

Which Factors Influence the Success of Communities of Practices in Large Agile Organizations, and How Are They Related?

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Abstract: Agile software development methods are intended to allow quick reactions to frequent changes. The success of these methods in small settings has motivated organizations to scale them. However, dependencies, collaboration, and alignment become challenging in this context. Communities of Practice (CoPs) can support addressing the mentioned problems, but organizations have struggled with their implementation. Also, existing research lacks empirical studies on factors influencing CoPs' success across organizations. Thus, we ran an expert interview study investigating factors hindering and supporting the success of CoPs in scaled agile settings and explored how they influence each other. Our findings highlight that establishing and cultivating CoPs should be aligned with organizations' and communities' contexts. Key barriers are a lack of (attending) members, limited time due to daily work, and difficulties in the CoP organization. Especially value for organization and members, a suitable organization of CoP internal activities, and regular adaption and improvement foster success.

1 INTRODUCTION

Continuous changes in today's business environment require companies to respond fast and frequently to stay ahead of their competitors (Van Oosterhout et al., 2006), especially in software development (Highsmith, 2002). Since traditional development methods cannot provide this level of agility (Highsmith, 2002), the popularity of agile methods and frameworks like Scrum, which are well-suited to this requirement, grew strongly (Digital AI, 2023). Following the success of agile methods in small-scale contexts, like single-team projects, organizations have started to scale their adoption (Digital AI, 2023; Dikert et al., 2016), for instance, by applying them in multi-team contexts and across the organization (Dingsøyr and Moe, 2014). However, as agile methods were intended for single teams, transforming organizations towards applying agility at scale is complex (Digital AI, 2023; Dikert et al., 2016). Besides missing knowledge and experience regarding scaled agile approaches, the expanded scope increases the risk of dependencies, knowledge silos, and misalignment

in agile practices (Digital AI, 2023; Dikert et al., 2016). At the same time, the coordination effort grows (Digital AI, 2023; Dikert et al., 2016). Cross-organizational collaboration, exchange (Digital AI, 2023; Dingsøyr and Moe, 2014), and alignment (Dikert et al., 2016) become crucial for success. Communities of Practice (CoPs), groups of people who share an interest and exchange ideas, experiences, and knowledge regularly (Wenger et al., 2002), are mechanisms claimed to help companies achieve these goals (Disciplined Agile, 2024; Kniberg and Ivarsson, 2012; LeSS, 2024; SAFe, 2023).

While existing research confirms CoPs' potential to support the adoption of agile methods at scale (Detofeno et al., 2021; Kähkönen, 2004; Korbel, 2014; Paasivaara and Lassenius, 2014; Šmite et al., 2019a,b), it also shows that implementing them is challenging. Multiple studies have investigated and reported challenges, best practices, hindering, and supporting factors for adopting CoPs in scaled agile settings (e.g., Detofeno et al. (2021), Paasivaara and Lassenius (2014), Šmite et al. (2019a), Šmite et al. (2019b)). Still, these studies mainly focus on individual organizations. Hence, additional research is required to validate the findings' applicability in other organizational contexts and extend them. Thus, we defined two research questions (RQs) for our study:

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Which factors hinder and foster the success of CoPs in scaled agile settings? How are these factors related to each other?

To answer these RQs and fill the described research gap, we carried out an interview study with 39 participants from 18 organizations to investigate factors influencing the success of CoPs in scaled agile settings and how they are related. With our findings, we aim (1) to provide insights into the factors hindering and fostering the success of CoPs in scaled agile settings, (2) to support CoP leads, initiators, members, and organizations in the establishment and cultivation of CoPs by identifying starting points for improvement or avoiding potential impediments, and (3) to build a foundation for identifying future research topics.

The paper is structured as follows: First, we provide a theoretical background on CoPs, their implementation in scaled agile contexts, and potential challenges and success factors. Then, we describe our research design and present our findings. Finally, we discuss the implications of our findings, explain limitations, and propose future research directions.

2 BACKGROUND

2.1 Communities of Practice (CoPs)

CoPs can be defined as groups of people sharing a concern or specific problem or being enthusiastic about a subject, enhancing their understanding and skills through regular interactions (Wenger et al., 2002). A CoP is characterized by its members' shared interest (*Domain*), their interactions (i.e., collaboration, support, knowledge exchange) (*Community*), and the shared set of knowledge, experiences, and approaches it creates (*Practice*) (Wenger et al., 2002). Compared to other group structures, like project teams, CoPs differ in at least one of the following aspects: purpose, members, boundaries, motivation, and lifespan (Wenger et al., 2002). For a CoP, the purpose is the creation, expansion, and exchange of knowledge, and the development of individual capabilities. A CoP's members are self-selected based on their expertise or enthusiasm for a topic. A CoP has fuzzy boundaries, and the motivation of its members relies on their enthusiasm, dedication, and connection to the community and its knowledge base. A CoP develops over time and dissolves organically.

CoPs can vary in many aspects, including their scope, size, level of organizational support, or how institutionalized they are (Wenger et al., 2002; Jassbi et al., 2015). CoPs can provide their members and the

organization with short- and long-term values (e.g., personal development, discovery of synergies across units (Wenger et al., 2002), organizational efficiency and speed (Fontaine and Millen, 2004)). Still, sustaining a community throughout its lifecycle is challenging, and factors like the distribution of community members add complexity (Wenger et al., 2002). To avoid pitfalls, Wenger et al. (2002) recommend respecting the following principles: *"Design for evolution," "Open a dialogue between inside and outside perspectives," "Invite different levels of participation," "Develop both public and private community spaces," "Focus on value," "Combine familiarity and excitement,"* and *"Create a rhythm."*

2.2 CoPs in Scaled Agile Software Development

CoPs can be a tool to support adopting agile methods at scale (Kähkönen, 2004; Paasivaara and Lassenius, 2014; Šmite et al., 2019a,b). The communities allow experts, usually spread across various cross-functional teams, to connect, interact, and collaborate (Tobisch et al., 2024). CoPs can help foster continuous learning and leverage different experiences and expertise in an organization (Tobisch et al., 2024). Also, CoPs can empower employees to actively influence the organization, align areas, teams, and roles across the organization, and support the agile transformation through the distribution and creation of knowledge about agile practices (Paasivaara and Lassenius, 2014; Šmite et al., 2019a,b; Tobisch et al., 2024).

