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OVERCOMING PEOPLE-RELATED CHALLENGES IN LARGE-SCALE AGILE TRANSFORMATIONS: THE ROLE OF ONLINE COMMUNITIES OF PRACTICE

Completed Research Paper

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Abstract

The contemporary business landscape is shaped by complexity, ongoing change, and disruptions. To remain competitive, an increasing number of organizations are embracing the company-wide adoption of agile methodologies, known as large-scale agile transformations (LSATs). However, these transformations face significant challenges, such as employees' lack of skills and motivation. While Communities of Practice (CoPs) are recognized as supportive mechanisms for LSATs, their role in addressing transformational challenges lacks adequate academic exploration. Our research bridges this gap by conducting an exploratory qualitative case study in a European automotive software company undergoing a LSAT. Through interviews with 33 actively participating employees across several internal online CoPs, we have found that these CoPs play a fundamental role in developing relevant employee abilities (workforce agility), perceptions (psychological empowerment), and attitudes (agile mindset). These findings contribute to understanding agile transformations and online CoPs and offer insights into effective strategies for managing and mitigating LSATs' challenges.

Keywords: Large-Scale Agile Transformation, Online Community of Practice, Workforce Agility, Psychological Empowerment, Agile Mindset

1 Introduction

In today's ever-changing business world, organizations confront complex, ever-evolving, and disrupted environments. Consequently, many organizations strive for enhanced agility to swiftly respond to rapid and unpredictable changes. This pursuit often involves implementing agile methodologies across the entire organization, known as large-scale agile transformations (LSATs) (Fuchs and Hess, 2018). LSATs encompass significant changes in procedural, organizational, technological, and cultural dimensions within the organization (Conboy et al., 2011; Fuchs and Hess, 2018). However, as employees play a crucial role in anticipating and adapting to change (Holbeche, 2018; Munteanu et al., 2020), the primary challenges of LSATs are mainly people-centric (Gandomani and Hazura Zulzalil, 2014; Howaldt et al., 2012). Specifically, significant challenges within LSATs revolve around employees' lack of abilities and motivation (Dikert et al., 2016; Fuchs and Hess, 2018). Ability-related challenges in LSATs include for example deficiency in skills among organizational members, while motivation-related challenges involve attitudes and perceptions of organizational members, such as inadequate mindsets or fears of consequences (Fuchs and Hess, 2018). Due to the limited research in this area, effective strategies to address these challenges remain unclear (Fuchs and Hess, 2018; Paasivaara et al., 2018). Exploration into community research reveals initial findings regarding the role of Communities of Practice (CoPs) as catalysts for LSATs. Generally, CoPs refer to informal groups of individuals with similar interests and expertise who share a common concern (Wenger, 2010). Traditional CoPs consist of co-located members interacting face-to-face. However, as many organizations today operate globally and digitally, there is a growing number of online-based CoPs. These platforms allow employees to connect and collaborate in a virtual environment, regardless of geographical barriers (Greer and Deokar, 2013). CoPs offer a platform for employees to collaborate,

share expertise, and collectively pursue shared objectives (Plessis, 2008; Wenger, 2010). They facilitate continuous learning, improvement, problem-solving, and the development of collective resiliency (Fuchs and Hess, 2018). These elements highlight CoP's increased significance within LSATs, characterized by heightened complexity, uncertainty, and turbulence. However, existing studies have primarily focused on the methodological and organizational impacts of CoPs in this transformative process. Scholars have largely overlooked the role of CoPs in addressing the people-related challenges of LSATs, particularly the issues surrounding employees' lack of abilities and motivation (Fuchs and Hess, 2018). Investigating these aspects can provide insights into effective strategies for managing and mitigating LSATs' challenges related to human aspects, enhancing the success and sustainability of LSATs.

This paper aims to bridge the gap in the existing literature by investigating the contribution of online CoPs to overcome people-related challenges, specifically, the challenges related to employees' lack of abilities and motivation within LSATs, framed by the research question: *How do online Communities of Practice (CoPs) contribute to managing the people-related challenges faced during large-scale agile transformations (LSATs)?* To answer the research question, we conducted an exploratory qualitative case study as the research design. The case organization, a young European automotive software company, has been in existence for about three years. At the time of our research, it employed over 6,000 individuals and had multiple locations worldwide. The company aims to adopt agile methodologies across its entire organization while undergoing an LSAT, considering these methodologies as a competitive advantage within the automotive software industry. Within the organization, more than 30 online Communities of Practice (CoPs) cover a wide range of topics, including artificial intelligence and software development. The company highly values these CoPs for fostering cross-functional collaboration and knowledge exchange. To examine the contributions of online CoPs in managing the people-related challenges of the LSAT, we conducted 33 semi-structured interviews with CoP members actively engaged in various internal CoPs. Our research significantly contributes to the scientific literature by advancing knowledge in the field of LSATs. Our study is the first to investigate how online CoPs within companies contribute to LSATs by shaping the development of essential abilities, perceptions, and attitudes among actively engaged employees. Furthermore, our study makes important practical contributions by outlining the relevance of online CoPs regarding LSATs and emphasizing their establishment and organizational support in transformational environments.

