SLR on SPL Scoping - Supplementary Data

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1. Complementary Material

Table 1 presents all activities identified in the approaches analyzed. These activities are grouped by phase (when it was possible). Table 2 shows the SPL scoping concepts identified, their definitions and the traceability with each activity identified in the approaches.

Table 1: Approaches activities

Approach	Phases	Activities
PuLSE	A) Preparation	1. Pre-assessment meeting 2. Initialization 3. Assessment Team Identification 4. Planning and scheduling 5. PL-Mapping
	B) Execution	1. Opening Briefing 2. Domain Assessment 3. Preliminary Results 4. Interviewee Feedback
	C) Analysis	1. Final Report Preparation 2. On-site final meeting
Kishi *et al.*	NM	1. Identify the requirements 2. Define the design policy 3. List the architectural candidates 4. Determine the Preference of Each Architectural Candidate 5. Examine the Architectural Candidate's Applicability for Each Product 6. Examine the Candidates for the SPL Scope 7. Determine Preferences among the Candidates 8. Define Scope
FORM	NM	1. Marketing and Product Plan 2. Product Plan Refinement 3. Feature Modeling 4. Conceptual Architecture Design 5. Design Object Modeling 6. Architecture Refinement 7. Component Design
GOA	NM	NM
DRM	A) SPL Scoping	1. Business Investigation 2. Candidate Products Selection 3. Development of SPL scenarios 4. Feature Attachment
	B) Domain Requirements Analysis	1. Goal Discovery 2. Scenario Authoring 3. Feature Attachment

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Approach	Phases	Activities
	C) Commonality and Variability Analysis	1. Commonality and Variability Analysis 2. Feature Modeling
Park *et al.*	NM	1. Commonality analysis 2. Variability analysis 3. Variability Dependency Analysis 4. Domain Model Refinement 5. Economical Evaluation of Core Asset Scope.
Traceability Map	A) Core Asset Engineering	1. SPL Scoping 2. Domain Analysis 3. Core Analysis
FARE	A) Prepare	1. Establish Analysis Scope 2. Carry out Feasibility Study
	B) Plan	1. Prepare checklists for assessment 2. Explain Checklists and Processes to Participants 3. Identify Domain Boundaries
	C) C&V Analysis	1. Identify Commonalities 2. Identify Reuse Opportunities
	D) Quantify	1. Generate Variation Parameters 2. Carry out Cost-Benefit Analysis
	E) Review	1. Apply Checklists 2. Check consistency of market requirements 3. Highlight areas of improvement
Her *et al.*	NM	NM
Noor *et al.*	NA	1. Review process objectives and reuse focus 2. Review SPL feature map 3. Identify logical components 4. Map technical solution packages to logical components 5. Map features to the logical components 6. Review reusability metrics of logical components 7. Evaluate the reuse potential of logical components 8. Prioritize logical components for reuse.
DRAMA	NM	1. Identifying components 2. Calculating the priority of components 3. Calculating the priority of quality attributes 4. Modeling domain architectures
Planning Game for SPLE	A) Exploration	1. Customer creates User Stories (US) with prioritization 2. Developers add estimated time and effort in the US 3. Generate prioritized set of US
	B) Commitment	1. Sort US by value and risk 2. Derive the scope from selected US
	C) Steering	1. Conduct planning game for iterations
CADSE	NM	NM
CAVE	A) Preparation	1. Collect user documentation 2. Divide documents into manageable parts 3. Check manageable parts
	B) Analysis	1. Apply patterns 2. Produce invalidated SPL artifacts
	C) Validation	1. Validate and change invalidated artifacts 2. Generate product map
COPE+	A) Voice of the customer analysis	1. Customer voting on features 2. Clustering of Customers 3. Identification of product variants for each cluster configuration
	B) Structural impact analysis	1. Identification of features impact 2. Setting up the Genetic Algorithm (GA) 3. Features sequence generation using GA
	C) Similarity Analysis	1. Conformance of product variant implementation

