Toward Measuring the Success of Communities of Practice in Large-Scale Agile Software Development

Lixun Dai, Jan 27th, 2025, Master Thesis Final Meeting

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Outline

1. Motivation
2. Research Questions
3. Research Methodology
4. Results
5. Key Findings
6. Future Work

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1. Motivation

Rapid Changes Drive the Need for Agility

- Technology, markets, and customers change quickly
- Companies must react agilely to stay competitive

Agile Methodology Rise in Software Development

- Digital world demands agile development methods
- Small teams successfully use agile like Scrum

Scaling Agility Brings New Challenges

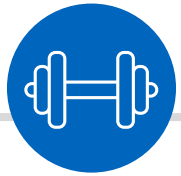
- Increased complexity from multiple teams and programs
- Coordination and knowledge sharing is difficult

I.F. Schlömer (2022), M. Franco, J. Guimarães, M. Rodrigues (2023)
Ö. Uludağ et al. (2022), R. Hoda, N. Salleh, J. Grundy (2018)
K. Hutter et al. (2023), M. Kalenda, P. Hyna, B. Rossi (2018)

1. Motivation

Communities of Practice Proposed as a Solution

- Allow knowledge exchange while preserving agility
- Address cross-team coordination and information siloing



Measuring Success is a Challenge

- Suitable measures are not clear yet in practice
- CoPs sounds useful but not proven in industries

Research Goal for this Thesis

- Identify characteristics that indicate CoPs are successful
- Investigate existing approaches for measuring
- Design a novel approach to measure the success

I. Monte, L. Lins, M.L. Marinho (2022) M. Paasivaara, C. Lassenius (2014) Monte, L. Lins and M. Marinho (2022), Ö. Uludağ et al. (2022) K. Hutter et al. (2023), M. Kalenda, P. Hyna, B. Rossi (2018)

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2. Research Questions

RQ1 What are the existing approaches to assessing the success of CoPs* in the context of ***Large-Scale Agile Software Development***, ***Agile Software Development***, and ***General Organizational Settings***?

Structured Literature Review (Scientific & Gray) + Interviews (Coding & Analysis)

RQ2 What traditional group structures within organizations are similar to the CoPs* in the context of ***Large-Scale Agile Software Development*** and how has their success been assessed?

Literature Review (Scientific), not necessarily structured

RQ3 How could a novel approach to assessing the success of the CoPs* in the context of ***Large-Scale Agile Software Development*** be designed?

Design Science Research

**Based on Taxonomy of CoP (from Franziska Tobisch)*

Dimensions	Characteristics							
Purpose	Distribution of information	Knowledge creation	Knowledge sharing	Support	Definition of best practices or standards	Improvement	Creation of solutions	Innovation

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3. Research Methodology - Design Science Research

combined with *Interview Study*, and *Multivocal Literature Review*

Expert Interview Study

M. Miles , A.M. Hubermann, J. Saldaña (2018)
M. D. Myers, M. Newman (2007)
C.B. Seaman (1999)

39 semi-structured expert interviews (already exist)

Chapter 4 & 5

Design Science Research

Hevner et al. (2004), Peffers et al. (2007)

Problem Identification and Motivation
Chapter 1

Objectives of a Solution

Design and Development
Chapter 6

Artifact: Measurement Approach for CoPs Success

Demonstration and Evaluation

Communication

Chapter 2 Foundations
Chapter 3 Related Work

Multivocal Literature Review (Literature and Grey Literature)

V. Garousi, M. Felderer, M. V. Mäntylä (2017)

Chapter 4 & 5

Investigate related knowledge about the success of CoPs / similar approaches in the fields:

1) Large-Scale Agile Software Development
2) Agile Software Development
3) General Organizational Settings

Chapter 4 & 5

Investigate related knowledge about the success measurement of traditional organizational structures

Expert Evaluation (Survey)

K. Peffers, M. Rothenberger, T. Tuunanen, R. Vaezi (2012)

Future Work

Chapter 7 Discussion
Chapter 8 Conclusion

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4. Results - Success Definition

Success Dimensions	Success Contents
Effectiveness (CoP's actual impact)	The value it created for the organization
	The extent to which the community has met its initial objectives
	The benefits it provided to its members
Health (The process by which the results were obtained)	Member satisfaction
	Level of activity

A. Bourhis and L. Dube. (2010)

Taxonomy ID	CoPs Taxonomy	LSASD	ASD	GOS
T1	General	/	1	13+11 (Gray)
T2	Knowledge Sharing	1	/	24
T3	Coordination	1	/	/
T4	Knowledge Creation	/	/	3
T5	Definition of best practices or standards	1	/	/
T6	Innovation	1	1	/

4. Results - Measured Aspects

Success Dimensions	Success Aspects	Measured Aspects (modified)
Effectiveness (CoP's actual impact)	Organizational Value	Business Value
		Operational Efficiency
		Financial Impact
	Community Results	Knowledge Sharing
		Knowledge Assets
		Decision Making
		Innovation
		Consensus
		Scalability
	Member Benefits	Performance Outcomes
		Learning & Development
		Reputation
Health (the process by which the results were obtained)	Member Satisfaction	Satisfaction
		Trust
	Activity Level	Engagement

4. Results - Measured Aspects - Organizational Value

1) Business Value

In the measured aspect of Business Value, the business impacts created for the company are highlighted, such as customer satisfaction, market share, etc. CoPs enhance an organization's ability to respond effectively to customer needs through knowledge sharing, collaborative problem-solving, and leveraging collective expertise.

Metrics Example

- Response time for customers
- Level of customer satisfaction
- Number of customer problems resolved

2) Operational Efficiency

The measured aspect of Operational Efficiency focuses on internal optimization impacts, e.g., reducing the cycle time of new product development and reducing the time of interactions with community members. CoPs optimize organizational workflows by reducing redundancies and facilitating better use of available resources.

Metrics Example

- Percentage of cost reduction
- Percentage of time reduction
- Value of the benefit

3) Financial Impact

For the measured aspect of Financial Impact, financial metrics, including but not limited to return on investment, percentage of revenue increase, and cost savings, are mentioned. These metrics provide a clear linkage between CoPs' activities and CoPs' ability to create sustained value, showcasing CoPs' role as a strategic asset in driving financial growth and operational resilience for the organization.

Metrics Example

- Profit
- Revenue
- Return on investment

4. Results - Measured Aspects - Community Results

4) Knowledge Sharing

The measured aspect of Knowledge Sharing focuses on the knowledge-sharing process, e.g., inviting external experts to share insights. Its measurement indicates how well CoPs facilitate the transfer of expertise and foster learning within and across organizational boundaries.

Metrics Example

- Frequency of documents are requested
- Number of collaborative projects
- Evidence of reusing best practices

5) Knowledge Assets

The measured aspect of Knowledge Assets focuses on the knowledge asset creation, e.g., best practice documentation in a database. This aspect evaluates the CoPs' contribution to organizational intellectual capital.

Metrics Example

- Level of established knowledge and expert system
- Number of solutions submitted
- Evidence of developing and defining best practices

6) Decision Making

The measured aspect of Decision Making focuses on the decision-making authority, e.g., taking the responsibility for making critical decisions. Decision Making measures the CoPs' role in enabling informed, collaborative, and effective decisions, often addressing complex or cross-disciplinary challenges. This aligns with a CoPs' contribution of enhancing organizational decision-making through collective intelligence.

Metrics Example

- Level of improved quality of decisions
- Evidence of making key decisions and resolving issues
- Evidence of resolving problems between the different home organizations

4. Results - Measured Aspects - Community Results

7) Innovation

The measured aspect of Innovation focuses on creating new approaches, methods, and products, e.g., new practices on how to convince customers to place orders. Innovation captures the CoPs' success in generating new ideas, approaches, or solutions.