Organizations establish CoPs for various themes beyond "agile". In addition to CoPs focused on agile roles or agility itself, common themes include architecture and software development (Tobisch et al., 2024).

Several studies and reports on CoPs in scaled agile settings describe factors hindering and supporting their successful establishment and cultivation.

Šmite et al. (2019a) investigated Spotify's cultivation of CoPs and identified recurring challenges and prerequisites for success. According to the authors, defining the CoP's purpose, finding time, achieving engagement, and connecting CoP members across sites are challenging. The found success factors include a clear purpose and direction, sponsorship, a passionate leader, and dedicated time for CoP work.

Šmite et al. (2020) provide insights on barriers to and enablers for engagement in Spotify's CoPs. According to the authors, a large CoP size, member distribution, and lacking organizational support reduce engagement, while regular exchanges, cross-site events, and virtual communication channels support

it.

Paasivaara and Lassenius (2014) investigated how Ericsson adopted CoPs while transforming to lean and agile methodologies. The authors identified eight characteristics of successful CoPs: interesting topic, passionate leader, a proper agenda, decision-making authority, openness, transparency, suitable rhythm, and cross-site participation.

Ojasalo et al. (2023) studied CoPs at a Finnish company undergoing an agile transformation, highlighting challenges like a vague understanding of CoPs' nature, them being overlooked and -managed, and low recognition and support. According to the authors, engagement activities, value for members and organization, and a defined working model can foster success.

Šmite et al. (2019b) studied corporate-level communities at Ericsson and identified factors that influenced their success. According to the authors, for example, limited decision-making authority, poor attendance and activity, and lacking visibility of CoP work are challenging. Strengthening factors include community members acting as ambassadors, member participation and engagement, and transparency.

Detofeno et al. (2021) investigated a CoP for technical debt in a large agile project, reporting several factors hindering and supporting its success. The found challenges include aligning members' issues with organizational needs, a needed culture shift, time constraints, and quantitatively evaluating results. The found success factors include management support and alignment, tool support, well-defined objectives, and qualified CoP members.

Geffers (2024) studied the role of online CoPs in a company undergoing an agile transformation. The author found that voluntary participation can strengthen employees' intrinsic motivation, while the company's merger led, for example, to cultural differences.

Korbel (2014) provides insights from establishing CoPs at Digital Globe, including challenges like lacking time commitment, failed expectation management, low attendance, and no value perceived by participants.

Kopf et al. (2018) share patterns for the success of CoPs in agile IT environments to avoid common pitfalls: securing management attention, a suitable implementation plan, and encouraging self-organization.

Finally, Monte et al. (2022) conducted a literature review on CoPs in large-scale agile software development, finding success factors like a suitable rhythm and agenda, an interesting topic, management support, and an engaged CoP leader.

While these studies identify various partly recur-

ring, challenging, and supporting factors, a broad empirical study across organizations does not exist yet.

3 RESEARCH DESIGN

Interview Study Design. The research design for our study is based on qualitative data collection, as implementing CoPs in large-scale agile environments presents a practical challenge (Seaman, 1999). We conducted semi-structured expert interviews (Fontana and Frey, 2000; Myers and Newman, 2007; Seaman, 1999) following the guidelines of Myers and Newman (2007) to ensure rigor. Within this study, we combine exploratory with descriptive and explanatory elements. The study participants include 39 experts from 18 organizations (see Table 1 and 2). Thereby, we used a mix of convenience and purposive sampling (Kitchenham and Pfleeger, 2002). We reached out to suitable candidates individually (e.g., by e-mail) and distributed a call for participation through existing contact networks. Still, we only interviewed experts working in large-scale agile settings (Dingsøyr and Moe, 2014) that have CoPs established and who are

Table 1: Interview partners.

ID	Job role — CoP role	Org.
E1	Manager — Lead, Stakeholder	SoftwareCo1
E2	Enterprise Architect — Member	InsureCo1
E3	Agile Coach, Program Manager — Lead	SoftwareCo2
E4	Manager — Lead	ConsultCo1
E5	Software Architect — Member	SoftwareCo2
E6	Consultant, Q&A Specialist — Member	ConsultProj
E7	Manager, Agile Master, CoP Lead — Lead	CarCo1
E8	Security & Infrastructure Expert, Scrum Master — Lead, Member	SoftwareCo2
E9	Developer, Scrum Master — Member	SoftwareCo2
E10	Agile Coach — Lead, Member	CarCo2
E11	Business Analyst — Lead	ConsultCo1
E12	Scrum Master — Lead	SoftwareCo2
E13	Agile Coach, Manager — Member	ElectroCo
E14	Agile Coach — Lead	ElectroCo
E15	Agile Coach — Lead, Member	FoodCo
E16	Scrum Master — Lead	SoftwareCo2
E17	Agile Coach, Consultant, Pr. Owner — Lead	ConsultCo2
E18	Agile Coach, Scrum Master — Lead	ConsultCo1
E19	Consultant — Lead	ConsultCo3
E20	Developer, Agile Coach — Lead	TeleCo1
E21	CoP Lead — Lead	InsureCo1
E22	Software Architect — Member	HealthCo
E23	Agile Coach, Enterprise Architect — Lead	InsureCo1
E24	Enterprise Architect — Lead	FashionCo
E25	Solution Architect — Member	TransportCo
E26	Solution Architect — Lead, Member	TransportCo
E27	Manager — Lead, Member	RetailCo
E28	System Architect — Lead, Member	TransportCo
E29	Enterprise Architect, Manager — Member	TransportCo
E30	Project Manager — Lead	RetailCo
E31	Manager — Stakeholder	TeleCo2
E32	Product Owner — Lead	TransportCo
E33	Organizational Developer — Stakeholder	TeleCo2
E34	Enterprise Architect — Member	TeleCo2
E35	Enterprise Architect — Lead, Member	InsureCo2
E36	Agile Master — Member	TeleCo2
E37	Organizational Developer — Lead, Member	TeleCo2
E38	Disciplinary Leader — Member	TeleCo2
E39	Agile Master — Lead	TeleCo2

a CoP lead, member, or stakeholder (e.g., a sponsor). Also, we focused on different job roles and industries to include multiple viewpoints (Myers and Newman, 2007). When we interviewed multiple experts from a single company, we tried to involve people in different roles, organizational areas, and CoPs.