2 Theoretical Background

2.1 Large-scale agile transformations

Today, almost all industries are experiencing extensive changes, further accelerated by the COVID-19 pandemic (Hai et al., 2021). To successfully face and respond to constant change, organizations aim to implement agility. Agility, in essence, refers to the ability “to change, learn continually, and act quickly and with flexibility” (Ulrich and Yeung, 2019). It consists of four key principles: envisioning a future, foreseeing opportunities, adapting quickly, and fostering continuous learning. Agility can manifest in the strategic, organizational, leadership, and individual dimensions of the work setting (Ulrich and Yeung, 2019). The company-wide implementation of agility, also referred to as large-scale agile transformation (LSAT), encompasses significant changes in culture, processes, and technical practices aiming to promote agility (Conboy et al., 2011). In this paper, we define LSAT as the comprehensive adoption of agile methodologies throughout entire organizations (Fuchs and Hess, 2018). Agile methodologies, such as SAFe (Scaled Agile, Inc., 2023), prioritize customer involvement, flexibility, teamwork, self-organization, shared learning, decision-making authority, and iterative work (Conboy, 2009; Malik et al., 2021; Petermann and Zacher, 2021). They are rooted in the so-called ‘Agile Manifesto’ which emphasizes transparency, inspection, and adaptation (Schwaber and Sutherland, 2001). Unlike plan-driven linear methodologies, agile methodologies are characterized by iterative development phases, emphasizing rapid deployment and a high level of responsiveness to change

(Abrahamsson et al., 2003). LSATs necessitate a sustained, long-term commitment and the provision of adequate resources to effectively transition from traditional, plan-driven development methodologies (Russo, 2021). LSATs can manifest in two primary approaches: a singular, comprehensive shift to agile methodologies across a substantial setting, such as an entire software development unit within a company, or a gradual progression where an initial agile pilot is incrementally expanded into a larger context (Fuchs and Hess, 2018). Scaling up, in this context, refers to extending the initial adoption of agile methodologies. This expansion may encompass broadening the application across the organization, transforming additional business units, or deepening the application by integrating further agile practices from various methodologies (Dikert et al., 2016; Paasivaara et al., 2018). Viewed as a socio-technical process, LSAT involves the intricate interplay between the social and technical subsystems within the organization. The social subsystem encompasses the individuals within the organization, including their knowledge, skills, attitudes, values, and needs. The technical subsystem consists of the tools, mechanisms, and techniques used within the social subsystem to carry out organizational work (Fuchs and Hess, 2018). The seamless connection between these subsystems is crucial, and optimal harmony contributes to favorable organizational outcomes and positive social aspects (Sarker et al., 2013).

Motivations driving LSATs encompass a range of factors, including reducing time-to-market (McDowell and Dourambeis, 2007), a strong focus on high customer orientation (Sillitti and Succi, 2005), and promoting flexibility (Prause and Durdik, 2012). Despite their advantages, LSATs bring extensive change to the entire organization, particularly in cultural and technical practices (Fuchs and Hess, 2018). Moreover, they involve coordination among multiple departments, teams, and stakeholders (Russo, 2021). Due to their complexity, LSATs present numerous challenges. Although obstacles are commonly discussed in agility-related research, navigating LSATs involves distinct challenges that go beyond implementing agile methodologies within smaller contexts, such as individual teams (Fuchs and Hess, 2018). Here, challenges include customizing the LSAT to meet specific company needs (Dikert et al., 2016), transforming organizational culture (Misra et al., 2009), the time-intensive nature of LSATs (Fuchs and Hess, 2018), and customer involvement and collaboration (Conboy et al., 2011). However, the primary difficulties reported are associated with the human dimensions of LSATs (Gandomani and Hazura Zulzalil, 2014; Howaldt et al., 2012). This is primarily attributed to the people-centric nature of agile methodologies which foster decentralization, autonomy, and self-organization (Howaldt et al., 2012; Nold and Michel, 2016). Employees at all levels are assigned more responsibility to make decisions themselves and take initiatives to improve their work (Conboy et al., 2011). In their paper, Fuchs and Hess (2018) provide a categorization of challenges that can occur in LSATs. The authors identify two people-related challenges that arise regarding the social subsystem on an individual employee level. These categories encompass ability-related obstacles (challenges regarding the abilities of employees involved in the LSAT, for example, hard skills) and motivation-related obstacles (challenges regarding the attitudes and perceptions on the LSAT of the employees involved, for example, a missing mindset and fear of consequences). Despite identifying challenges in LSATs, the existing body of academic studies addressing these challenges is limited and calls for further empirical research on the subject (Fuchs and Hess, 2018; Paasivaara et al., 2018).

2.2 (Online) Communities of Practice

CoPs are a well-established phenomenon in the scientific literature (Wenger, 2010; Lai et al., 2006). They can be defined as informal groups of people with similar interests and expertise who share a common concern or need to achieve a certain outcome (Wenger, 2010). Unlike conventional communities, CoPs couple practices and identity, enabling not only information and knowledge sharing but also knowledge building (Zhang and Watts, 2008). According to Wenger et al. (2002), a CoP consists of three elements: domain, community, and practice. The domain reflects the (temporary) common area of interest continuously renegotiated by its members. The community comprises individuals collaborating on a voluntary and regular basis. CoPs are open, allowing anyone interested in the topic to become a member (Lai et al., 2006). The practice encompasses the shared body of knowledge, experiences, and techniques that members have developed over time. CoPs are dynamic entities composed of individuals who voluntarily exchange knowledge, experiences, and best practices

(Wenger, 2010). All interactions within CoPs are based on informal structures, emerging naturally and spontaneously (McEvily et al., 2014). These structures facilitate dynamic and responsive communication, voluntary participation, genuine commitment, and the organic development of trust (Passerini et al., 2020). Embracing an organic nature allows for creative problem-solving, responsiveness to evolving needs, effective collaboration, and knowledge sharing. In contrast to controlled, predictive, and optimized systems, CoPs, comprised of experts from diverse disciplines, liberate collective intelligence and stimulate social imagination (Šmite et al., 2019). CoPs are self-organized social entities that grow, evolve, and dissolve according to their individual needs and goals (Paasivaara and Lassenius, 2014). Self-organization means that CoP members autonomously coordinate and structure their work, regulate their boundary conditions, and share decision authority (Stettina and Heijstek, 2011). CoP members do not necessarily work together daily but rather as needed (Plessis, 2008). Levels of member participation can vary widely, typically with a small number of members being quite active and most members only participating occasionally (Zhang and Watts, 2008). The benefits of CoPs within organizations are widely recognized, such as driving strategy, fostering innovation, providing a platform for problem-solving, transferring best practices, and developing professional skills (Plessis, 2008; Wenger, 2010). Consequently, an increasing number of companies are establishing internal CoPs (Šmite et al., 2019).