Metrics Example

- Evidence of innovative ideas created from community knowledge
- Evidence of capitalizing new opportunities
- Evidence of new assessment processes

8) Consensus

The measured aspect of Consensus focuses on creating consensus inside the community and organization, e.g., developing a common set of norms, standards, and language. Consensus reflects the CoPs' ability to align members toward shared goals, build mutual understanding, and resolve conflicts.

Metrics Example

- Evidence of common language, method, understanding, identity, and model
- Level of building enough background context
- Level of clear primary purpose

9) Scalability

The measured aspect of Scalability focuses on scaling the knowledge asset, such as good practices, to the organizational level or outside the community, e.g., standardization across the organization units. Scalability assesses the CoPs' capacity to create impact outside the community, which sets a solid foundation for increasing membership or broadening the scope of activities.

Metrics Example

- Evidence of making key decisions and resolving issues
- Evidence of resolving problems between the different home organizations

4. Results - Measured Aspects - Member Benefits

10) Performance Outcomes

The measured aspect of Performance Outcomes focuses on increasing individual performance, e.g., working more efficiently and solving problems in the work. By sharing knowledge and best practices, CoPs enable members to improve their work performance and address challenges more effectively.

Metrics Example

- Level of confidence and motivation
- Level of enhancing working efficiency
- Level of coordinating activities more effectively

11) Learning and Development

The measured aspect of Learning and Development focuses on personal learning and development, e.g., increasing expertise in pricing digital products and development of mentor-mentee relationships. Learning and Development reflects the CoPs' role in fostering continuous professional growth.

Metrics Example

- Level of increasing individual capability
- Evidence of fostering the development of mentor-mentee relationships
- Evidence of reflection on practice and situation

12) Reputation

The measured aspect of Reputation focuses on individual reputation, e.g., improving other coworkers' recognition of me. Reputation focuses on the recognition members gain within and beyond the organization due to their contributions to the CoPs.

Metrics Example

- Level of appreciation from peers for what I have accomplished
- Level of recognition from co-workers for my knowledge sharing
- Number of honorable prizes received for my knowledge sharing

4. Results - Measured Aspects - Member Satisfaction

13) Satisfaction

The measured aspect of Satisfaction focuses on member satisfaction, e.g., the sense of belonging, like being part of the community. Satisfaction reflects the degree to which members feel their needs and expectations are met within the CoPs. This includes their experiences with knowledge sharing, collaborative efforts, and the value derived from their participation.

Metrics Example

- Level of satisfaction of communication tool and knowledge management system
- Level of satisfaction of co-ordination
- Level of sense of belonging

14) Trust

The measured aspect of Trust focuses on trust itself, e.g., creating a safe environment where people feel comfortable sharing challenges. Trust represents the confidence members have in the CoPs and its participants.

Metrics Example

- Number of referrals or recommendations
- Level of sense of safety to company and colleagues
- Evidence of bringing up difficult problems and failures from practice

4. Results - Measured Aspects - Activity Level

15) Engagement

The measured aspect of Engagement focuses on engagement itself, e.g., the number of messages posted and average participation rate (messages/person). Engagement reflects the degree to which members actively participate in community activities, share knowledge, and collaborate with others.

Metrics Example

- Frequency of activities happen in the community
- Number of outside expert
- Level of satisfaction of co-ordination
- Percentage of users updating weekly

4. Results - Measurement Approach

- **Measurement Approach 1: Log Data Tracking**
- **Measurement Approach 2: Surveys and Questionnaires**
- **Measurement Approach 3: Interviews**
- **Measurement Approach 4: Social Network Analysis**

Value-creation story: filled-out example for a teacher

Name	**The math network**
Typical cycles	**Your story:**
1. **Activity**: Describe a meaningful activity you participated in and your experience of it (e.g., a conversation, a working session, a project, etc.)	*I was attending a teacher's meeting and everyone there was quite engaged in the conversation. Someone was describing his difficulties getting kids to understand the idea underlying the Pythagorean theorem and its applications. A teacher from Utrecht told us about an activity she has been using. I thought it sounded really good. I and some other teachers became quite excited and asked a lot question. We spent the rest of the meeting on it.*
2. **Output**: Describe a specific resource this activity produced for you (e.g., an idea or a document) and why you thought it might be useful.	*The idea of the activity is to get the kids to work in small groups, doing puzzles with pieces of cardboard of different sizes of triangles. It is quite subtle because to get the idea of the theorem, they have to really fit all the pieces together and explain why it works. We actually tried the idea together as if we were students. She even gave us some templates so we could prepare the pieces of cardboard ourselves.*
3. **Application**: Tell how you used this resource in your practice and what it enabled that would not have happened otherwise.	*When I got home that evening, I started to prepare my own pieces of cardboard. I was really excited. Two weeks later, I used the activity with my third-grade class. It took a little while for them to get the idea. I had to adapt it a little bit because of the age of the students and I used a few pieces less. The class had really never been so attentive. The kids seemed quite happy when they left that day.*
4. **Outcome**: a. **Personal**: Explain how it affected your success (e.g., being a better teacher, job satisfaction, student's grade) b. **Organizational**: Has your participation contributed to the success of your organization (e.g., metrics they use)	*Two months later, when the kids took the national exam, I was in for a surprise. All but one got a perfect score on the chapter on triangles and the Pythagorean theorem. That had never happened to me. The headmaster called me in her office and told me that my kids had done so well, the school had received a letter from the testing service to ask whether there could have been some cheating. After we checked everything, I received some special mention in the national teacher registry.*
5. **New definition of success**: Sometimes, such a story changes your understanding of what success is. If it happened this time, then include this here.	*What I realized after that is that what mattered most for my kids was not just their ability to do the activities on the curriculum, but also to be involved with concepts practically so they have a deeper understanding of the ideas underlying the theorems they are learning.*

Wenger et al. (2011)

4. Results - Good Practice

- **Good Practice 1: Creating the Awareness and Involvement of Measurement**
- **Good Practice 2: Standardizing the Data Collection Process**
- **Good Practice 3: Revealing Hidden Value through Interviews**
- **Good Practice 4: Combining Data for Holistic Insights**
- **Good Practice 5: Balancing Tangible and Intangible Measurement**
- **Good Practice 6: Refining Data Collection through Modular Approaches**
- **Good Practice 7: Establishing a Baseline Measurement at an Early Stage**

4. Results - Success Metrics Pyramid

Success Metrics Pyramid for Communities of Practice

5 Success Aspects **15 Measured Aspects**

4. Results - New Designed Metrics Catalog

Metrics Catalog for Measuring the Success of Communities of Practice in Large-Scale Agile Software Development

Version 1.0

Lixun Dai

Jan 2025

Contents

-> 237 Metrics

4. Results - New Designed Metrics Catalog

- **Navigation based on CoPs Taxonomy (Taxonomy-Metric-Matrix)**

Code	Metric	G	KS	C	KC	BPS	I
LSASD-CoPs-25	Percentage of cost reduction	✗	✗				✗
LSASD-CoPs-26	Percentage of time reduction	✗	✗				✗
LSASD-CoPs-27	Value of the benefit	✗	✗				

- **Navigation based on Measured Aspects**

15) Engagement

- LSASD-CoPs-207: Frequency of activities happen in the community (p. 242)
- LSASD-CoPs-208: Number of members (p. 243)
- LSASD-CoPs-209: Average number of login in online CoP per week (p. 244)
- LSASD-CoPs-210: Average hours to online CoP per week (p. 245)
- LSASD-CoPs-211: Number of outside expert (p. 246)

4.27 Value of the benefit

Description:
Value of the benefit reflects the impact of the CoPs by highlighting the difference between conservatively estimated savings and generously estimated costs, demonstrating the tangible advantages generated through collaborative efforts.* [10, 26, 35]