Data Collection. We conducted the interviews in two rounds: 23 interviews from February to May 2023 and 16 from November 2023 to January 2024. Most interviews lasted 40–60 minutes. All interviews in both rounds had a similar outline. However, we incorporated some changes for the second round to enhance the data collection through our previously gained experience and focus on investigating barriers and success factors. The interviews were divided into questions about the interviewees, CoPs within their organizational setting, potential support for CoP adoptions (first round), and challenges and good practices (second round). Most questions were open, allowing for detailed answers. We recorded and transcribed all interviews except one. In addition, we incorporated data sources (e.g., documents, websites) with information about certain CoPs shared by the experts for data triangulation.

Data Analysis. We performed the data coding and analysis following the guidelines of Miles et al. (2014) and Saldaña (2021), using a two-cycle approach that combined deductive and inductive coding. Inductive coding was the primary means to determine the barriers and success factors. Additionally, we analyzed the experts' statements regarding potential relationships between barriers and success factors. To clarify uncertainties and fill in information gaps, we reached out to the interviewees.

4 RESULTS

4.1 Barriers to the Success of CoPs

We identified 24 barriers to the success of CoPs in scaled agile settings mentioned by at least three experts from three organizations (see Table 3).

(B1) Lack of (attending) CoP Members: A lack of members or members not attending CoP meetings is one of the most common barriers to the success of CoPs in scaled agile environments. On the one hand, many CoPs struggle to get people to become members. For example, according to E23 *“it’s incredibly difficult and time intensive to try to get people on board.”* On the other hand, many CoPs suffer from low attendance in regular exchanges. For example, in the central Scrum Master CoP of SoftwareCo2 *“in some of these meetings, [there] are only 4 or 6 people.*

But the invitation list is longer” (E8). Often, a lack of (attending) members is caused by other barriers, like time limitations (B2).

(B2) Lack of time due to daily work: Many CoPs struggle with the limited time employees can dedicate to the community and related activities (e.g., preparation tasks) due to the high amount and priority of their daily work. Consequently, the capacity to initiate and lead CoPs can be low (B14), and attending CoP meetings difficult (B1). According to E24, low member numbers at FashionCo are commonly caused by *“timing issue. It’s finding the time to join these communities.”* This barrier can originate from a lack of management support (B8). For example, at CarCo2, an Agile CoP struggled because *“there was not the necessary backup for the participants from their own departments. So, they just didn’t get enough time to invest in the community”* (E10).

(B3) Difficulties in organizing CoP(s): Another common barrier is difficulties in the organization of CoPs. On the one hand, these difficulties include problems in the overall organization-wide approach to CoPs, like a lack of structure in the community landscape. On the other hand, difficulties occur in individual CoPs, like *“no discussion or no valuable discussion”* (E14) in meetings. A potential cause for such problems is a large CoP size (B17), which can complicate finding a meeting slot suiting most members and organizing regular meetings effectively. E4, for example, wonders: *“Once a community reaches a certain size, how can this be organized [so] [...] you’re still producing results and don’t go into [...] a lecture?”*

(B4) Lack of (perceived) value: CoPs not being perceived as valuable and needed from an organizational point of view and by (potential) members can hinder their success. Management, for instance, often does not recognize the long-term value of activities like knowledge sharing or employee development that happen outside of the day-to-day business. (Potential) members often perceive the topics discussed in a CoP as irrelevant to their daily work, do not feel a need for networking, or do not see other benefits. According to E30, *“the biggest challenge is [...] that the participants [do not] see the added value in it.”* As a potential consequence, people are not interested in participating in CoPs (B6).

(B5) Lack of engagement: Another common barrier is low engagement within CoPs. Often, members hesitate to propose topics for meetings and prefer to listen instead of actively participating in discussions and contributing. This deficit can lead to CoPs being *“one-way communication channels”* (E22). E24 describes that for the CoPs at FashionCo, the biggest

Table 2: Expert development organizations.