Due to globalization and digitization, organizations are becoming more geographically distributed. Additionally, the COVID-19 pandemic has significantly restricted in-person interactions and increased the demand for remote work, impacting the exchange of expertise within organizations (Mills et al., 2020). This has emphasized the significance of online CoPs, as traditional face-to-face CoPs cannot adequately cater to the growing necessity of including remote members (Greer and Deokar, 2013). Consequently, there has been a noticeable increase in CoPs primarily operating online through digital platforms (Lefebvre and Legner, 2022; Zhang and Watts, 2008). The shift of CoPs to an online environment primarily involves computer-mediated collaboration through digital communication tools (Passerini et al., 2020; Shaw et al., 2022). In this way, online CoPs facilitate idea exchange and collaborative problem-solving across geographical and temporal distances (McLoughlin et al., 2018; Mills et al., 2020). They also allow simultaneous access to a larger audience, with fewer restrictions compared to traditional CoPs (McLoughlin et al., 2018). Therefore, membership can be large and span different locations and even organizations. At the same time, work results can be saved and shared on digital platforms, becoming an important learning resource (Zhang and Watts, 2008). Online CoPs rely on computer-mediated interactions, emphasizing the importance of active member participation. This active participation includes engaging in knowledge exchange activities such as posting queries on community boards, participating in live chats, joining online videoconferencing sessions, and contributing responses in discussion threads (Shaw et al., 2022). The extent of engagement is shaped by members' motivations, personalities, available time, and values (Francis-Coad et al., 2017).

CoPs provide a platform for employees to collaborate, share their expertise, and collectively work towards common goals. In this sense, they offer their members opportunities for continuous learning, improvement, finding solutions to intricate problems, and nurturing collective resiliency in the face of challenges (Fuchs and Hess, 2018). These aspects underscore their heightened significance, especially in contexts such as LSATs, marked by increasing complexity, uncertainty, and turbulence. In practice, CoPs are already an established element in agile frameworks and participation in CoPs is discussed as a way of promoting LSATs (Conboy, 2009; Scaled Agile, Inc., 2023). However, the role of CoPs in this context has received limited attention in academic literature thus far. Specifically, only a few studies have examined to what extent CoPs can contribute to LSATs and address their associated challenges.

Kähkönen's (2004) study delves into the utilization of CoPs as a theoretical framework for implementing agile software development methodologies at Nokia, a large-scale organizational setting. The research introduces three of those methodologies (RaPiD7, Integration Camp, SEED) and analyzes, based on the CoP theory, how CoPs can solve the problems associated with multi-team communication and coordination. Furthermore, the study reveals a practical application derived from CoPs: the implementation of cross-team workshops. Paasivaara and Lassenius (2014) conducted a study focusing on the integration of CoPs as a component of the LSAT process at Ericsson, transitioning from a

traditional plan-driven organizational framework to one characterized by lean and agile methodologies. The study investigated Ericsson's CoP landscape, the success factors of CoPs (e.g. open community and suitable rhythm), and the evolution of the CoPs' role over time. The results demonstrated that CoPs promote the implementation and scaling of agile methodologies, as well as the application of lean thinking, serving as an inter-team coordination mechanism. In a study by Šmite et al. (2019), the authors explore the role of CoPs in facilitating the bottom-up scaling of agile practices within Spotify as a large-scale agile organization. The findings reveal success factors (e.g. representative leadership and stable core), values (e.g. perspectives on problems and access to expertise), challenges of the company's CoPs (e.g. unclear mission and low engagement), as well as practical advice. Mládková (2023) introduces a so-called 'CoP-based management model' in her conceptual paper. This model represents a specific organizational approach based on the concept of CoPs, emphasizing stable human-centered environments, self-management, employee empowerment, autonomous decision-making, and free knowledge sharing within and across teams. The author underscores that this approach is well-suited for fast-paced environments as it encourages flexibility, innovation, and competitiveness.

The existing studies provide initial insights into the role of CoPs within LSATs, highlighting their significance in this context. However, only two studies (Paasivaara and Lassenius, 2014; Šmite et al., 2019) employ empirical approaches to derive their findings. The majority of these studies examine CoPs' success factors, challenges, and values rather than their direct effects on the LSATs. Among these, only Paasivaara and Lassenius (2014) delve into how CoPs contribute to LSATs by establishing forums for discussing agile methodology implementation, fostering knowledge sharing, inter-team coordination, and promoting continuous improvement. However, this study mostly addresses methodology- and organizational-related challenges (Fuchs and Hess, 2018), leaving the role of CoPs in dealing with people-related challenges such as lacking abilities and motivation in LSATs largely unexplored.