Code:
LSASD-CoPs-27

Calculation Rule:
Benefit = Savings - Cost
1) Savings = numeric value * share of community * degree of certainty = reported savings
Example: A $2 million savings, half of which the person estimates came from participating in the community, where they feel 80 percent confident in their estimate, would translate to: $2M * 50% * 80% = $800,000 [10]

2) Cost
When calculating the costs of the community, we take all direct costs and add to them an estimate of average indirect costs. We are as generous in our cost estimates as we are conservative in our claims of value added. [10]

3) Why do so?
Such conservative calculations will generally produce a very positive ROI for a healthy community. But being carefully and visibly conservative helps skeptics and finance people trust that you are not inflating the value of the community. [10, 32, 33]

CoPs Taxonomy:
1) General
2) Knowledge Sharing
3) Coordination
4) Knowledge Creation
5) Best Practices or Standards
6) Innovation

Measured Aspects:
1) Business Value
2) Operational Efficiency
3) Financial Impact
4) Knowledge Sharing
5) Knowledge Assets
6) Decision Making
7) Innovation
8) Consensus
9) Scalability
10) Performance Outcomes
11) Learning and Development
12) Reputation
13) Satisfaction
14) Trust
15) Engagement

Notes: For practitioners use, such as noting potential improvements and good practice.

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5. Key Findings

- **Key Finding 1: Current scientific research lacks a consistent definition of success for Communities of Practice**
- **Key Finding 2: Currently the most comprehensive and systematic understanding and frameworks for assessing the value of Communities of Practice come from Wenger**
- **Key Finding 3: The three most common measurement approaches for measuring the success of Communities of Practice are: 1) log data tracking, 2) surveys and questionnaires, and 3) interviews**
- **Key Finding 4: Success metrics for Communities of Practice are predominantly derived from GOS, with limited insights from LSASD and ASD, and the CoPs taxonomy type Knowledge Sharing is the most commonly addressed**
- **Key Finding 5: Success metrics for traditional organizational structures are limited, with existing literature focusing primarily on cross-functional teams and project teams**

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- **Metric Catalog Evaluation and Improvement**
  - The evaluation of the metric catalog's first version is crucial. Feedback from real-world practice will show its usefulness and value for practitioners.
  - Based on this feedback, the catalog can be iterated to enhance user experience. This could involve highlighting popular metrics in specific CoPs taxonomy or measured aspects and adding different metric usage cases.

- **Incorporating Automated Tools for Measurement**
  - Consider how to integrate automated tools like data analytics platforms or performance management software for measuring CoPs success.
  - Current measurement methods rely heavily on questionnaires and interviews with manual post-data-collection processing. Automation can provide real-time views of CoPs activities, such as automatically collecting value-creation stories from community members.
  - Large language models can also suggest metric combinations from the catalog to gain more insights into the value-creation chain, including causal relationships and potential for value generation in CoPs and organizations.

- **Refining Metrics for Large-Scale Software Development Environments**
  - Most existing metrics are based on general organizational settings.
  - Metrics specifically tailored to large-scale software development environments need to be further refined to identify the most effective ones for measuring CoPs success in such environments.

B.Eng.