Org.	Details (e.g., scaling agile framework)
SoftwareCo1	The company has 20-30 employees working in two development teams. The applied framework is custom. E1 works with both teams. Two CoPs exist within the company: a software quality CoP and a data science and AI CoP.
SoftwareCo2	The company has over 30.000 developers across diverse areas. E9, E12, and E16 focus on solutions in the retail industry, E5 and E8 in the manufacturing sector, and E3 on technology innovation delivery. The framework varies by area and is often customized. Many CoPs exist, including a Quality CoP in retail, a UI/UX CoP in manufacturing, and a company-wide Scrum Master CoP led by E3.
InsureCo1	E2, E21, and E23 are part of the IT division of InsureCo1's German branch, which employs 2000 people and comprises 20 tribes, each consisting of 2 to 25 teams. The framework used is customized and builds on Spotify, LeSS, and SAFe. Multiple CoPs exist within the organization. Examples are CoPs for architecture, Agile Masters, and Product Owners.
ConsultCo1	E4, E4, E11, and E18 are involved in one customer project, which comprises eight programs, a total of 35 feature teams, and 450 employees. A customized framework is utilized for this project and various CoPs exist, for example, for architecture and agility.
ConsultProj	E6 is supporting a project as a consultant. This project comprises seven Scrum teams of a total of 100 employees and applies a custom framework based on LeSS. Several CoPs exist within the project, including a Scrum Master CoP and a CoP for testing.
CarCo1	E7 works in a division of CarCo1's enterprise IT with approximately 600 employees, divided into multiple domains. The applied framework is area-specific. E7's department has established multiple CoPs, such as a CoP for Agile Masters.
CarCo2	E10 works in the enterprise IT unit of the company with circa 900 employees in around 120-140 teams. The used framework contains SAFe elements. Various CoPs exist within the company, for instance, a CoP for collaboration and collaboration tools.
ElectroCo	The IT division of the company has over 800 employees distributed into 100 product teams, which are divided into domains on different levels. E13 and E14 work with multiple domains. The implemented framework is customized and inspired by Spotify. The IT division has several CoPs established, for example, for engineering, architecture, and Agile Coaches.
FoodCo	The IT unit of the company has over 2000 employees, working in 150-200 teams, which are grouped into domains. E15 operates at the level of the entire IT unit. The implemented framework builds on LeSS. The IT unit has multiple CoPs with different scopes established, such as CoPs for software craftsmanship, security, and Kanban.
ConsultCo2	The company is a small consulting firm acquired by a larger one, employing several hundred people. E17 belongs to a team with circa 50 consultants. The scaling framework used is client-specific. Different CoPs exist, for instance, for transformation and change, and agility.
ConsultCo3	E19 is a self-employed consultant with experience in establishing CoPs in different contexts, leading a cross-organizational CoP on agility.
TeleCo1	E20 worked in a department with 100 developers grouped into eight teams. The implemented framework is custom, integrating elements from Scrum-of-Scrums and LeSS. In the department, multiple CoPs existed, for example, for agility and security.
HealthCo	In the company's IT unit, over 1000 individuals are engaged in various projects. E22's project consists of 30 teams of, in total, around 250 developers. The applied framework uses parts of SAFe. CoPs exist in and across projects, for example, for requirement quality.
FashionCo	The company's IT division is divided into multiple domains with a total of around 400-500 employees. E24 works at the IT division level, not in a specific domain. Only certain parts of the IT operate in an agile manner, utilizing a customized framework influenced by SAFe. The IT division has several CoPs, particularly across all domains, for example, for architecture, Front-end Engineers, and Scrum Masters.
TransportCo	The IT unit of the company employs over 1300 people. The applied framework is SAFe. E25, E26, and E28 are part of different large solutions and ARTs. E29 and E32 work is independent of any ART or large solution. Many CoPs on various levels exist, for instance, for architecture and software development. A supporting IT sub-company also has several CoPs established.
RetailCo	The IT division of the company employs more than 2500 people and is structured into various departments. The applied framework is custom. E27 is part of a department with around 230 people in 30 product teams. E30 works on the IT division level. Additionally, 20 streams for cross-department projects exist. Multiple CoPs within and across departments exist, for example, digitalization.
TeleCo2	The company's IT unit comprises around 1000 people, with 30 teams distributed over 10-15 tribes. E31, E33, E34, and E36-39 work on the IT unit level or with multiple teams. The framework utilized is customized, with names inspired by Spotify. Multiple CoPs exist, for example, for business analysts, and leadership and management roles. E37 coordinates a CoP spanning multiple organizations.
InsureCo2	The agile section of InsureCo2's IT has around 220 employees distributed across four value streams, with each 4-8 teams. The implemented framework is custom. Moreover, several IT projects are carried out. E35 works at the overarching IT division level. Several CoPs exist at this level and between value streams and projects, for instance, CoPs for business analysis, security, and Architects.

problem “at first [...] was to move from a consumer mindset to a contributor mindset. Because it's a different way of working, and that took just some time.”

Low engagement can have various causes, for example, a format not allowing for contributions (B3).

(B6) Low motivation of (potential) CoP members:

Low motivation and interest of individuals to participate in a CoP is a common impediment. As a result, people refrain from joining CoPs as members and do not attend CoP meetings (B1) or engage (B5). Often, people are not interested in being part of a CoP because they do not see its value (B4). According to E4, “if they don't see a clear benefit for their day-to-day job, then it's hard to get people motivated to work in the CoP.”

(B7) Hindering organizational culture and Mindset:

In many companies, the organizational culture and the overall and individual mindset impede CoPs' success. Common culture problems are traditional ways of thinking and working, resistance towards agile principles, and missing awareness that activities

like knowledge sharing can support organizational development. A common consequence is that management is less willing to support CoPs (B8). E23 describes this problem as follows: “We also got the company culture difficulties that you need to bridge. So it's quite easy to start with the idea, but you need the buy-in from management to actually get the time.” Also, individuals often lack openness and fear sharing experiences (B5) or change.

(B8) Lack of management support: In many cases, lacking management support hinders CoPs from being successful. Difficulties in convincing management to support CoPs, lack of budget, or managers not allowing employees to spend enough time in CoPs (B2) can be challenging. According to E36, for the Agile Master CoP at TeleCo2, “time, budget, that are [...] the biggest challenges. Yes, you can get quite far without a budget, but it would be nice, of course, since we are spread all over [the country] if we at least had the budget to make an off-site once a year.”

(B9) Difficulties in starting CoP(s): Another bar-

rier to CoP success is problems during their initiation and formation, like difficulties in identifying potential suitable members and advertising it. As a potential consequence, CoPs struggle to gain members (B1), and the effort for initiators increases (B11). E15 explains: *“To make CoPs work, you have to invest time [...] and [...] a lot of patience [...] to make this organization aspect click and get people to work in the way of CoPs.”*

(B10) Hindering organizational setting: The organizational setting can negatively affect CoPs’ success. Examples are complicated company-internal processes and structures, a large company size, or strict policies limiting the tools that can be used (B12). Moreover, if an organization like a consulting company works for clients, booking time for CoP work is complicated (B3). E11 elaborates on this issue at ConsultCo2: *“This exchange costs time. [...] and that it’s not really bookable to the customer, right? [...] at the end, it just improves your way of working. But it’s not directly bookable.”*