3 Research Design

3.1 Case description

We chose an exploratory qualitative case study as our research design for three key reasons. Firstly, case studies are suitable for investigating dynamics within individual cases (Yin, 2013; Eisenhardt and Graebner, 2007). Secondly, case studies provide insights into the attitudes, beliefs, and motives of individuals. Lastly, qualitative research methods are effective in identifying individual behaviour (Rohrbeck et al., 2015) and allow for the discovery of unexpected information through extensive interaction with study subjects (Holloway, 2005). Given our aim to gain an initial understanding of how employees are affected by actively participating in online CoPs, a case study approach is deemed promising for our research. The case organization is a young European automotive software company. The company's vision is to redefine the automotive experience universally through the development of a pioneering technological infrastructure tailored for the automotive sector. Their objective is to enhance automotive mobility by introducing novel safety, sustainability, and comfort features, predominantly driven by software-based solutions. The company's corporate culture emphasizes agility, innovation, and collaboration, embracing agile methodologies to foster a dynamic work environment. Teams operate self-organized, facilitating quick decision-making and rapid iteration. Furthermore, the company's values include transparency, trust, mutual respect, and providing opportunities for growth.

The case company has recently undergone mergers with established companies from various industries, resulting in the transfer of a significant number of temporary workers. At the time of the research, the company has been in operation for approximately three years, employs over 6,000 people and has multiple locations worldwide. Recognizing the importance of agility as a competitive advantage in the automotive software industry, the company is in the process of transforming into a large-scale agile organization. The implementation and scaling of agile practices are facilitated by the adoption of the Scaled Agile Framework (SAFe) (Scaled Agile, Inc., 2023). The framework is based on the 'Agile Manifesto' and the principles of lean thinking (Schwaber and Sutherland, 2001). The case organization

utilizes a functional organizational structure, grouping departments according to distinct functions such as human resources, finance, quality, and IT. Each department comprises multiple subordinate departments and teams, facilitating focused operations within each functional area. In addition, a matrix organizational structure has been implemented for Solution Trains and Agile Release Trains, fostering cross-functional collaboration and alignment across various departments. Furthermore, the company has already established a company-wide cadence, agile events, and various agile accountabilities (Scaled Agile, Inc., 2023).

During the early stages of the COVID-19 pandemic, the organization rapidly grew due to multiple company mergers. To adapt to remote work across globally distributed locations, online collaboration tools were widely adopted, leading to challenges in restructuring collaboration and limited transparency. In response, employees established over 30 online CoPs aimed at enhancing networking, transparency, and collaboration. These CoPs cover various subject areas, such as artificial intelligence, software development, and testing, with membership sizes varying from 5 to 750. We selected the company as our case organization for its explicit goal of promoting agility and high appreciation of CoPs as a tool for fostering agility among employees. CoPs operate in a self-initiated, self-organized manner, facilitated by professional moderation. Access to CoPs is unrestricted, allowing every employee autonomy in joining. Participants come from various departments and have flexibility in their engagement levels. CoP activities primarily occur online via platforms like Microsoft Teams, Yammer, and Confluence.

3.2 Data material and analysis

To explore the effects of active participation in CoPs on employees, we conducted semi-structured interviews with 33 employees from the case organization. Participation in these interviews was voluntary, and we reached out to potential participants by posting interview requests on Microsoft Teams within the existing internal CoPs. To qualify for the interviews, employees needed to actively engage in at least one company-internal CoP. Active participation in online CoPs, as defined in this study, involves employees voluntarily and meaningfully engaging in various activities, such as posting messages in CoP Teams or Yammer channels, responding to requests in chats, attending CoP videoconferencing meetings, and asking or answering questions during these meetings more than once a week (Gharib et al., 2017). To minimize potential biases among interviewees, we followed the recommendations of Suri (2011) and purposefully selected a diverse sample that varied in terms of age, gender, business unit, job roles, and CoP memberships. The interview participants comprised individuals ranging in age from 25 to 56 years. The gender distribution was 24% women and 76% men. These participants were spread across different departments such as domains, solution trains, and the Human Resources department, holding various positions like Solution Train Engineer, Release Train Engineer, Specialist, and Agile Coach. Furthermore, they were active members of different CoPs addressing distinct subjects like software testing, automotive SPICE, and artificial intelligence. The diverse group of individuals with different backgrounds and characteristics brought a broad spectrum of viewpoints and backgrounds, enriching the discussion.

The interviews, conducted digitally via Microsoft Teams, lasted between 20 to 30 minutes each. Employing a semi-structured format allowed for comprehensive interaction with the participants, enabling them to freely express their perspectives (Osch and Bulgurcu, 2020; Holloway, 2005). We developed the interview guide using straightforward language (Denzin and Lincoln, 2011) to engage the 33 employees actively participating in the CoPs. Their active engagement in the community, through attending events, contributing to online discussions or chats, and sharing ideas, is vital for the CoPs' functioning and success. In the introductory segment of our interviews, we recorded demographic characteristics (see Table 2) and identified the CoPs in which the interviewees were actively involved, along with the duration of their participation. Active participation in at least one company-internal CoP was a prerequisite for being involved in the interviews. This active involvement encompassed activities like posting requests on community boards, engaging in chats, participating in online videoconferencing sessions, and contributing to discussion threads regularly (more than once a week). Our research

question concentrates on the human-centered challenges of LSATs, particularly those concerning 1) employees’ abilities and 2) motivation, encompassing perceptions and attitudes of the employees, identified by a study by Fuchs and Hess (2018) (Chapter 2.1). Thus, subsequent interview questions aimed to evaluate participants’ perceptions of their ability development and motivation, influenced by their active participation in CoPs and relevant to their daily responsibilities. Table 1 provides an excerpt from the interview guide.