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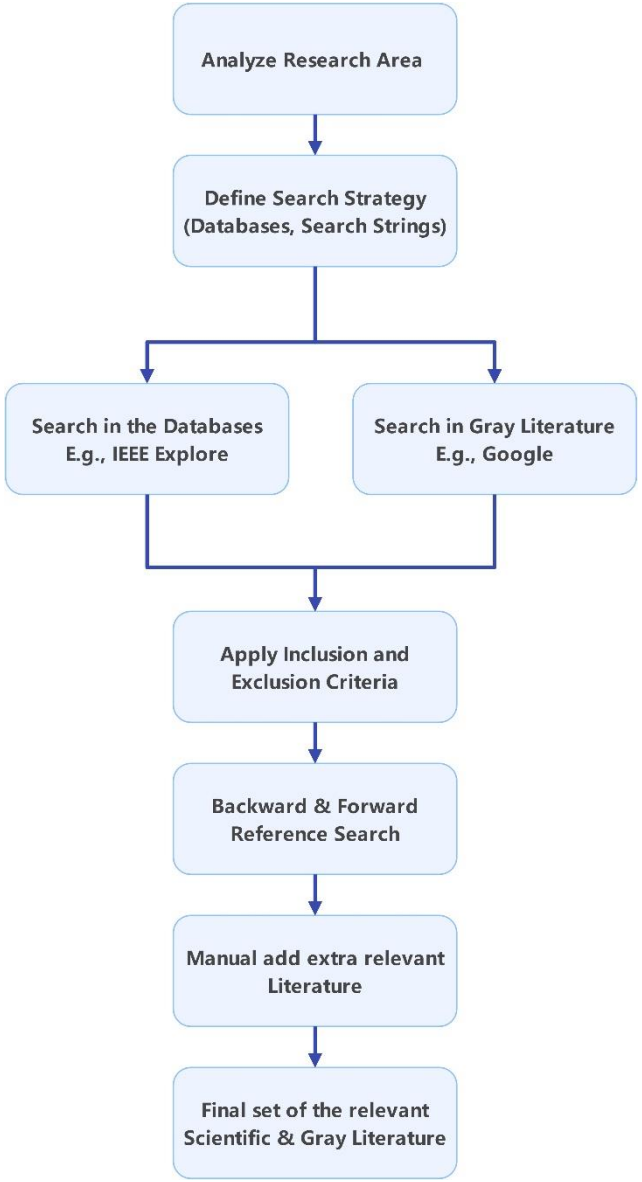
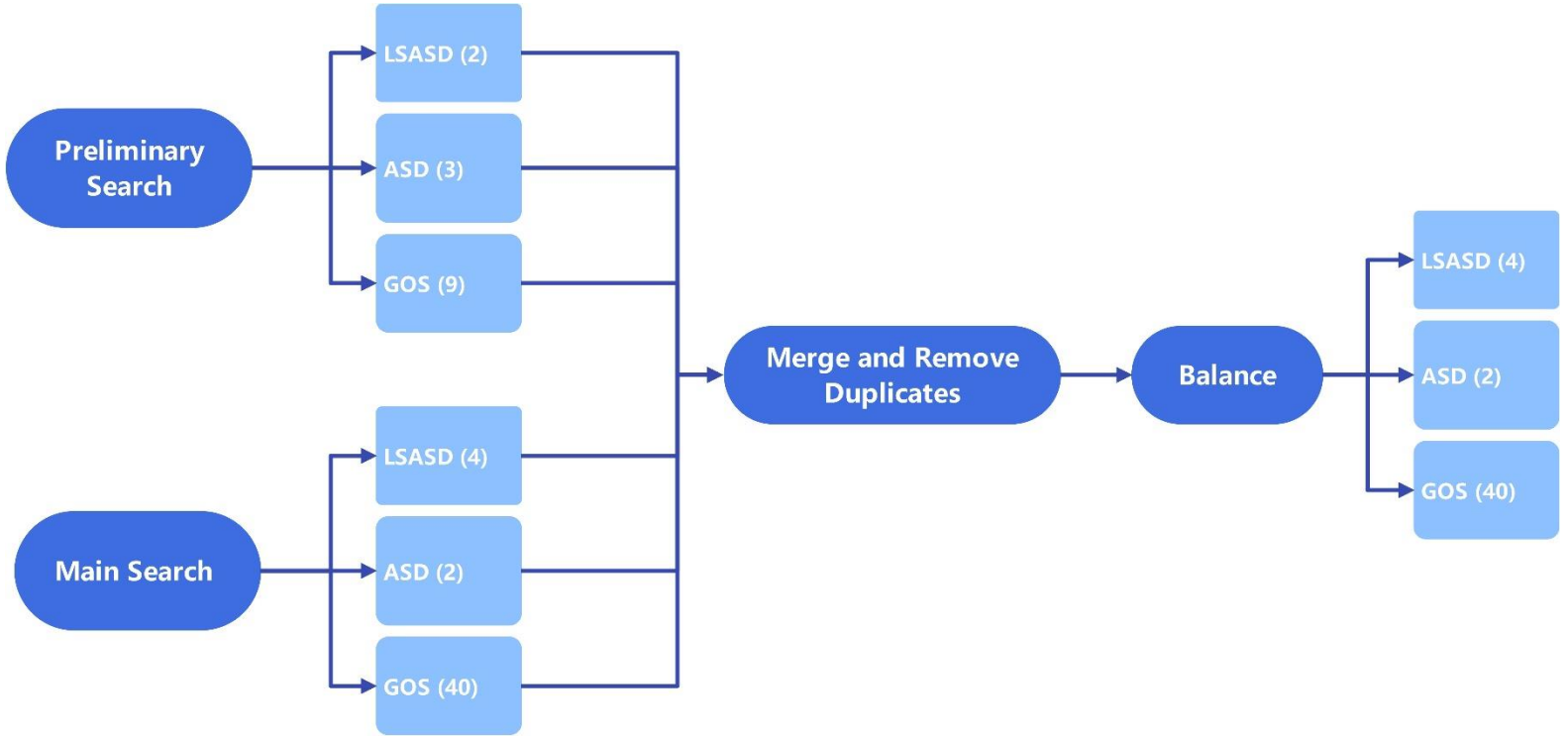
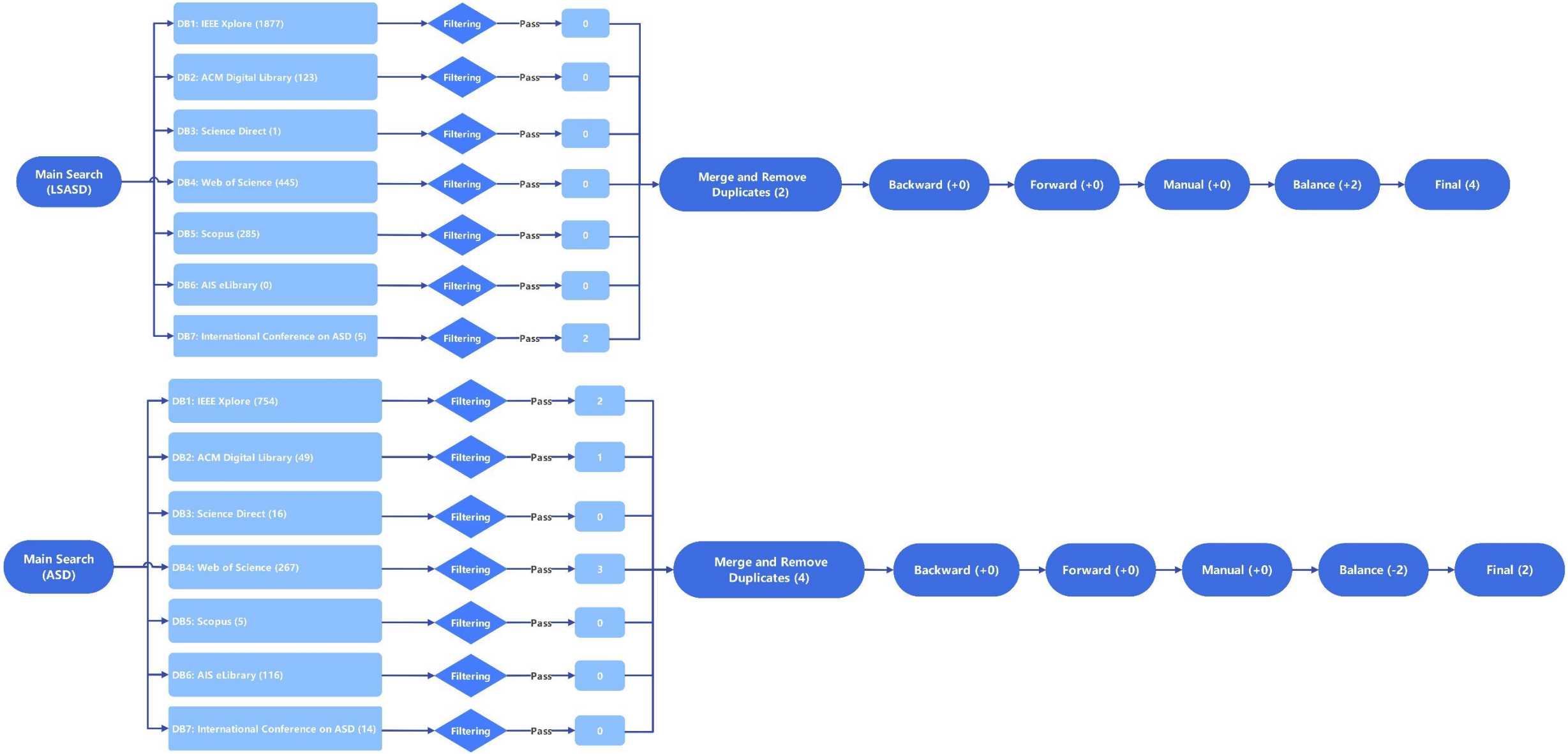
Appendix - Research Methodology



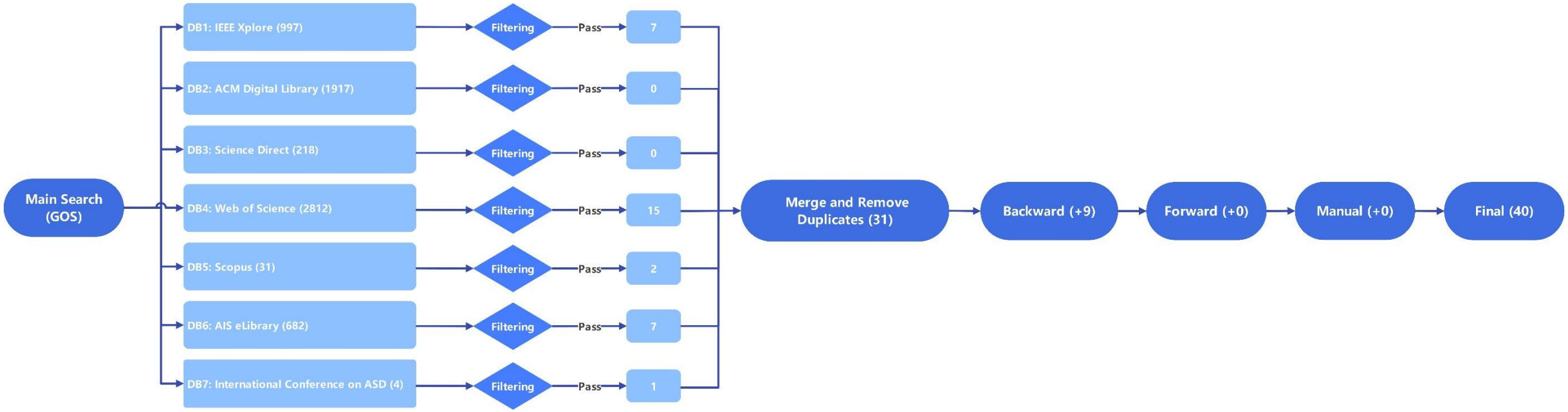


ID	Search Engines	Link
DB1	IEEE Xplore	https://ieeexplore.ieee.org/Xplore/home.jsp
DB2	ACM Digital Library	https://dl.acm.org/
DB3	Science Direct	https://www.sciencedirect.com/
DB4	Web of Science	https://www.webofknowledge.com
DB5	Scopus	https://www.scopus.com/
DB6	AIS eLibrary	https://aisel.aisnet.org/
DB7	International Conference on ASD	https://link.springer.com/conference/xpu

