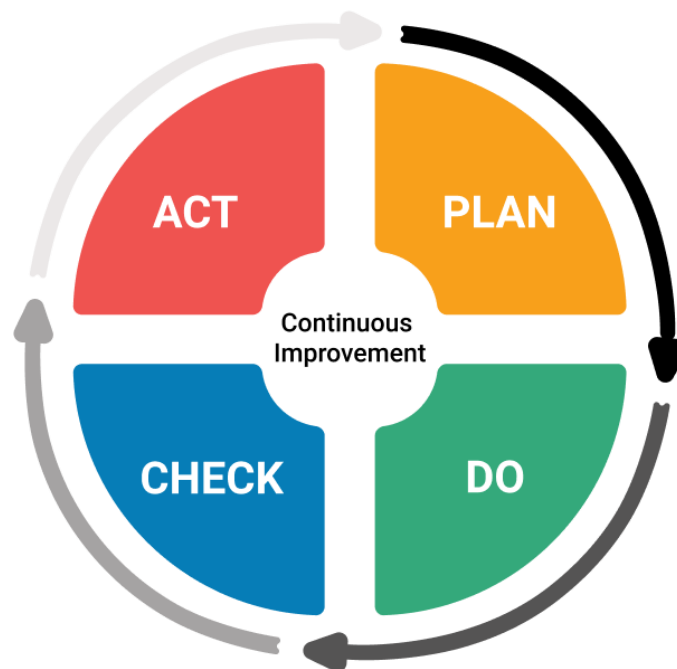
FEF is important to the evaluator, but for the product line it is just a tool among many. Everyone can not know everything about the FEF and PLE/SPLE. Take the time to explain reasons and purpose during the interviews.

Benefits:

Spreading SPLE knowledge and connecting all aspects/roles in the development organization to a common goal.

Lowering maintenance and development costs.

The end



Thank you!

- Many thanks to all authors and contributors of [this paper!](#)



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