(B11-24) A high amount of effort required for initiators and leads to establish and maintain CoPs **(B11)** can have negative effects if the leads and initiators are not able or willing to spend this time and effort. Insufficient tool support, like missing features or unreliability **(B12)**, can complicate organizing CoPs (B3). Alternative formats, like similar CoPs or meetings **(B13)**, can make CoPs obsolete (B4). Not having skilled and motivated CoP initiators and leads who build the CoP up, organize meetings, and motivate (potential) members **(B14)** counteracts success. High time and effort required to participate in CoPs (e.g., for meeting preparation) **(B15)** can stop people from joining (B1). Heterogeneous CoP members **(B16)** can complicate the organization (B3), for example, due to different interests and ways of working. Despite the relevance of members, also a large CoP size **(B17)** can complicate, for instance, communication, coordination, and finding a meeting slot (B3). Difficulties in assessing the success and impact of CoPs **(B18)** can make it hard to prove their added value (B4). A missing correct understanding of the CoP concept and its potential benefits **(B19)** can negatively affect the value perceived (B4). No shared understanding of a CoP’s topic and purpose between members **(B20)** can decrease engagement (B5). The geographical distribution of members (e.g., across time zones) **(B21)** makes it challenging to find suitable CoP meeting slots (B3). A virtual setting for CoP exchanges **(B22)** often impedes collaboration and establishing personal connections between members, which can negatively affect engagement (B5). Organizational changes, like intense personnel fluctuations **(B23)**, can lead to a de-

crease in members (B1). Finally, steering (by management) **(B24)** can harm engagement (B5), for example, since people fear being controlled.

4.2 Factors Fostering the Success of CoPs

We identified 24 factors fostering the success of CoPs in scaled agile settings that at least three experts from three organizations mentioned (see Table 4).

(SF1) (Perceived) value for the organization and CoP members:

The value of CoPs perceived by members and the organization is the most commonly mentioned success factor. For (potential) members, value is often connected to the CoP topic’s relevance for daily work and the option to collaboratively address a need or a shared problem. Other aspects perceived as valuable by individuals can be having a “safe haven”, personal development through learning, or appreciation of the CoP engagement by managers and colleagues. According to E11, CoP members must *“take value out of the meeting. [...] have the feeling [...] that they learned something, or at least that they had fun talking to some other people.”* Value for organizations is, for example, connected to enhanced efficiency through collaboration and knowledge sharing and the development of employees. Often, management is more prone to support when it sees a CoP’s value (B8, SF4).

(SF2) Suitable organization of CoP internal activities:

A common influence factor for CoP success is the organization of its exchange and activities. This organization can include having an agenda for regular meetings, embracing consistency, adopting agile practices like retrospectives, allowing topic contributions by members, and having a facilitator for exchanges. Depending on the context, suitable topics and an appropriate CoP meeting location (i.e., virtual, hybrid, or in-person) and format (e.g., workshops, presentations, discussions) should be chosen. For example, according to E7, for the Agile Master CoP at CarCo1 *“it’s [...] very important that in each of those community meetings, there’s not only one to many people presentation, but we always have interactive parts.”*

(SF3) Regular adaption and improvement: Adapting and improving a CoP regularly can influence its success. Changes can be related to the topics discussed in the CoP, its structure (e.g., splitting or merging communities), and meeting format, and should always be situation- and context-dependent. Also, if not needed, closing a CoP can make sense. For example, E10 claims that *“if you also realize, okay, the community has run into a sort of lockdown or dead end road,*

you also have to have the guts to say, okay, let's stop it in the end." Meaningful changes can ensure that the CoP remains valuable (B4, SF1) and can be facilitated through feedback by members and stakeholders (SF8). According to E13, *"changes come with the evolution of CoPs and are needed since changes [...] are part of agility."*

(SF4) Management support: Support by management can play a vital role in CoPs' success. This support can be in the form of budget and funding (e.g., for events), resources like meeting rooms, advertising of CoPs, or allowing employees to spend enough time in them. Primarily, the latter can ensure that CoP members, initiators, and leads have time for CoPs (B2, SF16). According to E6, *"[CoPs] should be backed by [...] leadership that these are established, exist and have the time to meet."* Transparency and involving management (SF17) can foster its support.

(SF5) Suitable CoP set-up and governance: Another factor contributing to CoPs' success is a suitable set-up and governance. This set-up should balance governance and self-management, have flat hierarchies, and, depending on the context, enforce voluntary or mandatory participation. A CoP working agreement between members can help to align them, for instance, on common values (SF18). CoPs with a certain degree of decision-making power and influence allow members to have an impact on the organization, boosting engagement (B5, SF12). E22 explains that *"if you want to influence [...] the discussion, [...] you have to be part of the discussion, and if you have good arguments [...] you can influence how something is done in the organization."*

(SF6) Motivation of (potential) CoP members: Motivation and interest of (potential) members to participate, learn, share, and be involved in a CoP is a key building block to its success. For example, motivated members tend to attend (B1, SF21) and contribute (B5, SF12). If people perceive a CoP as valuable (SF1), it can motivate them. According to E2, *"if [members] realize these benefits, they're really interested in further enhancing the community and improving it."*

(SF7) Engagement and promotion activities: Activities that promote and foster engagement can contribute to a CoP's success. These activities can be incentives to join, like drinks and snacks or recognition within the organization, an effective promotion strategy (e.g., announcements in company-wide meetings), proof of the potential of CoPs, and personally reaching out to (potential) members. According to E24, *"sometimes it's really a good idea to address a person who's mainly silent personally, [...], what do you think? [...] Could you elaborate any further?"*

Such measures can motivate (potential) members to participate and engage (B6, SF6).

(SF8) Assessment of impact and success: Investigating and reflecting on the impact and success of a CoP can help ensure that it is perceived as valuable (B4, SF1) and allows for regular improvements (SF3). This review can be done through feedback from CoP members and stakeholders, regular retrospectives, surveys, and metrics. For example, E4 recommends: *"Get feedback on a regular level. Are the things which we are focusing on bringing value for the people involved in the CoP? Is there anything that we would change?"*

(SF9) Availability of skilled and passionate CoP initiators and leads: Motivated CoP initiators and leads with the right skills are crucial for CoP success. These persons should drive the CoP set-up and organization, manage stakeholders, provide structure, and motivate members. According to E28, *"you need key players who drive this and who set it up first and who also feel responsible, for a whole first time, so that it doesn't fall asleep."* These individuals should make a CoP work without prescribing topics or rules and ensure activities and topics discussed align with CoP goals. Initiators and leads should be passionate, committed, open-minded, and ideally good facilitators. Support for leads (e.g., coaching or CoPs for leads) (SF20) can enhance their skills and knowledge.