Appendix - Research Methodology



Appendix - Research Methodology



Appendix - Research Methodology

Measurement	Success	Communities of Practice
measurement OR measurements OR metric OR metrics OR KPI OR KPIs OR "Key Performance Indicator" OR "Key Performance Indicators" OR performance OR evaluate OR evaluation OR criterion OR criteria OR assess OR assessment OR assessments OR diagnostic OR monitor OR monitors OR "quantitative model" OR reporting OR measuring	success OR successes OR impact OR outcome OR outcomes OR influence OR effectiveness OR succeed OR fail OR failure	CoP OR CoPs OR "community of practice" OR "community of practices" OR "communities of practice" OR "communities of practices" OR CoE OR CoEs OR "community of excellence" OR "communities of excellence" OR "community of interest" OR guild OR "round table" OR "interest league"

LSASD	ASD	GOS
"large-scale agile software development" OR "scaling" OR "LSASD" OR "LSAD" OR "scaling agile frameworks" OR "Crystal Family" OR "Dynamic Systems Development Method Agile Project Framework for Scrum" OR "Scrum of Scrums" OR "Enterprise Scrum" OR "Agile Software Solution Framework" OR "Large-Scale Scrum" OR "Scaled Agile Framework" OR "Disciplined Agile" OR "Spotify Model" OR "Mega Framework" OR "Enterprise Agile Delivery and Agile Governance Practice" OR "Recipes for Agile Governance in the Enterprise" OR "Continuous Agile Framework" OR "Scrum at Scale" OR "Enterprise Transition Framework" OR "ScALeD Agile Lean Development" OR "eXponential Simple Continuous Autonomous Learning Ecosystem" OR "Lean Enterprise Agile Framework" OR "Nexus" OR "FAST Agile" OR "SAFe"	"agile software development" OR "agile development" OR agile OR agility OR "application agility" OR "continuous integration" OR "iterative development" OR "incremental development" OR "extreme programming" OR XP OR "feature driven development" OR FDD OR scrum OR crystal OR "pair programming" OR "test-driven development" OR TDD OR leanness OR "lean software development" OR "lean development" OR LSD NOT manufacturing	general organizational setting OR organizational OR organization OR organizations OR company OR companies OR enterprise OR enterprises OR institution OR institutions OR corporation OR corporations OR group OR groups OR business

Appendix - Research Methodology

All for LSASD	All for ASD	All for GOS
(measure OR assess OR evaluate) AND (success OR impact OR outcome OR effectiveness) AND communities of practice AND large-scale agile	(measure OR assess OR evaluate) AND (success OR impact OR outcome OR effectiveness) AND communities of practice AND agile	(measure OR assess OR evaluate) AND (success OR impact OR outcome OR effectiveness) AND communities of practice AND organization

Table 4.6: Search Terms - Science Direct

Search Engines	Link	Search Date
Google	https://www.google.com/	20241112
Project Management Institute	https://www.pmi.org/	20241113
Scrum Alliance	https://resources.scrumalliance.org/	20241113
Scaled Agile Framework	https://scaledagileframework.com/	20241113

Table 4.7: Search Engines (Gray)

Search Engine	Stop Criterion	Result
Google	Top100	7 found and 4 identified via backward
Project Management Institute	Top100	no highly relevant result found
Scrum Alliance	Top100	no highly relevant result found
Scaled Agile Framework	Top100	no highly relevant result found

Table 4.8: Overview of Gray Literature Review

Appendix - Research Methodology

Source	Identified Organizational Structures
On the Relationship Between Organizational Structure Patterns and Architecture in Agile Teams	Communities of Practice
	Informal Networks
	Formal Networks
	Informal Communities
	Networks of Practice
	Workgroups
	Project Teams
	Strategic Communities
	Formal Groups
	Problem-Solving Communities
	Learning Communities
	Knowledge Communities
	Social Networks
Wenger's Book - Communities of Practice: Learning, Meaning, and Identity	Task Forces
	Committees
	Executive Committees
	Cross-Functional Teams
	Workgroups
	Teams
Wenger's Book - Cultivating communities of practice: a guide to managing knowledge	Business Units
	Functional Units
	Formal Departments
	Operational Teams
	Project Teams
	Communities of Interest
	Informal Networks
	Professional Associations
Designing organizations: Strategy, structure, and process at the business unit and enterprise levels	Formal Groups
	Platforms
	Cross-Functional Teams
	Networks
	Functional Organization
	Product Organization
	Business Unit Organization
	Customer Business Unit
	Channel Organization
	Geographical Organization
	Hybrid Structures
	Matrix Organization

Identified Organizational Structures	Source
Informal Networks	[56, 49]
Formal Networks	[56]
Informal Communities	[56]
Networks of Practice	[56]
Workgroups	[56, 57]
Project Teams	[56, 49]
Strategic Communities	[56]
Formal Groups	[56, 58]
Problem-Solving Communities	[56]
Learning Communities	[56]
Knowledge Communities	[56]
Social Networks	[56]
Task Forces	[57]
Committees	[57]
Executive Committees	[57]
Cross-Functional Teams	[57, 58]
Teams	[57]
Business Units	[49]
Functional Units	[49]
Formal Departments	[49]
Operational Teams	[49]
Communities of Interest	[49]
Professional Associations	[49]
Platforms	[58]
Networks	[58]
Functional Organization	[58]
Product Organization	[58]
Business Unit Organization	[58]
Customer Business Unit	[58]
Channel Organization	[58]
Geographical Organization	[58]
Hybrid Structures	[58]
Matrix Organization	[58]

Taxonomy ID	CoPs Taxonomy	Traditional Group Structure
T1	General	Project Teams (1), Teams (1), Work Groups (1)
T2	Knowledge Sharing	Cross-Functional Teams (1)
T3	Coordination	/
T4	Knowledge Creation	/
T5	Definition of best practices or standards	/
T6	Innovation	Cross-Functional Teams (1)

Appendix - Traditional Group Structures (RQ2)

Taxonomy ID	CoPs Taxonomy	Traditional Group Structure
T1	General	Project Teams (1), Teams (1), Work Groups (1)
T2	Knowledge Sharing	Cross-Functional Teams (1)
T3	Coordination	/
T4	Knowledge Creation	/
T5	Definition of best practices or standards	/
T6	Innovation	Cross-Functional Teams (1)

Name	Description
Communities of Practice	A CoP consists of collocated groups of people who share a concern, a set of problems or a practice. These people interact frequently, face-to-face, collaboratively. This set of social processes is called situatedness [112, 113]. For example, a software architecture board in a company is a collocated organisational body (i.e., a community) specialised in collaboratively addressing software architecture problems (i.e., the practice).
Workgroups	Workgroups are groups of technical experts whose goals span a business area or array of organisational factors. Workgroups are always accompanied by a number of organisational sponsors and are expected to generate benefits as wide as their goals. For example, IFIP5 working groups are WGs by definition.
Project Teams	Project Teams are made by people with complementary skills who work together to achieve a common purpose for which they are accountable. They are enforced by their organisation and follow specific strategies or organisational guidelines (e.g., time-to-market, effectiveness, low-cost). Their final goal is delivery of a product or service that responds to provided requirements [114].
Cross-Functional Teams	Cross-functional teams are composed of individual representatives drawn from various functional units, such as departments or organizations, who possess specialized knowledge and skills relevant to the completion of the project [115, 116].
Teams	Teams itself can be defined as distinguishable entities composed of two or more individuals who work interdependently toward a shared objective [117]. Teams are thought to possess certain unique characteristics that differentiate them from all other units (e.g. work groups, taskforce groups). These unique characteristics include specialized roles and responsibilities held by team members, the capacity for team adaptability and the use of communication to perform team tasks [118].

