A Systematic Review on Scoping Definition Approaches in Software Product Lines

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PUB. TITLE: A Practical Guide to Product Line Scoping

CRITERIA: [Fill in this blank with explanation about the criteria this papers fits in – EXCLUSION OR INCLUSION]

1 - SPL approaches or processes which address scope definition. Investigate approaches and process that show clearly, with specific activities and guidelines, how the scope is identified. The purpose is to investigate which activities are used and their characteristics.

2 - Studies that present metrics or cost models for scope definition in SPL. This criteria aims to identify as the approaches measure the effort associated at the implementation of the SPL and the costs related to it.

RESEARCH QUESTIONS

Q1. What activities are addressed for scope definition in the software product lines approaches and processes?

The approach consists of three phases: product line mapping, domain potential assessment and asset infrastructure scoping. However, the scope process comprises customizations required in different product line settings, impacting in some aspects, this are:

- **Optional Phases**: The phases domain potential assessment and reuse infrastructure scoping are optional. Furthermore, they can either be performed on the complete product line, a specific part of the product line, or a sub-domain. In contrast product line mapping applied to the complete product line is mandatory.

- **Customizable Activities**: Basically, all activities are customizable and variable in their internal realization. They can be performed offline only, or together with domain experts, either in interviews or in workshops.

- **Optional Input**: Some input artifacts are labeled as optional. However, within the customization of the scoping process for a specific product line setting the dependencies among the three phases have to be considered.

The phases:

Product Line Mapping: This phase is mandatory in the approach. It have how goal to identify the planned products in the product line and to identify their features.

The activities of this phase and their respective inputs and outputs mandatory are:

- **Identify Products** – outputs: products description
- **Plan Product Release** – inputs: products description; outputs: product release plan, which is a graphical representation of the release dates of the products as well as their interdependencies
- **Identify Features** – inputs: products description; outputs: feature list
- **Identify Domains** – inputs: products description and feature list; outputs: domain list
- **Specify Product Feature Matrix** – inputs: product description, feature list and domain list; outputs: product feature matrix
- **Asses Features** – inputs: product release plan and product feature matrix; outputs: prioritized and optimized product feature
**Domain Potential Assessment:** This phase is optional in the approach. It have how goal to give recommendations for a product line strategy in the different sub-domains.

The activities of this phase and their respective mandatory inputs and outputs are:

- **Describe Domains** (if not already done during the product line mapping activity) – inputs: domain list; outputs: domain description
- **Identify Product Line Goals** – outputs: product line goals
- **Prioritize Product Line Goals** – inputs: product line goals; outputs: prioritized product line goals
- **Assess Domain** – inputs: prioritized product line goals; outputs: domain assessment report

**Reuse Infrastructure Scoping:** This phase is optional in the approach. It have how goal to determine an appropriate asset scope for the product line, which means the concrete planning of the reuse infrastructure under scoping aspects.

The activities of this phase and their respective inputs and outputs mandatory are:

- **Develop Characterization Metrics** – inputs: product feature matrix and product line goals; outputs: characterization metrics
- **Identify Existing Assets** – outputs: asset list
- **Quantify Product Feature Matrix** – inputs: asset list and characterization metrics; outputs: quantified product feature matrix

### Q2. Do the SPL approaches optimize scope?

Yes. The approach prioritize and optimize the product feature matrix. The approach cite which the prioritization can e.g. be done with a modification of the Kano-Model, which is part of QFD [Cohen, 1995] or with a customized QFD [Helferich et. al., 2005]. Further, the feature distribution in the different products (product portfolio scoping) can be optimized by using marketing-oriented models like.

### Q3. What are the types of scope used by the approaches?

The approach show how identify the three types of scoping: product portfolio scope, domain scope and assets scope. However, the focus is on the two levels **domain scope** and **asset scope**, product portfolio scope is seen as part of marketing science and thus only partially addressed.

### Q4. Which stakeholders are involved in the scope definition process?

The study does not cite stakeholders, but identify roles for their scope process, this are: **scoping expert**, **domain experts** with technical or marketing knowledge, and the **product line manager**. The scoping experts are one or more persons that drive and customize the scoping activities and conduct workshops and interviews. They should not be part of the development team itself as they should push an external view on the products and domains. The domain experts provide their knowledge on the products and the application domain from technical or marketing side and the product line manager provides an overview on the product line, its goals and embedding in the organizational environment.

### Q5. Do the approaches use specific metrics or cost models for scope definition?

Yes. The approach utilize characterization metrics, which possibilitate the development of a quality model that measures economic factors like effort, risk etc.

### Q6. Are the approaches customizable?

Yes. The approach makes customization of its activities depending of the context. It define five categories for the customization factors: operational context, domain characteristics, integratable artifacts, enterprise context and resources.

### Q7. Do the approaches treat the new perspective of agile SPL planning?

No. The approach does not use agile practices in its process.
Q8. How are the approaches related with SPL development?

The approach does not have specifics activities to define scope according with the different development stages.

### QUALITY CRITERIA ASSESSMENT

<table>
<thead>
<tr>
<th>ID</th>
<th>QUALITY CRITERIA - APPROACHES</th>
<th>SCORE</th>
<th>AVAILABLE VALUES</th>
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<tbody>
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<td>Are the metrics defined?</td>
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<td>Yes.</td>
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<td>QC2</td>
<td>Are the guidelines or activities described?</td>
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<td>QC4</td>
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<td>QC5</td>
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<td>QC7</td>
<td>How well is the study detailed?</td>
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**TOTAL**: 5.5

### ANALYSIS

This approach is the more complete between the approaches analyzed, it show the activities of clear form, defining inputs, outputs, roles, etc. Besides, it consider a aspect important in scoping of software product lines, the scope customization, which identify the scope according with the scenario of the software product line and the categories for the customizations factors. The categories for the customizations factors are:

- **Operational Context**: Operational and projects constraints describe how the scoping activities are related or integrated (best case) in the project portfolio of the organization.
- **Domain Characteristics**: Domain characteristics are factors which relate to the domain itself and are independent of implementation aspects.
- **Integrable Artifacts**: This category indicates the presence or absence of a particular artifact relevant to the scoping activities and indicates existing artifacts that can be integrated in a new product line.
- **Enterprise Context**: This category captures how the structure and maturity of the organization itself influences the scoping activities.
- **Resources**: This category comprises the skills and the existing knowledge of the stakeholders involved in the scoping activities and the resources available for the scoping activities.
The approach too use characterization metrics which possibilitate the development of a quality model that measures economic factors like effort, risk etc. However, does not define this metrics, it too does not treat of way complete the social problem.