(SF10) Supporting organizational culture: An organizational culture and a mindset of individuals valuing and open towards agile practices, learning, supporting, and sharing experiences can foster CoPs. A supporting organizational culture can make it easier to get management support (B8, SF4), and individuals with the right mindset are more motivated to join a community (B6, SF6). For example, E9 explains: *"In our organization, the agile culture is quite good [...] people understand that if you are [...] taking part in such communities, you will benefit."*

(SF11-24). A suitable establishment approach, including the selection of an appropriate topic, format, target group, and communication strategy (SF11), builds the foundation for a CoP's success. Depending on the context, the initiation should be top-down or bottom-up. Also, engagement of CoP members, like contributions and good discussions (SF12), is essential. Appropriate tool support, for instance, for virtual meetings and workshops (SF13), facilitates meeting and engaging (B1, B5, SF12, SF21). A well-organized and accessible documentation of relevant information like CoP meeting summaries or outcomes (SF14) is important. Limited steering of CoPs (by management), for example, regarding topics discussed (SF15), can have a positive impact on mem-

bers' motivation (B6, SF6). The time CoP leads and members have for CoP meetings and tasks (SF16) is crucial and depends highly on the degree of management support (B8, SF4). Transparency and stakeholder engagement, like getting stakeholder feedback, making results transparent, and involving management (SF17), can increase the chances of getting support (B8, SF4). Trust within the CoP and good relationships between members (SF18) can foster their engagement (B5, SF12). Support for establishing and cultivating CoPs, for example, help from Agile Coaches or coaching for CoP leads (SF20), can foster success. People with a correct understanding of CoPs and their potential benefits (SF19) are more likely to understand their value (B4, SF1). Naturally, members who attend CoP meetings (SF21) are a central element of a CoP. Defining a clear common goal and strategy for a CoP (SF22) can foster a shared understanding of its topic and purpose among members (SF23), which, in turn, can help perceive its value (B4, SF1). Limiting the effort required for a CoP membership, for instance, through facilitated meetings (SF24), can ease convincing people to participate (B1, SF21).

4.3 Relationships Between Barriers and Success Factors

The barriers and success factors we identified are connected: (1) barriers can cause other barriers, (2) success factors can mitigate barriers, (3) success factors can reinforce each other, and (4) some barriers and success factors are counterparts. To provide a comprehensive overview of those relationships, we mapped the barriers and success factors to variables that influence the success of CoPs in scaled agile settings and illustrated how they influence each other (see Table 5). Several identified variables (V1–8), like the geographical distribution of members (V3), only have effects on others. Some variables (V15, V17, V18, V24, V27), like skilled and passionate CoP initiators and leads (V18), influence a high number of factors. The engagement of CoP members (V13) is the only variable solely affected by others.

5 DISCUSSION

5.1 Key Findings

To answer our first RQ “Which factors hinder and foster the success of CoPs in scaled agile settings?”, we identified 24 barriers and 24 success factors.

The most common barriers we found are a lack of (attending) CoP members, limited time to participate in CoPs due to daily work, and difficulties organizing CoPs (B1–3). Similarly, Wenger et al. (2002) and numerous studies on CoPs in scaled agile settings have reported these barriers (Detofeno et al., 2021; Korbel, 2014; Monte et al., 2022; Ojasalo et al., 2023; Paasivaara and Lassenius, 2014; Šmite et al., 2019a,b, 2020). While also many other barriers we found are mentioned in related work (see Section 2.2), some barriers (B12, B13), like insufficient tool support (B13), to the best of our knowledge, have not been reported yet. The diverse range of barriers we identified underlines the complexity of implementing CoPs in scaled agile settings.

The most common success factors we identified are (perceived) value for the organization and members, a suitable organization of CoP internal activities, and regular adaption and improvement (SF1–3). These factors were also reported by Wenger et al. (2002) and, for the most part, by related studies (Detofeno et al., 2021; Kopf et al., 2018; Korbel, 2014; Monte et al., 2022; Ojasalo et al., 2023; Paasivaara and Lassenius, 2014; Šmite et al., 2019a,b, 2020). However, despite continuous improvement being a key aspect of the agile manifesto (Beck et al., 2001), only Wenger et al. (2002) emphasize its relevance for CoP adaptations. Other authors only mention certain aspects of this success factor, like closing a CoP if not needed anymore (Kopf et al., 2018; Paasivaara and Lassenius, 2014). Most other success factors we found are also reported in related work (see Section 2.2). Still, we identified that a limited time and effort required for members to participate in a CoP (SF24) can be beneficial, which, to the best of our knowledge, has not been explicitly highlighted by other studies.

To answer our second RQ “How are the factors influencing CoPs' success related to each other?”, we transformed the found barriers and success factors into variables and illustrated how they impact each other. The factors with the highest impact are CoP governance (V27), organization of activities (V24), skilled leads, and initiators (V18). While no other related study focused on these relationships, several highlight some links (e.g., Detofeno et al. (2021); Korbel (2014)), covering some connections we found (e.g., perceived value (V12) can foster engagement (V13)).

Our findings show that certain variables, i.e., (attending) members (V9) and their homogeneity (V20), can have positive and negative effects. While no CoP would work without members, a large CoP size can complicate its organization (e.g., finding common in-

Table 3: Barriers to the successful implementation of CoPs in scaled agile settings.