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Table 1: Continued

Approach	Phases	Activities
PLiCs	NM	1. Specify Customized Product Lines (CPL) 2. Set up CPL 3. Specify CPL Product 4. Generate CPL Product
PLEvo-Scoping	A) Preparation for volatility analysis	1. Establish the time-frame restriction 2. Identify/update system components related to SPL products
	B) Environment Change Anticipation	1. Identify the actors that play a role in the PL's environment 2. Identify and characterize facts that may be caused or realized by the identified actors 3. Verify the perspective of new actors playing a part in the SPL's environment 4. Classify facts according to their relevance
	C) Change impact analysis	1. Identify adaptation needs 2. Characterize adaptation needs 3. Classify adaptation needs according to relevance
	D) SPL evolution planning	1. Determine when and which adaptations are expected to be introduced 2. Analyze alternative solutions for dealing with adaptation needs 3. Select alternatives for dealing with the adaptation needs 4. Revise the SPL Evolution Map
Cavalcanti *et al.*	NM	NM
RiPLE	A) Pre-Scoping	1. Pre-scoping meeting 2. Analyze market
	B) Domain Scoping	1. Analyze domains 2. Review domains 3. Identify sub-domains 4. Analyze sub-domains 5. Prioritize domains and sub-domains
	C) Product Scoping	1. Construct user stories 2. Identify features 3. Features review meeting 4. Identify products 5. Construct product map 6. Validate product map
	D) Assets Scoping	1. Create metrics 2. Apply metrics 3. Prioritize product map
VB Portfolio Opt.	NM	1. Select Preliminary Features 2. Analyse Customer 3. Analyse Cost 4. Analyze Competitors 5. Optimize 6. Decide 7. Realize
Acher *et al.*	NM	NM
Bartholdt and Becker	NM	NM
Gillain *et al.*	NM	1. Determine the relevant customers and what their needs are 2. Defining what the products are constituted of 3. Identify conditions for the product to realize the tasks
Pro-PD	A) Initiate project	1. Translate Customer Requirements 2. Coverage analysis 3. Customer negotiation 4. Create the product requirements 5. Verify the product requirements 6. Define role and task structures
	B) Identify and refine requirements	1. Find and outline requirements 2. Create the product test cases 3. Allocate requirements 4. Create guidance for decision makers
	C) Derive products	1. Component development 2. Component testing 3. Component integration 4. Integration testing
ARF-E	NM	NM

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Table 1: Continued

Approach	Phases	Activities
Cruz *et al.*	NM	1. Inferring the cost of each asset 2. Calculating the asset relevance for each segment 3. Calculating candidate products for each segment 4. Qualifying candidate products 5. Grouping the best product of each segment
FeDRE	NM	1. Scoping 2. Requirements Specification for Domain Engineering 3. Requirements Specification for Application Engineering.
Nobauer *et al.*	NM	1. Select products for analysis 2. Define the scope of the analysis 3. Define how similarity between selected configuration settings are calculated 4. Perform similarity analysis 5. Draw conclusions
Sierszecki *et al.*	NM	1. Portfolio 2. Requirements management 3. Design and implementation 4. Testing
SPLICE	A) Portfolio planning	1. Select Business Goals and Marketing Strategies 2. Identify products 3. Identify major features 4. Build product map and feature model 5. Prioritize major features
	B) Release development	1. Release planning 2. Sprint development
SPLBench	A) Requirements	1. Elicitation 2. Weighting 3. Transformation of requirements to language
	B) Features	1. Transformation of domain FM to XML 2. Instantiation of application FM
PPSMS	A) Analyzing customer needs	1. Classify customer preferences using the Kano's model 2. Prioritize features using the absolute importance values
	B) Analyzing features	1. Analyzing features for potential commonality and variability
	C) Optimization	1. Construct mathematical model 2. Optimize with simulated Annealing 3. Analyze non-dominated solutions
Ianzen *et al.*	A) Scoping	1. Feature identification 2. Feature Classification
	B) Product engineering	1. Evaluate variabilities and commonalities 2. Decide to include the features
Karimpour and Ruhe	NM	1. Plan the portfolio scoping based on high profits goals 2. Incorporate uncertainty into SPL scope modelling 3. Perform optimization by simulating changes in the environment
Neto *et al.*	NM	1. Calculate features' cost 2. Calculate features' relevance 3. Generate candidate products 4. Calculate products' suitability 5. Select best products
Domain analysis process	A) Domain analysis	1. Gather products and information sources; 2. Establish criteria for reuse 3. Collect and analyze documentation 4. Prepare initial interview documents 5. On-site interview sessions 6. Evaluate results and identify opportunities

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Approach	Phases	Activities
	B) Economic analysis	1. Create business case calculation
ISPL	A) Domain engineering	1. Business feasibility study 2. SPL scoping 3. SPL requirements analysis 4. Security policy and modeling 5. SPL design and architecting 6. SPL implementation 7. SPL Testing
AgiFPL	A) Domain requirement engineering	1. Problem space 2. Upgrade domain requirements
	B) Domain design	1. Domain scoping 2. Domain modelling
	C) Implementation	1. Planning meeting 2. Production flow 3. Review 4. Retrospective
CoMeS	NM	1. Initial meeting 2. Explore existing products 3. Identify features 4. Identify products sub-domains 5. Specify product map 6. Establish objectives 7. Quantify product map and domains 8. Closure meeting
Small-SPL	A) Scoping	1. Study the objective domain 2. Identify needs 3. Explore existing solutions 4. List possible solutions and Identify features 5. Establish common features 6. Recognize variable features 7. Diagram feature model
APLE	A) Planning Meeting	1. Identify Future Configuration 2. Select Base Configuration
	B) Map use requirements	1. Customer evaluation 2. Customer negotiation
	C) Sprint backlog	1. Implementation 2. Daily meeting
	C) Sprint review	1. Review 2. Retrospective