Appendix - CoP Taxonomy

**Based on Taxonomy of CoP (from Franziska Tobisch)*

Dimensions	Characteristics							
Purpose	Distribution of information	Knowledge creation	Knowledge sharing	Support	Definition of best practices or standards	Improvement	Creation of solutions	Innovation

Taxonomy ID	CoPs Taxonomy	LSASD	ASD	GOS
T1	General	/	1	13+11 (Gray)
T2	Knowledge Sharing	1	/	24
T3	Coordination	1	/	/
T4	Knowledge Creation	/	/	3
T5	Definition of best practices or standards	1	/	/
T6	Innovation	1	1	/

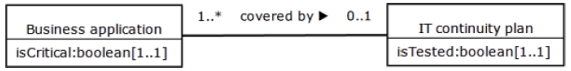
Appendix - RQ3 Reference Catalog

Application continuity plan availability

Description

A measure of how completely IT continuity plans for business critical applications have been drawn & tested up for the IT's application portfolio.

Information model



Organization-specific instantiation

Mapping:

Name in model	Mapped name	Contacts	Data sources
Business application			
isCritical			
IT continuity plan			
isTested			
supported by			

Properties:

KPI property	Property value	Best-practice
Measurement frequency		Quarterly
Interpretation		Good if >80% Normal 60%-80% Problematic if <60%
KPI consumer		
KPI owner		
Target value		80%
Planned value(s)		70% 75%
Tolerance value(s)		
Escalation rule		

Goals

Ensure compliance
Foster innovation
Improve capability provision
Improve project execution
Increase disaster tolerance
Increase homogeneity
Increase management satisfaction
Increase transparency
Reduce operating cost
Reduce security breaches

Calculation

The number of critical applications where tested IT continuity plan available divided by the total number of critical applications.

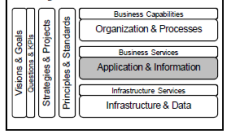
Code

EAM-KPI-0001

Sources

CobiT 4.0

Layers



Average user story cycle time

Measurement of the average time required by a team to close a user story. The more time a team needs to finish user stories, the higher the metric value is.

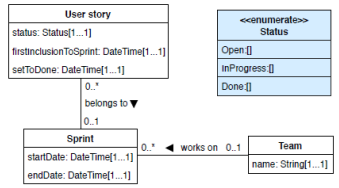
Calculation rule

Sum of the duration (end time minus start time) from the first inclusion of each user story into a sprint until the user story is set to Done divided by the total amount of user stories completed by a team

Code

LSAD-M-11

Information model



Goals

Customer
Development organization and processes
Adherence to deadlines
Agility
Improved planning
Predictability
Speed
Transparency
Employee
Finance
Product
Delivery reliability

Level

Organizational
Portfolio
Program
Team

Organization-specific elements

Organizational instance:

Data item	Mapped name	Data source	Data contact
User story			
status			
firstInclusionToSprint			
setToDone			
belongs to			
Sprint			
startDate			
endDate			
Team			
name			
worked on			
Status			
Open			
InProgress			
Done			

Property	Property values
Calculation tool	□ Automated □ Manual
Measurement frequency/event	
Monitoring frequency/event	
Reporting frequency/event	
Owner	
Definition responsible(s)	
Implementation responsible(s)	
Achievement responsible(s)	
Monitoring responsible(s)	
Target value(s)	
Planned value(s)	
Tolerance values(s)	
Escalation rule(s)	
Interested stakeholders	

Related metrics

Average user story cycle time on program level
Average user story size
Sprint burn-down
Sprint burn-up
User story lead time
Work item cycle time

F. Matthes et al. (2011)
P. Philipp and F. Tobisch. (2021)

Appendix - Answer for each RQ

Research Question 1: What are the existing approaches to assessing the success of CoPs* in the context of LSASD, ASD, and GOS?

Three questions are to be answered in RQ1:
1) What are the current metrics and their corresponding measured aspects? 2) How is the measurement conducted? 3) What needs to be considered when conducting measurement (good practice)?

According to the research in this thesis, the definition of success for CoPs was first defined based on the existing literature, focusing on the two primary success dimensions: effectiveness and health. Building on these dimensions, five key aspects of CoPs success were identified: organizational value, community results, member benefits, member satisfaction, and activity level. Through a systematic classification of success metrics found in the literature, a final set of 15 measured aspects and their corresponding metrics was determined, providing a comprehensive framework for assessing CoP success. The three most common measurement approaches for measuring the success of CoPs are: 1) log data tracking, 2) surveys and questionnaires, and 3) interviews. Seven good practices were summarized from the literature, namely creating the awareness and involvement of measurement, standardizing the data collection process, revealing hidden value through interviews, combining data for holistic insights, balancing tangible and intangible measurement, refining data collection through modular approaches, establishing a baseline measurement at an early stage.

Appendix - Answer for each RQ

Research Question 2: What traditional group structures within organizations are similar to the CoPs* in the context of LSASD and how has their success been assessed?

In RQ2, the traditional organizational structures identified in the literature include cross-functional team, project team, team, and work group. Among these structures, the quality of success metrics research is notably higher for cross-functional teams and project teams. This can be attributed to the established focus on cross-functional teams as a distinct research domain and the extensive body of work in project management, which naturally includes studies on success metrics for project teams. The collected success metrics were mapped to the 15 measurement aspects identified in RQ1, ensuring alignment across CoPs and traditional organizational structures. The most commonly employed measurement method involves surveys and questionnaires incorporating a Likert scale to capture data effectively. Besides, self-reporting by members is also an approach mentioned for measurement. Furthermore, two key good practices highlighted in the literature are creating the awareness and involvement of measurement and establishing a baseline measurement at an early stage, both of which emphasize the importance of proactive and structured approaches to measurement in traditional organizational contexts.

Appendix - Answer for each RQ

Research Question 3: How could a novel approach to assessing the success of the CoPs* in the context of LSASD be designed?

Based on the synthesis from RQ1 and RQ2, a novel approach is designed, and 2 questions are to be answered: 1) How should measurement in an agile environment be conducted? 2) How should an approach for measuring the success of CoPs in LSASD look like?

A new metrics catalog with 237 metrics and corresponding navigation tools was developed in this thesis. To effectively conduct measurement in an agile environment, several key success factors have been identified through literature review, such as ensuring understanding of metric purpose, keep metric adoption simple, and empowerment of teams in metric adoption, etc. To measure the success of CoPs in an LSASD environment, a structured process has been designed. Practitioners begin by mapping their CoPs' goals to the CoPs taxonomy types included in the catalog. They can then determine the final metrics by selecting relevant measured aspects or utilizing navigation tools such as the Taxonomy-Metric-Matrix and the metric lists categorized by measured aspects for quick identification. A highly recommended approach involves integrating value-creation stories to uncover key insights. By understanding the causal relationships in value creation, practitioners can leverage the Success Metrics Pyramid to select appropriate success aspects and their corresponding measured aspects to identify potential metrics. This process enables a deeper understanding of how the CoP creates value and how the chosen metrics reflect the community's potential for future value creation. For example, through employee interviews, practitioners may identify that shared best practices help employees resolve work-related challenges, saving time for both the company and the employees. If practitioners focus on metrics like the download frequency and quality ratings of shared best practice documents, they can gain insights into the extent to which these practices are appreciated by community members, thus reflecting the success of the CoP in knowledge sharing. This combination of metrics and stories offers a comprehensive view of the CoP's impact and its potential to foster ongoing value creation. The specific catalog details can be found in the accompanying metric catalog for further reference.