ID	Barriers	Experts	# E.	# Org.
B1	Lack of (attending) CoP members	E1, E3, E4, E6–26, E28–31, E33, E35–37, E39	33	18
B2	Lack of time due to daily work	E1, E3, E4, E6, E10, E11, E14, E15, E17–21, E23–27, E29–37, E39	28	16
B3	Difficulties in organizing CoP successfully	E1, E2, E4–7, E9, E11, E12, E14–17, E21–25, E26–30, E32, E34, E36, E37	27	14
B4	Lack of (perceived) value	E1–4, E6–8, E10, E11, E15, E21–26, E28–31, E33–35, E37–39	26	14
B5	Lack of engagement	E2–6, E11, E12, E14, E16–19, E21–24, E26, E30, E32, E33, E35	21	13
B6	Low motivation of (potential) CoP members	E2, E4, E7, E10–13, E18–23, E25, E29, E30, E37	17	12
B7	Hindering organizational culture and mindset	E1, E7, E8, E10, E13, E15, E22–29, E31, E36	16	12
B8	Lack of management support	E1, E3, E8, E10, E15, E18, E23, E24, E29, E32, E35, E36	12	10
B9	Difficulties in starting CoP(s)	E4, E9, E11, E23, E25, E26, E28, E29, E34, E37	10	5
B10	Hindering organizational setting	E4, E6, E7, E10, E11, E17, E26, E29, E30	9	8
B11	High time and effort required for CoP initiators/leads	E4, E11, E15, E23, E24, E26, E27, E29, E32	6	6
B12	Insufficient tool support	E6, E10, E14, E15, E17, E22, E23, E25	8	8
B13	Alternative formats	E3, E6, E10, E13, E23, E26, E28, E32	8	6
B14	Lack of skilled and passionate CoP initiators/leads	E14, E25, E28, E29, E31, E33–35	8	4
B15	High time and effort required to participate in CoP	E7, E11, E19, E20, E29–31	7	6
B16	Heterogeneity of CoP members	E2, E11, E15, E30, E33, E37, E38	7	6
B17	Large size of CoP	E4, E21, E23, E25, E28, E34	6	4
B18	Difficulties in assessing success and impact	E4, E7, E18, E23, E25, E28	6	4
B19	Lack of understanding of CoP concept	E6, E11, E17, E25, E29	5	4
B20	No shared understanding of CoP topic and purpose	E2, E7, E13, E21, E37	5	4
B21	Geographical distribution of members	E11, E12, E14, E16	4	3
B22	Virtual setting	E3, E11, E16, E30	4	3
B23	Organizational changes	E5, E8, E24, E27	4	3
B24	Steering (by management)	E19, E23, E35	3	3

Table 4: Success factors for the implementation of CoPs in scaled agile settings.

ID	Success factors	Experts	# E.	# Org.
SF1	(Perceived) value for organization and CoP members	E1–4, E6, E7, E9–19, E21–28, E30–33, E35–39	34	17
SF2	Suitable organization of CoP internal activities	E2, E3, E6–8, E10–18, E20–26, E28–39	33	16
SF3	Regular adaption and improvement	E2, E4, E6–8, E10, E12–19, E21–26, E28, E30, E31, E34, E37, E39	26	15
SF4	Management support	E2, E4–6, E8, E10–12, E15, E16, E18–20, E23–25, E29, E30, E32, E34, E36, E37	23	13
SF5	Suitable CoP set-up and governance	E2, E3, E6, E7, E11–16, E19–23, E25, E26, E28–30, E33, E34, E37	23	13
SF6	Motivation of (potential) CoP members	E2, E6, E8, E11, E13, E14, E16, E18, E19, E21–26, E28, E29, E32, E35–37, E39	22	11
SF7	Engagement and promotion activities	E1, E2, E4–7, E13, E14, E17–22, E24, E25, E27–30, E37	21	15
SF8	Assessment of impact and success	E1–4, E7, E10, E12–16, E18, E23, E24, E26, E28, E30, E34, E37, E39	20	12
SF9	Skilled and passionate CoP initiators/leads	E2, E3, E7, E15, E16, E19, E20, E23–29, E32, E33, E35–37, E39	20	11
SF10	Supporting organizational culture	E2, E3, E6–12, E16, E22–25, E29, E30, E36, E38, E39	19	11
SF11	Suitable establishment approach	E2, E3, E5, E9, E11, E12, E14–17, E21, E24, E26, E28, E29, E33–35, E37	19	10
SF12	Engagement of CoP members	E2, E3, E5, E10, E12, E16, E18, E22–24, E26, E29, E30, E32, E37	15	9
SF13	Appropriate tool support	E2, E3, E6, E8, E10, E14, E15, E17, E21, E22, E24, E25, E39	13	12
SF14	Sustainable and efficient documentation	E1, E2, E8, E14, E15, E18, E20, E22, E24, E26, E28, E34, E39	13	11
SF15	Limited steering (by management)	E7, E11–15, E19, E23, E25, E29, E33, E34, E37	13	9
SF16	Time of members and leads for CoP	E6, E8, E11, E12, E15, E18–20, E23, E29, E36	11	9
SF17	Transparency and stakeholder engagement	E2–4, E7, E8, E15, E18, E24, E26, E29, E30	11	8
SF18	CoP cohesion	E6, E11, E14, E16, E19, E30, E34, E36–39	11	7
SF19	Understanding of CoP concept	E6, E11, E17, E25, E28, E29, E31	7	5
SF20	Support for set-up and organization	E2, E6, E7, E14, E29, E38	6	6
SF21	(Attending) CoP members	E6, E23, E25, E26, E29, E37	6	4
SF22	Clear common goal and strategy	E13, E24, E26, E28, E30	5	4
SF23	Shared understanding of CoP topic and purpose	E24, E26, E28, E35	4	3
SF24	Limited time and effort required for CoP members	E15, E31, E35	3	3

terests). Heterogeneous members can cause similar problems but also enrich discussions and exchanges. Several studies report similar issues caused by a large CoP size or heterogeneous members (Šmite et al., 2019b, 2020; Wenger et al., 2002).