All interviews were recorded and transcribed to ensure the precision of our analysis. Adhering to qualitative research standards, we followed various criteria such as confirmability, reliability, dependability, auditability, credibility, authenticity, transferability, and fittingness (Miles and Huberman, 1994). Employing Gioia et al.’s methodology (2013), our qualitative data analysis followed a two-phase approach. The first phase, known as the first-order analysis, utilized an inductive approach. It involved extracting terms and concepts directly from interview transcripts. This phase involved an open coding process following Corbin and Strauss (2015), resulting in the identification of numerous informant-centric codes. These codes were later consolidated by associating them with specific concepts, thus creating a comprehensive collection of terms encompassing the fundamental aspects of the phenomenon (Gioia et al., 2013). Moving to the second phase of analysis, we organized the informant-centered first-order codes identified in the initial phase into theory-centered second-order themes. These themes, representing corresponding concepts, served to provide further clarification of the observed phenomena. Subsequent refinement took place as we distilled the second-order themes into aggregated dimensions (Gioia et al., 2013). Throughout this analytical process, we continuously iterated among emergent data, themes, concepts, dimensions, and relevant literature. In summary, our data structuring involved the generation of first-order concepts, second-order themes, and aggregated dimensions, elucidating the progression from raw data to the terminologies and themes employed in our analysis. Employing this methodological approach is crucial in demonstrating the rigor and depth of qualitative research (Gioia et al., 2013).

1.1 Experience (<i>Warm-up</i>)	Which internal CoPs do you actively participate in and since when? What are the goals of the CoP(s)? Which activities within the CoP(s) do you actively engage in?
2.1 Effects of CoPs on abilities	How does your participation in CoPs contribute to the development of abilities that apply to your everyday work?
2.2 Effects of CoPs on motivation	In what way does your participation in CoPs influence and enhance your motivation for your day-to-day tasks?
	How does your participation in CoPs help shape attitudes directly related to your everyday work?

Table 1. Excerpt from the interview guide

No.	Age	Gender	Role	Business Unit	Topics of CoPs participated in
1	45	Male	Product Manager	Human Resources	Cooperations, leadership
2	36	Male	Specialist	Human Resources	Software testing, artificial intelligence
3	38	Female	Assistant	Domain	Software testing, artificial intelligence
4	42	Male	Product Manager	Solution Train	Diversity
5	33	Female	Senior Coach	Human Resources	Leadership
6	29	Male	Agile Coach	Solution Train	Release train engineer
7	51	Male	Release Train Engineer	Solution Train	Software testing
8	42	Male	Product Owner	Domain	Software testing
9	54	Female	Specialist	Human Resources	Agility, Automotive SPICE
10	44	Male	Specialist	Domain	Machine Learning, DevOps

Table 2. Excerpt from the interview sample

4 Findings

In this section, we present our findings derived from the qualitative analysis. To ensure a rigorous and comprehensive presentation, we adhere to the approach outlined by Gioia et al. (2013) (see Chapter 3.2), utilizing theory-centered 2nd-order themes and aggregated dimensions (see Table 3), while emphasizing these through the perspectives shared by the interview participants. Aligning with the focus of our research question on the people-oriented challenges within LSATs (Chapter 2.1), the subchapters are sorted by employee abilities, perceptions, and attitudes that are influenced by their active participation in CoPs.

4.1 Employees' work-related ability – workforce agility

During our interviews, we came across various perspectives on how active participation in CoPs affects the employee's work-related abilities:

1. CoP members actively seek out opportunities and collect relevant information to improve their work and thereby contribute to organizational success. This includes, for example, optimizing tasks and processes, increasing efficiency, and leveraging synergies. CoP members use the CoP chats and online meetings to ask questions and address work-related challenges. They actively gather feedback from other CoP members and ask for help. A CoP member (I24) outlined the collaboration in his CoP which is also characterized by a willingness to help: *“Each member can also bring their topics [...] and then there is discussion, help is given, and you learn a lot. Many colleagues are fighting the same battles”*.
2. We also observed that members show a considerable degree of flexibility. They enjoy working in interdepartmental teams that come together in ever-new constellations during online CoP activities. The resulting exchange across teams and departments encourages the development of new knowledge and skills. A CoP member (I30) concluded in our interviews: *“Without a community of practice, you wouldn't have the exchange on such a big topic beyond your small department and you just wouldn't see: hey, what are the others doing, what are the others doing better today, what can I learn from it, what can I adopt from them, what can they perhaps also learn from me?”*. At the same time, CoP members are able to quickly switch between tasks, roles, and teams, as all CoP activities take place outside of everyday work and independently from established work structures and job profiles. A CoP member (I26), who is a business unit leader, described how she changes her role when acting in the community context: *“And I'm not going in there as a leader, that is very important. [...] For me, It's like being close to: What moves people? What is discussed, what challenges? [...] I am there as a participant”*.
3. CoP members aim to challenge the status quo and push for improvements by actively asking for new ideas and fresh perspectives in chat discussions or online meetings, as depicted by an interview participant (I30): *“You get different aspects, different perspectives on the issues, and then you have a broader picture. [...] You have people with various backgrounds and different experts on board”*.

Combining these insights, we identified three theory-centered second-order themes that demonstrate the effects of active participation in CoPs on employees' work-related abilities: (1) proactivity, (2) adaptability, and (3) openness to change. These themes can be aggregated to what the literature refers to as 'workforce agility'. A systematic literature review by Salmen and Festing (2021) indicates that the majority of studies describe workforce agility as a construct oriented toward abilities or/and behaviours (e.g. Alavi et al., 2014; Petermann and Zacher, 2022). In this context, workforce agility encompasses the abilities required by individual employees in an agile working environment, involving overcoming obstacles, being flexible, and continuously developing in a changing, complex environment (Storme et al., 2020). More specifically, workforce agility can be defined through three dimensions: proactivity, adaptability, and resiliency (Sherehiy and Karwowski, 2014). Proactivity entails seeking opportunities to enhance organizational success and taking the initiative to pursue promising chances (Muduli, 2017). Additionally, proactivity involves addressing change-related issues and identifying and anticipating potential problems (Sherehiy and Karwowski, 2014). Adaptability involves continuously acquiring new tasks, skills, and procedures. Moreover, proactivity entails taking on multiple responsibilities and

concurrently working on various tasks across different teams. This also encompasses the ability to assume and adapt to different roles as needed (Petermann and Zacher, 2022). Resiliency describes the employee's ability to cope successfully in an uncertain and unexpected environment (Sherehiy and Karwowski, 2014). This includes being open to change, new ideas, and innovative technology (Muduli and Pandya, 2018; Patil and Suresh, 2019). Numerous studies have provided evidence of the positive effects of workforce agility, for example, heightened performance flexibility, reduced work-related stress (Alavi, 2014), and greater job satisfaction (Melnik and Maurer, 2006).