Appendix - Three Distinct Traits for CoPs

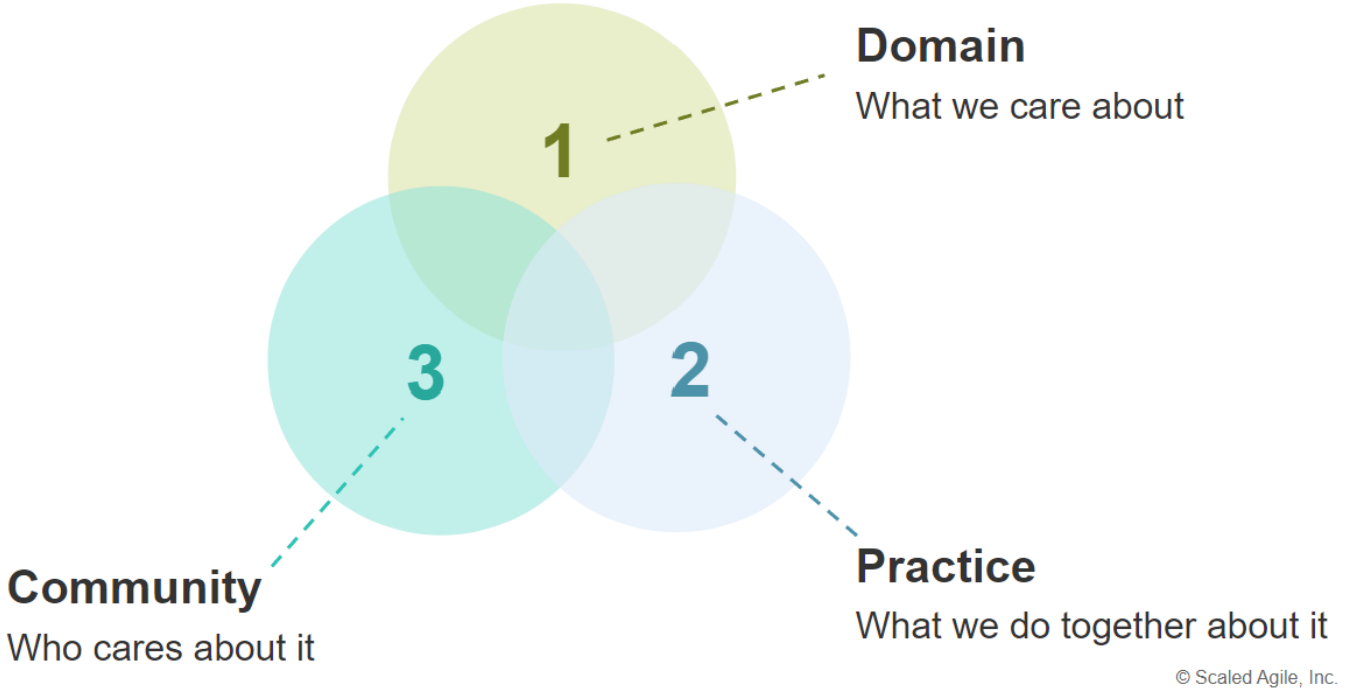


Figure 1. Communities of Practice have three distinct traits

https://scaledagileframework.com/communities-of-practice/
Wenger, Etienne. Communities of Practice: Learning, Meaning, and Identity. Cambridge University Press, 1999.

Appendix - Role-based CoPs

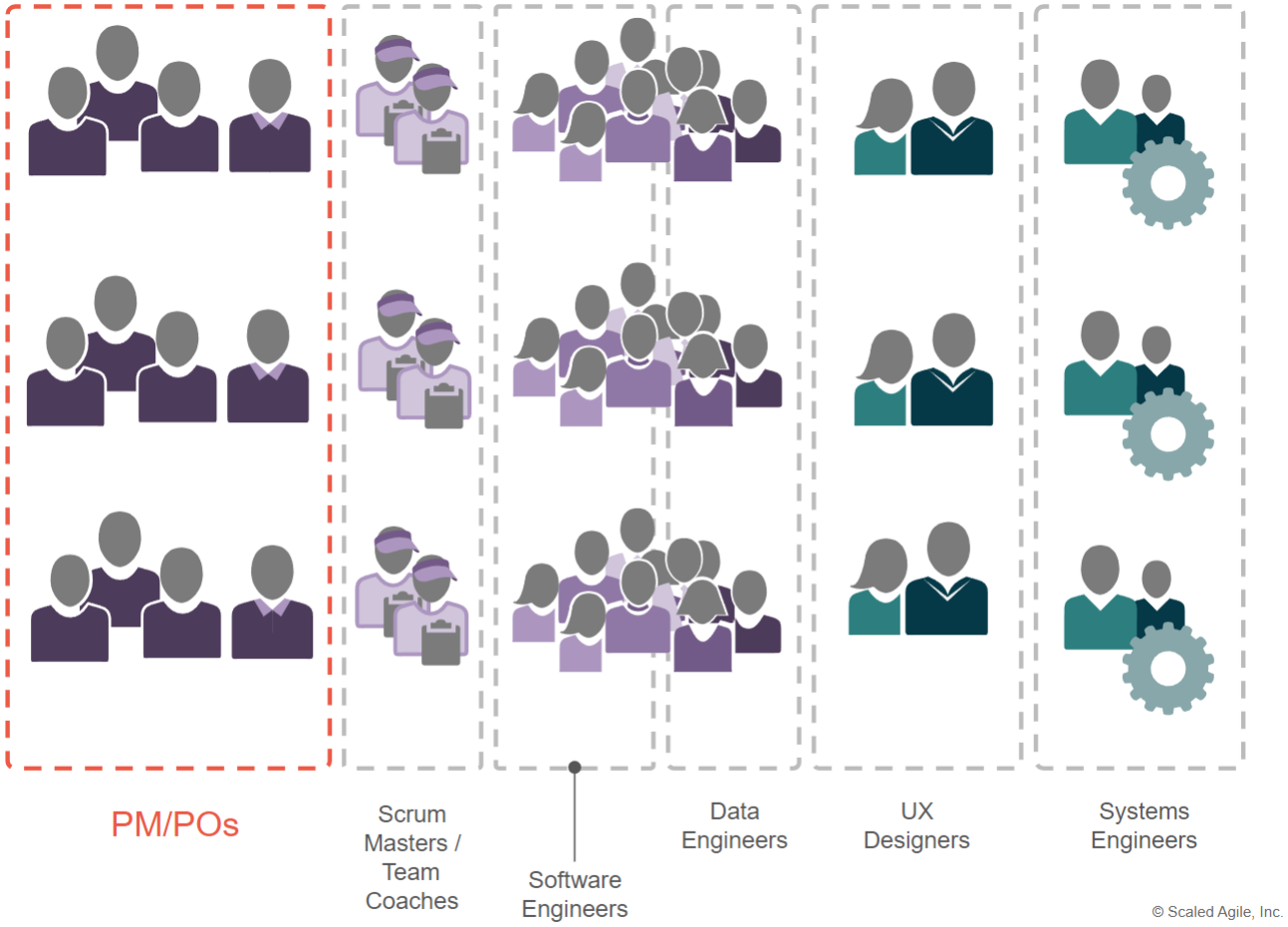


Figure 2. Role-based Communities of Practice

https://scaledagileframework.com/communities-of-practice/
Wenger, Etienne. Communities of Practice: Learning, Meaning, and Identity. Cambridge University Press, 1999.