Our study's results highlight the relevance of adapting CoP implementation in scaled agile settings to each organization and specific community context. The difficulties in organizing CoPs (B3) that we found vary between communities and organizations, and how a suitable CoP organization, establishment, governance, and adaption (SF2, SF3, SF5, SF11) should look can differ. Moreover, that some barriers, like a lack of skilled, passionate CoP initiators and leads (B14), were mentioned by many experts, but, in comparison, in a few organizations highlights that some problems are only prevalent in certain contexts. Likewise, the organizational difficulties different studies report are manifold (e.g., managing diverse CoP members (Šmite et al., 2019b, 2020; Wenger et al., 2002) vs. over-commitment (Korbel, 2014)) and different studies provide different recommendations (e.g., self-organization (Kopf et al., 2018) vs. management alignment (Detofeno et al., 2021)). Also, some barriers, success factors, and the respective variables (e.g. supporting organizational culture (V7)) are even determined by an organization's or CoP's context and are only partly controllable. Still, CoP leads, initiators, or organizations can control other variables (V6, V8, V15, V17, V21, V23–25, V27–31), like CoP internal activities (V24).

Our study has theoretical and practical implications. We confirmed prior findings and extended them with novel insights across organizations. The identified variables impacting CoP success in scaled agile settings allow identifying future research topics (e.g., approaches to assess the impact and success of CoPs). Moreover, our findings aid practitioners in understanding the various factors influencing CoP success, help companies to support CoPs by identifying actionable factors, and guide CoP leads in finding starting points for improvement, for example, variables that affect many others or that they can actively influence.

5.2 Limitations

We assessed our study's validity and identified potential threats (Runeson and Höst, 2009). To increase external validity, we conducted more than 30 interviews with experts who differ in roles and company backgrounds. To improve the reliability of our study, we adhered to guidelines during the data collection and analysis. Also, we clarified uncertainties during

the data analysis by contacting the interviewees. We explained vital concepts and resolved potential ambiguities at each interview's start to foster construct validity. To increase internal validity, we kept a similar interview outline to collect data and focused on patterns across organizations and CoPs. Still, the internal validity may be impacted by the high interview participation of CoP leads, potentially overemphasizing lead perspectives. Also, the variation in interviewees per organization could introduce bias. To ensure representativeness, we included only barriers and success factors mentioned by experts of at least three organizations and provided context on each organizational setting. We also indicated the number of organizations in which each barrier and success factor was identified.

6 CONCLUSION

In this paper, we presented the results of an interview study involving 39 experts from 18 organizations, exploring factors that influence the success of CoPs in large-scale agile development. The most common barriers are a lack of (attending) members, limited time for CoP activities, and difficulties organizing CoPs successfully. Key success factors identified are the (perceived) value for organizations and CoP members, a suitable organization of CoP internal activities, and regular adaption and improvement. Highly influential variables that can impact many other aspects are the CoP governance, organization, and skilled initiators and leads. Many factors influencing CoP success in scaled agile environments, like regular adaptation and improvement, can be shaped by CoP leads or organizations. In addition, our findings show that establishing and cultivating a CoP in scaled agile settings should be tailored to the specific context of an organization and community. Future research directions include expanding the study by interviewing more CoP members instead of leads, validating our qualitative findings through quantitative research, and using the identified success factors as a basis to design solutions for CoP implementation in large-scale agile environments. Aligned with this, we aim to provide detailed, context-specific guidance to influence these factors.

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Table 5: Factors influencing the success of CoPs in scaled agile settings and how they are related.

(Influencing) Variable(s)/Factor(s)	Affected Variable(s)/Factor(s)																															
	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28	V29	V30	V31	V32								
V1: Supporting organizational setting (B10)	+	+	-																													
V2: Virtual setting (B22)	-		+		-																			-								
V3: Geographical distribution (B21)	-		+																													
V4: Alternative formats (B13)					-																											
V5: Organizational changes (B23)	-		+		-																											
V6: Support for set-up and organization (SF20)			-	+					+					+																		
V7: Supporting organizational culture (B7/SF10)	+		-	+	+	+	+		+								+															
V8: Clear common goal and strategy (SF22)	+			+		+	+																									
V9: (Attending) CoP members (B1/SF21)			+		-																											
V10: Time of members, initiators, leads (B2/SF16)	+		-		+	+	+		+																							
V11: Diff. in set-up and organization (B3/B9)	-			-	-	-	-	+																								
V12: (Perceived) value and need (B4/SF1)	+	+			+	+	+		+				+																			
V13: Engagement of CoP members (B5/SF12)																																
V14: Motivation of (potential) members (B6/SF6)	+		-		+	+																										
V15: Management support (B8/SF4)	+	+	-		+	+	+														+											
V16: Time and effort req. for initiators/leads (B11)			+																		+											
V17: Appropriate tool support (B12/SF13)			-	+	+	+																+										
V18: Skilled/passionate CoP initiators/leads (B14/SF9)	+	+	-	+	+	+	+														+											
V19: Time and effort req. for participants (B15/SF24)	-		+		-	-	-	+																								
V20: Homogeneity of CoP members (B16)	+		-	±	+																+											
V21: Assessment of CoP success/impact (B18/SF8)	+			+	+	+	+										+															
V22: Understanding of CoP concept (B19/SF19)		+		+	+	+	+	+																								
V23: Steering (by management) (B24/SF15)	-		+		-	-	-																									
V24: Suitable org. of CoP internal activities (SF2)	+		-	+	+	+	+										+															
V25: Regular adoption and improvement (SF3)	+		-	+	+	+										+																
V26: Shared underst. of CoP topic/purpose (B20/SF23)	+			+	+	+	+																									
V27: Suitable CoP structure and governance (SF5)	+		-	+	+	+	+										+							+								
V28: Suitable engage. and promotion activities (SF7)	+			+	+	+	+																									
V29: Suitable establishment approach (SF11)	±			+		+	+	-				±																				
V30: Sustainable and efficient documentation (SF14)			-	+	+	+	+											+														
V31: Transp. and stakeholder engagement (SF17)			-	+	+	+	+													+												
V32: CoP cohesion (SF18)	+		-	+	+	+	+																									

+

= increasing effect,

= decreasing effect

+ = increasing effect, - = decreasing effect

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