In sum, our findings demonstrate that employees actively participating in CoPs exhibit workforce agility.

4.2 Employees' work-related perception – psychological empowerment

With regard to the effects of active CoP participation on the employee's perceptions, we identified several references from our interviews:

1. CoP members highly value the CoP as a meaningful platform and attach great importance to their participation in the CoPs. They are genuinely passionate about the CoP's subject matter, goals, and activities, and derive personal satisfaction, enjoyment, and fulfilment from being part of the CoP. Moreover, their work aligns with their interests, experiences, and knowledge and serves desirable purposes. CoP members are willing to invest their time and effort voluntarily as intrinsic motivation drives them. These insights are evident from several statements by interviewees: *"People are here because it brings them added value, and they stop coming if it doesn't add any value to them"* (I22). Additionally, an interviewee (I20) stated that their contributions have an impact on the entire organization: *"These are overall issues that we want to solve, issues that concern everyone"*.
2. CoP members experience autonomy in their participation, as they have the freedom to decide when and how they engage in CoP activities. This autonomy is a result of the self-organizing nature of CoPs and the absence of hierarchical structures (Paasivaara and Lassenius, 2014). An interviewee (I32) reported: *"There is no boss, no leaders. We are all the same. [...] That is why people are not afraid to do things and also people are not afraid to not do things"*.
3. Several interview participants concluded that they believe that sharing their expertise, ideas, and experiences has a positive impact and helps advance the collective goals of the CoP, as a CoP member (I8) explained to us: *"The people coming together are exactly the right people to talk about this topic"*.
4. Members also recognized that every member has the opportunity and responsibility to contribute to the outcome of the CoP: *"Each CoP member, regardless of their role, makes their best possible contribution"* (I8).

These insights can be summarized by the following theory-centered second-order themes, reflecting the effects that active participation in CoPs has on employees' motivation: (1) meaningfulness of participation, (2) autonomy in participation, (3) confidence in contributing to the CoP's goals (desired result), and (4) significant influence on the CoP's outcome (actual result). These themes can be aggregated to the construct of 'psychological empowerment'. In general, psychological empowerment reflects the sense of internal motivation related to the work environment (Stewart et al., 2010). Specifically, it can be defined as an inner drive to perform tasks stemming from a feeling of personal autonomy and engaged participation in work responsibilities (Seibert et al., 2011). The construct comprises the alignment of the work role with personal beliefs, values, and standards, autonomy in initiating actions, belief in the capability to perform work activities, and conviction in influencing work outcomes (Spreitzer, 1995; Oyen et al., 2001). Together, these cognitions reflect a person's active alignment with his or her work role (Amundsen and Martinsen, 2014). Psychological empowerment consists of four dimensions: meaning, competence, self-determination, and impact, reflecting the individual's perception of their work role (Spreitzer, 1995). Meaning refers to the subjective importance and perceived purpose of one's work. Empowered individuals view their work as personally significant, showing commitment to their tasks, responsibilities, and goals (Spreitzer, 1995). Competence reflects the belief in one's capability to successfully perform work activities (Oyen et al., 2001). Employees engage confidently in activities they feel capable of handling (Spreitzer, 1995). The dimensions of

meaning and competence are primarily self-focused, referring to evaluations of alignment between one's work role and one's own beliefs, values, and standards (Oyen et al., 2001). Impact is the conviction that one can influence the work outcome (Oyen et al., 2001). Self-determination represents an individual's sense of autonomy over the initiation of their actions. In the work context, this refers to completing tasks, which includes making decisions about work objectives, approaches, and timing (Oyen et al., 2001). Self-determination and impact are control-focused, referring to autonomy and influence at work (Spreitzer, 1995). The dimensions refer to the broader work environment, such as management decision-making concerning the work unit or department.

Overall, these results indicate that employees actively participating in CoPs experience psychological empowerment.

4.3 Employees' work-related attitude – agile mindset

In our interviews, we observed various perspectives regarding how active participation in CoPs affects employees' attitudes toward their work:

1. Many interviewees highlighted that one of the primary goals of their CoP participation is continual learning and expanding their experience and knowledge. This is made clear by the following statement from an interview participant (I2): *“Of course, being a fairly large community, the multiplier effect is huge. [...] You have the opportunity to learn an incredible amount from other colleagues in this community”*. Furthermore, CoP members acknowledge the value of learning from mistakes, as another interviewee (I19) emphasized: *“Sometimes things go wrong. Admitting a previous mistake or failure and understanding that it didn't go as expected. This was a valuable experience that I can now pass on to other community members”*.

2. Our findings reveal that CoP members place significant emphasis on teamwork and mutual exchange. They provide feedback to support other members in addressing questions and problems. Furthermore, they share their ideas and results, gathering feedback and appreciating diverse perspectives. An employee (I1) told us: *“We share many questions, fostering an environment of open and transparent collaboration. We freely exchange opinions, tackle issues, and support one another within the community. We also talk to other members from entirely different units, strengthening our connections”*.