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Table 2: Relation Between Scoping Concepts and Approaches

Concept	Description	Activities
Architecture Definition	Define a high-level structure to be used for all products [1].	PuLSE B.3 / Kishi *et al.* 5 / FORM 4 and 6 / GOA / Traceability Map A.3 / Her *et al.* / DRAMA 4 / PLiCs 3 / RiPLE D.3 / Bartholdt and Becker / Pro-PD D.1 / ARF-E B.2 / Sierszecki *et al.* 3 / Domain Analysis Process A.1 and A.3 / ISPL A.5 / AgiFPL B.2 / APLE A.2
Scoping Metamodel	Make use of a meta-model to define the structure and constraints of SPL scoping	CADSE / PLiCs 1 / Cavalcanti *et al.* / VB Portfolio Opt. 7 / Traceability Map 2 and 3 / FeDRE 2
Cost Models	Define/Use mathematical models for calculating costs related with the SPL development [2].	Park *et al.* 5 / FARE D.2 / DRAMA 2 and 3 / VB Portfolio Opt. 3 / Gillain *et al.* 1 / Cruz *et al.* 1, 2 and 3 / PPSMS C.1 and C.2 / Karimpour and Ruhe 1 / Neto *et al.* 1, 2 and 4 / Domain Analysis Process B.1

Table 2: Continued

Concept	Description	Activities
Customer Needs	Understand and consider the needs of customers when scoping the SPL [3].	PuLSE A.2 and B.1 / Noor *et al.* A.1 / DRAMA 3.1 / Planning Game in SPLE A.1 / PLiCs 1 / RiPLE A.1 and C.1 / VB Portfolio Opt. 2 / Bartholdt and Becker / Gillain *et al.* 1 / Cruz *et al.* 2 / Nobauer *et al.* 3 / SPLBench A.1 and A.2 / PPSMS A.1 / Karimpour and Ruhe 1 / ISPL A.1 and A.3 / CoMeS 1 and 8 / SPLICE A.1 / APLE B.1 and B.2
Metrics Definition	Define metrics to be used for measuring SPL scoping tasks or artifacts [2]	Park *et al.* 5 / Her *et al.* / Noor *et al.* 6 / COPE+ B.1 / Cavalcanti *et al.* / RiPLE D.1 and D.2 / Cruz *et al.* 2 and 3 / SPLBench 2 / PPSMS A.1 / Karimpour and Ruhe 1 / Neto *et al.* 2
Market Analysis	Analyze the market to understand the domain and identify competitor products	PuLSE A.2 / FORM 1 and 2 / GOA / DRM A.1 and B.1 / FARE A.1 and E.2 / DRAMA 1 / RiPLE A.2 / VB Portfolio Opt. 4 / Gillain *et al.* 1 / PPSMS A.1 / Karimpour and Ruhe 1 / ISPL A.1 / CoMeS 1 / Small-SPL A.1 / FeDRE 1 and 2 / SPLICE A.1, A.2, A.3, and B.1 / Domain analysis Process A.6 and B.1 / AgiFPL A.1, B.1 and C.3
Product Map	Maps the relation between features and products, usually represented as a matrix [4]	PuLSE A.5 / Noor *et al.* 5 / CAVE C.2 / PLEvo-Scoping D.4 / RiPLE C.5 and D.3 / ISPL A.2 / CoMeS 5 / FeDRE 1, 2 and 3 / SPLICE A.4
Candidates Analysis	Analyze candidate products or assets to be reused by the SPL [5]	PuLSE A.5 and B.2 / Kishi *et al.* 3, 4, 5, 6 and 7 / GOA / DRM A.2 / Traceability Map 1 and 2 / COPE+ C.1 / RiPLE C.4 and C.5 / VB Portfolio Opt. 1 and 5 / Acher *et al.* / Cruz *et al.* 4 / PPSMS A.2 and B.1 / Ianzen *et al.* A.2 and B.2 / Neto *et al.* 3 and 4 / SPLICE A.2 and A.3 / Domain Analysis Process A.1 and A.3 / APLE A.1 and A.2
Evolution Planning	Plan the evolution of the SPL based on the demand from new customer requirements [6]	PuLSE C.2 / Planning Game in SPLE C.1 / CADSE / COPE+ C.1 / PLEvo-Scoping D.1, D.2, D.3 and D.4 / RiPLE C.5 and D.4 / ISPL 1
Prioritize Products	Give higher/lower prioritization to products during SPL scoping.	Kishi *et al.* 4 and 7 / Noor *et al.* 2 / Planning Game in SPLE A.3 / RiPLE B.5 and D.3 / Cruz *et al.* 4 / PPSMS A.2 / CoMeS 7 / FeDRE 3 / SPLICE A.5 / AgiFPL B.1 and C.1

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