Appendix - Topic-based CoPs

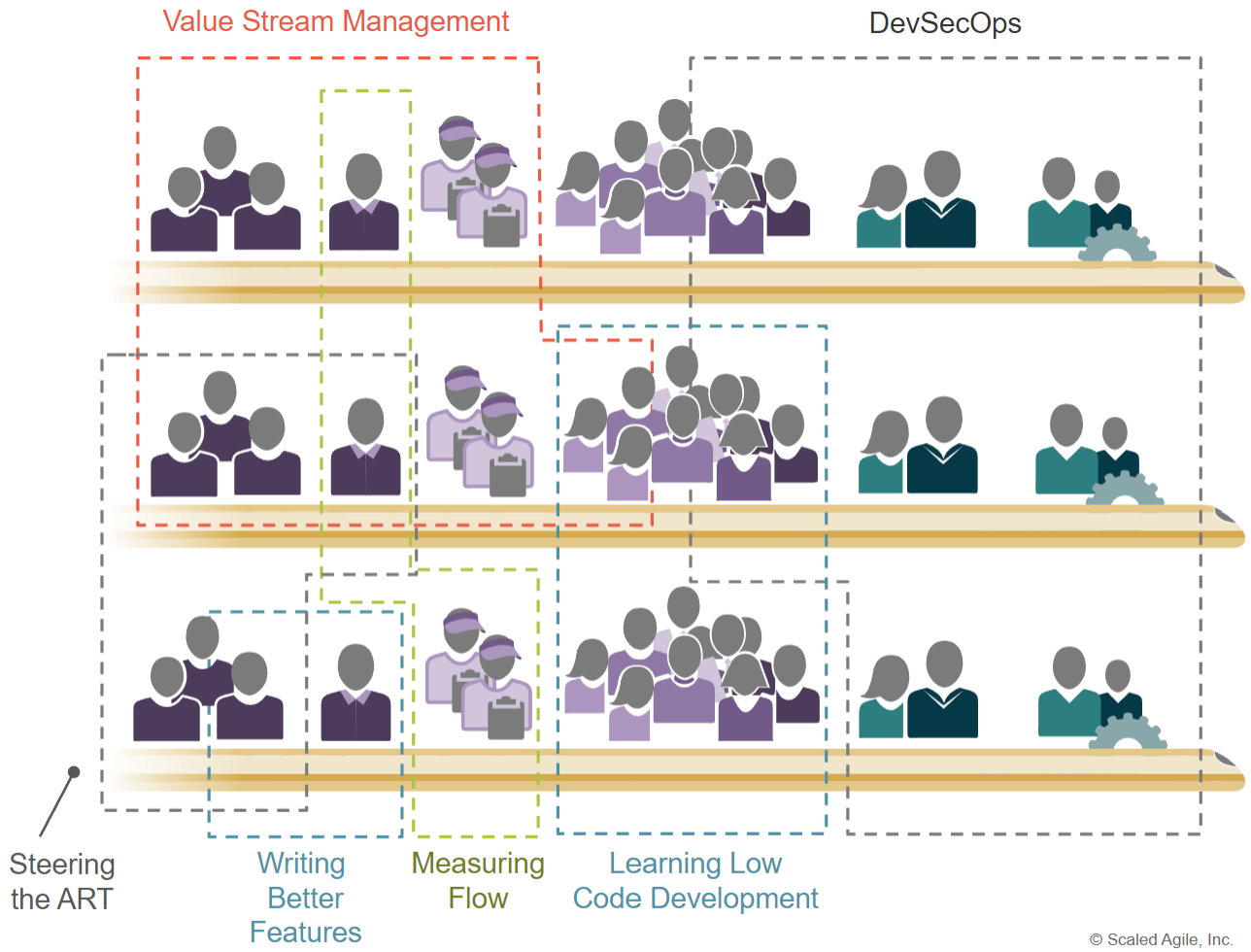


Figure 3. Topic-based Communities of Practice

https://scaledagileframework.com/communities-of-practice/
Wenger, Etienne. Communities of Practice: Learning, Meaning, and Identity. Cambridge University Press, 1999.

Appendix - Organizing a CoP

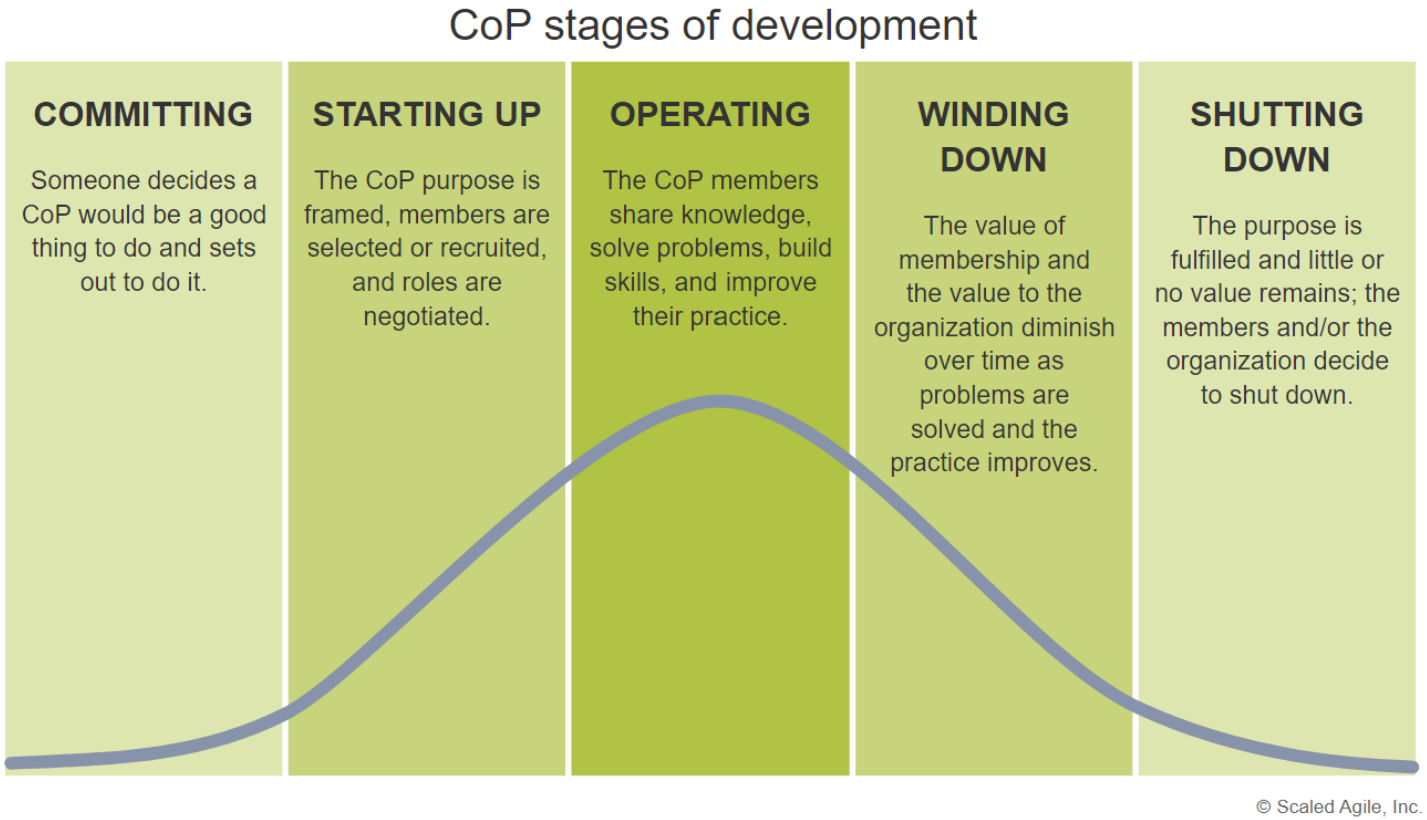


Figure 4. CoPs typically follow a five-stage life cycle, from conceptualization to closure (4)

https://scaledagileframework.com/communities-of-practice/
Wenger, Etienne. Communities of Practice: Learning, Meaning, and Identity. Cambridge University Press, 1999.

Bibliography

Please refer to the thesis at SEBIS website.
https://wwwmatthes.in.tum.de/pages/y0h0omlmoxf0/Toward-Measuring-the-Success-of-Communities-of-Practice-in-Large-Scale-Agile-Software-Development