3. In our interviews, we found evidence that the CoP members work in a self-organized manner. A CoP member (I14) confirmed this: *“But all people are definitely free to take responsibility. [...] We are all equal, see us as peers, although it becomes necessary to structure our actions. [...] Things remain open and unrestricted, so there's no formal hierarchy in place”*.

These insights can be summarized by the following indicators, reflecting the effects that active participation in CoPs has on the employees' work-related attitude: (1) interest in learning, (2) interest in teamwork and mutual exchange, and (3) self-organized working. These themes can be aggregated to what is discussed in the literature as an 'agile mindset'. Miler and Gaida (2019) describe that agile individuals, teams, and organizations require a particular attitude and way of thinking, the so-called 'agile mindset', beyond the given set of procedures, techniques, and rituals. The agile mindset can be defined as “a psychological tendency that is expressed by personal evaluation regarding learning, exchange with others, self-organization, and value creation for the customer which occurs by working in a vulnerable, uncertain, complex, and ambiguous working environment with a high degree of favor” (Eilers et al., 2022, p. 20). It consists of four dimensions: learning spirit, collaborative exchange, empowered self-guidance, and iterative value creation (Eilers et al., 2022). The learning spirit is associated with continuous improvement and exploration, involving the pursuit of work-relevant subjects and the desire to experiment and try out new things. The agile mindset enables individuals to effectively navigate uncertainty and proactively respond to change. Collaborative exchange refers to the preference to share knowledge, give feedback and integrate different perspectives. Employees with an agile mindset, enjoy asking for help, collaborating with colleagues for problem-solving, and supporting others. Empowered self-guidance describes the extent to which a person evaluates reflection on themselves and their work processes positively, organizes themselves, and takes responsibility. Iterative value creation includes customer orientation and constant exchange and alignment with the customer.

Employees with an agile mindset (Eilers et al., 2022). proactive record of customer needs and a proactive transfer into appropriate actions in response to these needs

Based on these findings, it can be concluded that employees actively participating in CoPs are more likely to develop an agile mindset.

1st-order codes	2nd-order themes	Aggregate dimension
I search for opportunities and collect related information to contribute to the organizational success.	Proactivity	Workforce agility
I am flexible to change quickly from task to task, role to role, and team to team.	Adaptability	
I work in interdepartmental teams.		
I quickly develop new knowledge and skills.		
I am comfortable with change, new ideas, and new technologies.	Resiliency	Psychological empowerment
My active participation in the CoP is meaningful to me.	Meaning	
I have significant autonomy in determining how and when I participate in the CoP.	Self-determination	
I am confident about my ability to contribute to the CoP’s goals.	Competence	
I have a significant influence on the outcome of the CoP.	Impact	Agile mindset
I come up with new ideas to better complete my tasks.	Learning spirit	
I like exchanging views with others about the challenges of reaching our goal.		
It is important to me to always learn something new.		
I solve difficult challenges best when I work together with others.	Collaborative exchange	
I like making my work transparent to others.		
I appreciate different perspectives.		
I like supporting others.		
I regularly review my approach with others.	Empowered self-guiding	
I am good at organizing myself.		
I learn new skills that help me handle changes.		
I use mistakes as a chance for me to adjust my approach.		

Table 3. Overview of findings (data structure)

5 Discussion, Limitations, and Areas for Future Research

The implementation of agile methodologies through LSATs represents a complex and demanding endeavour (Fuchs and Hess, 2018). LSATs primarily confront people-related challenges (Gandomani and Hazura Zulzalil, 2014). However, due to the limited extent of research in this domain, effective strategies to effectively address these challenges remain uncertain (Fuchs and Hess, 2018; Paasivaara et al., 2018). In parallel, CoPs are integrated into agile frameworks, seen as a means to promote LSATs (Scaled Agile, Inc., 2023). Their value is particularly emphasized in complex and uncertain contexts like LSATs (Mládková, 2023; Šmite et al., 2019). However, academic attention on CoPs’ role in evolving business environments, especially in addressing LSAT challenges, remains limited. Our study is the first that investigates the impacts on employees actively participating in internal CoPs that, in turn, contribute to the LSAT. Our findings indicate that active participation in online CoPs relates to higher levels of (1) workforce agility, (2) psychological empowerment, and (3) an agile mindset. These factors play a pivotal role in mitigating and addressing people-related challenges (Gandomani and Hazura Zulzalil, 2014; Howaldt et al., 2012), particularly concerning employees’ limitations in abilities and

motivation (Dikert et al., 2016): (1) Workforce agility, characterized by proactivity, adaptability, and resiliency, is a vital ability for navigating dynamic environments (Muduli & Pandya, 2018). In the context of LSATs, which entail significant organizational change and uncertainty (Dikert et al., 2016; Fuchs & Hess, 2018; Russo, 2021), workforce agility becomes particularly relevant. Employees with higher levels of agility not only embrace change positively but also excel in adapting to new situations and continuously acquiring new skills (Patil & Suresh, 2019; Petermann & Zacher, 2022). Moreover, they actively contribute to LSAT success by proactively anticipating and resolving challenges (Muduli, 2017; Storme et al., 2020). (2) Psychological empowerment, reflecting an employee's intrinsic motivation at work (Stewart et al., 2010), significantly boosts employees' motivation in agile transformations (Muduli & Pandya, 2018). It fosters meaningful work, increasing commitment and engagement. Empowered employees are more inclined to proactively develop new skills (Muduli, 2016) and better equipped to handle unexpected changes (Petermann and Zacher, 2022). Furthermore, they collaborate effectively, exhibit high engagement, and contribute innovative ideas aligned with transformational goals (Paul et al., 2020; Seibert et al., 2011). (3) The agile mindset is considered essential in addressing the challenges of LSATs. It comprises particular attitudes from the Agile Manifesto like trust, self-organization, collaboration, and continuous improvement (Miler & Gaida, 2019). It involves openness to new ideas, embracing uncertainty, integrating diverse perspectives, and prioritizing customer needs (Eilers et al., 2022). This mindset empowers individuals to navigate change and collaborate effectively, emphasizing a proactive and customer-centric approach.

Our findings are derived from an exploratory case study conducted within a case organization. We conducted 33 interviews with employees actively engaged in company-internal CoPs. The specifics of the case company and its CoPs (Chapter 3.1) significantly influence our study results which need to be reflected. The case organization operates in the automotive software industry, renowned for its high competitiveness and the imperative for continuous innovation. Employees within such a company may be more inclined to innovate driven by social pressure and the organizational culture. Consequently, employees may tend to utilize CoPs as a platform for knowledge exchange to generate novel ideas. Furthermore, the company comprises many young employees aged between 30 and 40 years old. These individuals likely possess strong digital skills and thus have easier access to and a greater interest in digital platforms through which the organization's internal CoPs are organized. Participation in the internal CoPs is voluntary, which can strengthen employees' intrinsic motivation. However, there is a risk that certain employees may be excluded or that engagement may be unevenly distributed, representing only a part of the workforce. Additionally, the case company is affected by the merger of different companies, leading to cultural differences, communication challenges, and conflicts that may affect the effectiveness of CoPs.

While our study provides some promising insights, our research also has some limitations that present opportunities for future research: (1) We used an exploratory qualitative case study as the research method. Although the case organization appeared very suitable for data collection, the generalizability of the results is constrained by the unique characteristics of the organization outlined above (Industry, age distribution of employees, voluntary participation in CoPs), which impact our findings. Future research should compare our results with additional cases from various enterprises (e.g., SMEs and startups), countries, and industries, and conduct interviews with a larger and more diverse sample to strengthen the generalizability of our findings (Walsham, 2006; Yin, 2013). (2) While we maintained a diverse interview sample, our focus on a single company and 33 interview partners may limit the representativeness of the findings. Additionally, the voluntary participation in our interviews may introduce bias towards employees who are motivated by CoPs. Further studies should aim to utilize a general cross-section of employees to obtain more representative survey results. (3) Internal factors within CoPs, such as member engagement and motivation (Francis-Coad et al., 2017), may indeed play a significant role, although they were not explicitly considered in our exploratory study. Moreover, external factors such as organizational culture and management support (Paasivaara and Lassenius, 2014), were not explicitly addressed in our exploratory study. However, these internal and external factors could potentially influence the results and should be considered in further scholarly research. (5) Our study relied solely on qualitative data gathered from interviews. To gain a deeper understanding of

the effects of participation in CoPs, future research should consider employing a mixed-methods approach that combines quantitative and qualitative data (Venkatesh et al., 2016). While our research provides initial insights into the abilities, perceptions, and attitudes necessary for LSATs, it remains static knowledge in a dynamic environment and may not capture all relevant factors. Developing an inductive theoretical model to examine the dynamic relationships between the investigated effects (Gioia et al., 2013) would be a valuable addition to our findings. (6) Furthermore, the effects of CoPs on LSATs may change over time, making it important to consider long-term impacts.

6 Theoretical and Practical Contributions

1) Theoretical contributions: The scientific literature as it advances knowledge in the field of agile transformation, particularly large-scale agile transformations (LSATs). Existing studies (Kähkönen, 2004; Mládková, 2023; Paasivaara and Lassenius, 2014; Šmite et al., 2019) indeed highlight the effectiveness of CoPs in transitioning from traditional plan-driven frameworks to agile methodologies. However, they primarily provide initial insights into the role of CoPs within LSATs, predominantly addressing methodology and organizational challenges (Fuchs and Hess, 2018). Consequently, the role of CoPs in addressing people-related challenges, such as lack of abilities and motivation in LSATs, remains largely unexplored. Bridging this gap, our study is the first to investigate how company-internal online CoPs contribute to LSATs by developing relevant abilities (workforce agility), perceptions (psychological empowerment), and attitudes (agile mindset) of actively participating members. By establishing this initial understanding, our research lays the groundwork for future studies on CoPs as catalysts for LSATs.

2) Practical contributions: By illustrating that active participation in CoPs is linked to higher levels of workforce agility, psychological empowerment, and an agile mindset, online CoPs emerge as a potential solution to address the lack of essential abilities and motivation among employees in LSATs. Consequently, online CoPs can be viewed as an effective approach to support LSATs. Hence, managers overseeing LSATs should consider establishing and fostering internal CoPs within their organizations. For instance, Paasivaara and Lassenius (2014) identified three pivotal factors to cultivate a supportive environment for CoPs: inclusive participation, recognition of participation, and managerial and coaching support for CoP development. Our findings hold particular significance for large enterprises and those characterized by diverse workforces resulting from mergers or rapid expansion. Additionally, they are pertinent for companies aiming to enhance agility and promote active employee engagement.

7 Conclusion

Large-scale agile transformations (LSATs) are complex phenomena that often bring people-related challenges with them. While communities of Practice (CoPs) have been acknowledged as supportive mechanisms for LSATs, their specific role in addressing challenges within transformational environments lacks sufficient academic exploration. Based on a case study, our study pioneers an investigation into how online CoPs within companies contribute to LSATs by influencing the development of crucial abilities (workforce agility), perceptions (psychological empowerment), and attitudes (agile mindset) among actively engaged employees. To advance this field, future research could broaden the scope by conducting comparative case studies across diverse enterprises and sectors. Additionally, employing a mixed-methods approach and developing a dynamic theoretical model would further enrich our understanding of the effects and dynamic relationships of online CoPs within LSATs.

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